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JOURNAL OF THE TRANSACTIONS
OF
THE VICTORIA INSTITUTE.

VOL. XXXIII.

JOURNAL OF
THE TRANSACTIONS
OF
The Victoria Institute,
OR,
Philosophical Society of Great Britain.

EDITED BY THE SECRETARY.

VOL. XXXIII.



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DAVID NUTT, LONG ACRE.

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. *The Institute's object being to investigate, it must not be held to endorse the various views expressed at its meetings.*

PREFACE.



THE position of the Institute and its work during the past Session are so fully stated in the Report read at the Annual Meeting of the Institute held at the House of the Society of Arts on June 10th last, that it seems unnecessary for me to add anything further. The contents of this Volume of the Transactions will probably be found of not less interest and importance than those of any of the preceding volumes.

EDWARD HULL,

Secretary and Editor.

September 23rd, 1901.

ANNUAL GENERAL MEETING
HELD AT THE HOUSE OF THE SOCIETY OF ARTS,
MONDAY, JUNE 10, 1901.

The President,
Sir GEORGE GABRIEL STOKES, Bart., LL.D., Sc.D., F.R.S.,
IN THE CHAIR.

THE PRESIDENT.—Ladies and gentlemen, a telegram has been received from General Sir H. L. Geary regretting that he is unable to attend, and letters have been received from Captain Creak and Mr. Howard also expressing their regret that they are unable to attend the Annual Meeting.

I will now ask the Secretary to read the Report.

The Secretary, Professor EDWARD HULL, M.A., LL.D., F.R.S., read the following Report of the Council :—

1. In presenting the THIRTY-FIFTH ANNUAL REPORT, the Council has the pleasure of stating that the position of the Institute has been fairly well maintained during the past year, both as regards membership, the character of the communications read at the Ordinary Meetings, and the funds. The Institute has not been free from "those adverse influences" referred to in the previous Report, which have caused some Members and Associates to retire from their connection with it—due to increased demands on their income; and this influence has especially affected the parochial clergy. But in nearly every case where such withdrawal of support has been rendered necessary, the notice of resignation has been accompanied by expression of sincere regret, and of continued interest in the work carried on by the Institute itself. It were much to be desired that there was some fund available from which the Council could assist such persons in retaining their connection with the Institute.

2. The Institute would be greatly aided if individual Members or Associates would endeavour to interest their friends at home, abroad, or in the Colonies in its work. A large proportion of our constituents reside outside the British Isles, especially in America and India; and the *Annual Journal of Transactions* serves as a bond of sympathy with this country, and from the variety of subjects discussed in its pages, serves to interest them in many of the problems of the day.

3. The following is the new list of the Officers and Council:—

President.

Sir George Gabriel Stokes, Bart., LL.D., Sc.D., F.R.S.

Vice-Presidents.

The Rt. Hon. the Earl of Halsbury, P.C., F.R.S., The Lord High Chancellor.
The Ven. R. Thornton, D.D., *Archdeacon of Middlesex*.
Sir Joseph Fayrer, Bart., K.C.S.I., F.R.S.
Sir T. Powell Buxton, Bart., K.C.M.G., F.R.G.S.
Alexander McArthur, Esq., J.P., D.L.
W. H. Hudleston, Esq., M.A., F.R.S.
Professor Lionel Beale, F.R.C.P., F.R.S.
The Most Rev. the Archb. of Armagh, D.D.

Trustees.

D. Howard, Esq., D.L., F.C.S.
Rev. Preb. H. Wace, D.D.

Hon. Auditors.—J. Allen, Esq.; General G. S. Hallowes.

Council.

Hon. Treasurer.—Lieut.-General Sir H. L. Geary, K.C.B.

Sec.—Professor Edward Hull, LL.D., F.R.S.

His Honour Judge Waddy, K.C.	T. G. Pinches, Esq., LL.D., M.R.A.S.
Rev. J. H. Bigg, D.D.	The Ven. Archdeacon Sinclair, D.D.
H. Cadman Jones, Esq., M.A.	Dr. Gerard Smith, M.R.C.S.E.
Rev. W. Arthur.	Commander G. P. Heath, R.N.
Rev. J. Angus, M.A., D.D.	Rev. Canon Tristram, M.A., D.D., LL.D., F.R.S.
*D. Howard, Esq., D.L., F.C.S.	Rev. G. F. Whidborne, M.A., F.G.S., F.R.G.S.
Rev. F. W. Tremlett, D.D., D.C.L., Ph.D.	General Sir H. L. Geary, K.C.B., R.A.
*Rev. Preb. H. Wace, D.D.	Count Della Rocchetta.
Rev. Chancellor J. J. Lias, M.A.	Dr. Walter Kidd, F.Z.S.
*Gen. G. S. Hallowes.	E. S. M. Perowne, Esq.
Capt. Creak, C.B., R.N., C.B., F.R.S.	M. L. Rouse, Esq., B.L.
Rev. F. A. Walker, D.D., F.L.S.	Rev. E. A. Bullen, B.A., F.G.S.
T. Chaplin, Esq., M.D.	Rev. John Tuckwell.
Rev. Canon Girdlestone, M.A.	

* *Ex officio*.

4. The Council regret to announce the decease of the following supporters of the Institute, among whom were many exceptionally prominent men in varied spheres of usefulness:—

Sir H. W. Acland, Bart., K.C.B., *M.*; Rev. F. B. Angell, *A.*; Rev. H. R. Bailey, M.A., *A.*; W. Bickford-Smith, Esq., *M.*; Rev. R. Collins, M.A., *M.*; Rev. R. Cooper, M.A., *A.*; John Deacon, Esq., *L.M.*; W. Forsyth, Esq., LL.D., Vice-President; the Hon. H. D. Ryder, Earl of Harrowby, *L.M.*; Rev. S. H. Kellogg, D.D., *A.*; John Napier, Esq., *M.*; Rev. A. Peache, D.D., *A.*; Capt. F. W. H. Petrie, late Hon. Sec.; E. Quaile, Esq., *A.*; C. K. J. W. Tyndall, Esq., *A.*; William Vanner, Esq., *M.* (Member of Council); A. G. Yeates, Esq., *M.*

5. The following is an approximate statement of the constituency of the Institute at the end of May, 1901:—

Life Members	..	..	..	44	in number.
Annual „	..	..	..	197	„
Life Associates	..	..	..	64	„
Annual „	..	..	..	480	„
Hon. Corresponding Members	..			183	„
				<hr/>	
Total	..			968	

The Council hope that during the coming year an effort will be made to bring the adherents up to the number of one thousand. In this connection Members are reminded that payment of the entrance fee of one guinea is temporarily suspended.

6. Finance.

The Treasurer's Balance Sheet for the year ended December 31, 1900, duly audited, shows the total receipt of £1,171 19s. 10d., leaving a balance of £18 3s. 7d. to credit of the Institute. The Reserve Fund of 2½ per cent. Consols has been reduced by £200, which was sold out in order to meet the unusually heavy charge on account of printing. In order to bring this item of expense within more moderate limits, the Council decided to discontinue the issue of the quarterly numbers of the Journal.

Special.—The Council desires to urge the great importance of all subscriptions being remitted during the first half of the year (Bye-law III, 3 and 4). Adherence to this rule will facilitate the work of the Institute, and help towards removing any cause of anxiety to the Council. Forms for the payment of the subscriptions through a banker are used by a large number of Members and Associates, and may be had at the office.

7. MEETINGS.

The meetings of the Institute have been generally well attended, and the subjects dealt with have been of a varied character, as will be seen by the following programme. The subjects may be arranged under the following heads:—

1. HISTORY.

- “Report on the Proceedings of the Congress for the History of Religion,” Paris. By THEOPHILUS G. PINCHES, LL.D., M.R.A.Soc.
 “The Wahabies.” By Rev. S. M. ZWEMER, F.R.G.S.

- "The Maoris' Place in History." By JOSHUA RUTLAND, Esq.
 "The Arab Immigration into South-east Madagascar." By Rev. G. A. SHAW, F.Z.S.

2. ZOOLOGY.

- "Notes on Hornets and Grasshoppers." By Rev. F. A. WALKER, D.D., F.L.S.

3. GEOLOGY.

- "Evolution from a Geological point of View." By Rev. G. F. WHIDBORNE, M.A., F.G.S.
 "Time Divisions of the Ice Age." By WARREN UPHAM, Esq., F.G.S.Amer.

4. GEOGRAPHY.

- "Visit to the Hittite Cities, Eyuk and Boghaz." By Rev. G. E. WHITE, Marsovaen.
 "Ancient Script in Australia." By E. J. STATHAM, Esq., C.E.

5. ART.

- "The Relation of Religion and Art." By Rev. T. HUNTER BOYD.
 "The Sacrament of Divine Art." By ERNEST NEWLANDSMITH, Esq.
 The "ANNUAL ADDRESS," by Sir ROBERT S. BALL, LL.D., F.R.S., Professor of Astronomy, Cambridge University, on "The Origin of New Stars," to be delivered this afternoon.

8. *The Journal of Transactions.*

The King, following the custom of Her late Majesty, His illustrious mother, has been graciously pleased to add the last volume of the *Transactions* to the Royal Library.

The thirty-third volume of the *Journal of Transactions* will shortly be issued. It will contain the subjects brought before meetings of the Institute and discussed, together with the communications received from Members in the country and abroad, who have added to the value of those discussions by sending in communications on the subjects considered.

The careful correction of the papers, discussions, and communications, by their respective authors, often involving repeated communications even with distant lands, and references to the views of other investigators who have made the subjects treated matters of research, is at times a cause of delay in the publication of the Journal containing them, but the result is to give the Volume of Transactions the character of a finished work. From time to time Members of the Institute and others have expressed their high sense of the value of the Transactions of the Institute, inasmuch as they contain, not the views of any one person only, but the well-considered opinions of many, resident in various and even distant parts of the world. This system gives a

value to the treatment of the several subjects beyond that which any individual author could give.

9. *Spread of the Work and Useful Influence of the Institute.*

Not many years ago the issue of the Annual Volume was considered to complete the work of the Institute, but of late the wish to make further use of the matter it contains has had valuable results:—

First;—Members and Associates at home, in India, and elsewhere, make use of the papers in the Journal as lectures, or as the basis of such, in their several localities.

Secondly;—Some Members and Associates secure the translation and circulation of portions of the Journal in the various countries in which they reside. Such translations have been made in many countries of Europe, South America, and India; and now from China and Japan, the importance of securing translations has been strongly urged.

Thirdly;—Some home, foreign, and colonial public libraries and institutions are regular purchasers of the Journal, and Members and Associates have sought to encourage this practice in their respective localities. The need of so doing has been pointed out by many Members, since it is by no means unusual, especially in the Colonies, to find in public libraries books arguing that Science and Revelation are at variance. The Journal of the Institute has been spoken of as specially suited as a corrective to such erroneous views. In India and elsewhere some have obtained the Journal or copies of the People's Edition, and placed them in local reading rooms for the use of English-speaking natives and others.

10. *Accession of King Edward VII.*

The Council of the Institute was not less desirous than other learned Societies to testify its sorrow upon the death of our late Queen, and to offer to His Majesty Edward VII the assurance of devotion and loyalty to the Crown and Person of His Majesty. In accordance with this desire a dutiful and loyal address to the King was adopted at the meeting of the Council on Monday, 4th February, and afterwards read at the meeting of Members and Associates by the President; and forwarded through the Home Secretary to His Majesty, by whom a gracious reply was returned, which was read from the Chair at the meeting held on April 1st in the rooms of the Institute.

11. *The People's Edition.*

This consists of twelve papers—written by men of eminence in such a style that they may be comprehended by all—reprinted from the *Journal of Transactions*. The Edition was started by some Members in the year 1873, and first attracted attention in other quarters to the importance and need of works of the kind. The pamphlets often contain the objections and criticisms brought forward in discussing the subjects, as many home and foreign correspondents have urged the value of including these. They are published in neat covers, and are sold at a nominal price (sixpence), and single copies are supplied *gratuitously* or at cost price, at the office, to all individual lecturers against infidelity, including those of the London City Mission, the Christian Evidence Society, and similar bodies.

12. *The Gunning Fund.*

This fund was founded by His Excellency Robert Halliday Gunning, M.D., LL.D., F.R.S.E., etc. It at first consisted of a bond of £500, the interest on which was paid by Dr. Gunning to further the work of the Institute. The Executors have now paid the money to the Trustees of the Institute; and the amount is lodged with the bank on deposit receipt pending its investment. A Sub-Committee has been nominated by the Council for the purpose of drawing up a scheme for founding “a triennial prize,” in accordance with the will of the founder, and in harmony with the constitution of the Institute;—a matter which will require careful consideration, and which may not be definitely arranged for some time.

13. *Conclusion.*

In conclusion the Council desires to express its thankfulness for the success thus far of the Institute.

The importance of its work has been recognized by loyal support from its Members in all lands. They realise that an Institute conducted by such men as the President of the Institute (Sir G. G. Stokes), the Lord High Chancellor of England (Earl of Halsbury), Lord Kelvin, and other leaders of thought, devoting their time voluntarily to carrying on the Institute's work, is one which is potent for good results in banishing that spirit of unbelief which has professed to be founded on science.

G. G. STOKES.

ANNUAL BALANCE SHEET, from 1st January to 31st December, 1900.

RECEIPTS.		£	s.	d.	£	s.	d.
		133	19	3			
Balance from 1899							
Subscriptions:—1 Member, 1897		2	2	0			
2 Members, 1898.. ..		4	4	0			
7 „ 1899.. ..		14	14	0			
152 „ 1900.. ..		319	4	0			
3 „ 1901.. ..		6	6	0			
5 Entrance Fees.. ..		5	5	0			
1 Associate, 1894		1	1	0			
1 „ 1895		1	1	0			
3 Associates, 1896		3	3	0			
3 „ 1897		3	3	0			
10 „ 1898		10	10	0			
28 „ 1899		29	8	0			
348 „ 1900		365	8	0			
15 „ 1901		15	15	0			
1 „ paid short.. ..		1	0	0			
		782	4	0			
Dividend on £1,165 18s. 9d. 2½ p.c. Consols		34	13	8			
Donation to Special Fund (H. C. Dent, Esq.)		1	1	0			
Sale of Journals		23	12	11			
Sale of Consols (Reserve)		196	9	0			
		£1,171	19	10			

EXPENDITURE.		£	s.	d.
Printing		436	0	3
Postage		54	0	6
Binding		22	10	4
Reporting		29	8	0
Typewriting		0	15	9
Stationery		21	9	2
Advertising		7	9	6
Expenses of Meetings		11	2	6
Travelling		5	18	10
Clerk—Salary		84	10	0
„ Extra		28	12	0
Rent.. ..		180	0	0
Housekeeper		0	15	0
Coal and Light		8	17	1
Library		14	4	1
Late and Present Secretaries		235	0	0
Insurance		0	12	0
Bank Charges		0	18	6
Sundries		9	10	9
Subscriptions repaid		2	2	0
Balance Cr.		18	3	7
		£1,171	19	10

There is a reserve fund of £1,165 18s. 9d. New 2½% Consols.

We have examined the Balance Sheet with the Books and Vouchers, and find a Balance in hand of £18 3s. 7d.

26 March, 1901.

JOHN ALLEN,
G. S. HALLOWES, Major-Gen., } *Auditors.*

Rev. Dr. IRVINE, F.G.S.—Mr. President, ladies and gentlemen: By accident your Secretary has requested me to move the adoption of this admirable Report since I came into the room. I suppose he fixed on me by a kind of instinct of fraternity. We have together, in former years, hammered the rocks—especially in the sunny south-west of that glorious county of Devonshire. So I cannot, for a moment, hesitate to accept that responsibility which your Secretary wished to thrust upon me. Not that I feel that that responsibility is a great one, because no advocacy is required, I think, to recommend this Report to the minds of all present, and to all who are interested in this Institute and the noble work it is carrying on. I look upon this Institute as something unique. It is a learned Society and something more. It is, as it were, a nucleus for the fraternization of all learned Societies and for all those engaged in learning—not scientific only, but literary and historical, and everything which tends to throw light on progress and the welfare of the human family; and to elucidate the beneficent workings of Divine providence. So I am sorry to see one statement in the Report, which announces the loss of so many clerical members of the Institute. Let us hope it will be only a temporary relapse, for I think the Institute has done in this way somewhat of the work which the great Oxford Reformers did for us when they advocated greater learning, a wider range of studies and a severer intellectual discipline for the clergy of the Church of this country. Therefore I have very great pleasure, and I count it a great honour to be called upon, to move the adoption of this Report.

The Ven. Archdeacon THORNTON, D.D.—Mr. President, ladies and gentlemen: A long speech is not wanted in seconding the resolution which has been proposed to you. The Report which has been read to us, or partially read to us, appears to be a satisfactory one, and shows that while the Institute is doing its work in various departments of science, it is possible to be deeply scientific and at the same time deeply religious.

I sincerely hope, if the number of Members and persons interested in the Institute be raised to the round "one thousand," which the Secretary expressed his hope it would be, that this difficulty will be removed and that the £200 which has been taken away from the reserve fund will be replaced by £300. I beg to second the adoption of the resolution.

The PRESIDENT.—Before putting this motion, I will just make one remark. Although it would appear from the balance sheet as if we had been rather going down hill, it is more in appearance than in reality. I think our late Treasurer, who is to be replaced by another to-day, will be able to say a word or two in explanation of that.

The SECRETARY.—In the absence of the new Treasurer I may state what the President has said is quite correct. The actual income has not been less than last year—possibly a little more: but it would be impossible to go into details on the present occasion.

The PRESIDENT.—Before I put this to the vote I may remark that some of the officers of the Society have been changed, *i.e.*, new names have been introduced, *viz.*—Sir T. Fowell Buxton, Bart., and Professor Lionel Beale as Vice-Presidents. There are three new members of Council—E. S. M. Perowne, Esq., Martin L. Rouse, Esq., and the Rev. R. A. Bullen.

According to the rules of the Association the Anniversary Meeting is the proper time for the election of officers.

The motion is that the Report of the Council now read be received and adopted and circulated amongst the Members and Associates.

The resolution, having been put to the meeting, was carried *nem. con.*

I will now call on Dr. Clapton to move the next resolution.

Dr. CLAPTON, F.L.S.—I beg to move that the thanks of the Members and Associates be presented to the Council, the Hon. Officers and Auditors for their important services during the past year. I am sure that those who have attended the meetings this year will heartily support this resolution, which I have much pleasure in moving.

Professor ORCHARD.—I have very much pleasure in seconding that resolution. It requires no seconding, because the Council and officers are really the people who have brought this Institute to its present state of efficiency.

The PRESIDENT then put the resolution, which was carried unanimously. He then called on Sir Robert Ball, LL.D., F.R.S., Lowndean Professor of Astronomy in the University of Cambridge, to deliver the Annual Address, "The Origin of New Stars."

THE ORIGIN OF NEW STARS.

By Prof. Sir ROBERT S. BALL, LL.D., F.R.S.

MR. PRESIDENT, LADIES AND GENTLEMEN,—The subject of the address that I propose to give you is “The Origin of New Stars,” and the title was naturally suggested by that very remarkable star—the most remarkable of its kind which has appeared for three hundred years—at which we all looked with such interest in the early months of this year.

But I am taking the opportunity to refer to the subject also in a somewhat wider manner—to speak of those processes of change and transformation which we observe actually going on at this moment in the universe around us.

First of all as to what we mean by new stars. We look up into the heavens at night and see constellations, and history tells us that those constellations were the same in the days of Homer, and in the days of Job, practically, as they are at present. But we must not imagine that those constellations, and those arrangements of stars are eternal; for, as Professor Hull tells us, the mountains and other features of the earth have been in constant change during the course of geological time, though those changes are not appreciable in historic times; and in like manner these constellations of the sky are not always the same. It is very easy to show that within such a period of time as may be comparable with geological periods, the whole face of the skies, too, will have undergone a complete transformation. We have all seen in museums the *ichthyosaurus*, the eye of which is a most remarkable optical instrument; but if that animal could ever have glanced up to the skies I think I shall be justified in saying that not a single one of those stars that we now see were then within his ken. The heavens have gradually changed, and in the course of a certain period of time—say ten million years, from what we know of the movements of the stars, there would doubtless be a complete transformation; so that the stars which we see about us now, that may be unchangeable from our ephemeral point of view, are in a state of gradual change. When coming down Channel you see a number of ships about; you do not see much motion in them, if you look again, in

another hour you still see a number of ships about, but they are not the same ships that you saw before. So in the heavens there is a continual flux. The old stars are passing away, and new stars are coming into view.

I will try to illustrate the appearance of this new star—the way in which it came, and the evidence we have of its character. I am fortunate to be able to do this, for by the kindness of friends I have obtained the use of photographs which will show us the peculiar circumstances which mark that star from all other ordinary stars, even if we had not the remarkable circumstances in connection with its sudden outbreak and its still more remarkable decline. I will now ask for the lights to be turned down for a few minutes while we look at the pictures thrown on the screen.

[*A picture was then exhibited.*]

That is merely a picture of a small part of the skies—not the whole heavens—not more than a one ten-thousandth part of the heavens. It is a very rich part of the Milky Way, containing innumerable myriads of stars. There is no spot on that diagam upon which I could place the tip of my finger without hiding some star behind it. We take that as an example of the starry firmament as we see it.

Now we will look at another, giving us a view of a different part of the heavens.

[*Exhibited on the screen.*]

It would take ten thousand such pictures as you are looking at to cover the whole stars of the heavens, and here, again, there are innumerable myriads of them, and in view of what is to come, I will ask you to retain a general impression of this picture in your minds.

Now we come to a much more special picture.

[*Exhibited on the screen.*]

This was given to me by Mr. Stanley Williams, and it represents a photograph of a part of the sky on February 22nd. That picture represents all those stars which have, no doubt, been there for thousands of years, and then, a week later, he took *this* second picture and this is the new star which appeared in the meantime.

[*Exhibiting on the screen.*]

It shows the sudden way in which that new star burst into view. It greatly increased in lustre until it exceeded,

for a short time, any other star in the northern sky, and then there set in a decline and the star got gradually fainter. It did not go out entirely, but declined, and then every now and then there was a recrudescence. Sometimes the star could not be seen and sometimes it could. It suffered remarkable fluctuations in brightness and then gradually declined, and it had sunk down to a faint star when last seen before the advancing daylight extinguished it.

Now what is the origin of such a star as that? Let us first consider what the stars are. This is a question which depends very much on heat, or the degree of capacity for radiating heat and light that the stars present. Will you imagine this stick to be a thermometer with a long-graduated scale, and where I hold my finger to represent the temperature of the bodies when red hot; when you can just see them. Up about *here* would be the temperature of bodies when they would be as hot as suns; and below would be a very cold temperature—the temperature of space. Such a temperature as this Professor Dewar has shown us by his most remarkable researches to be that at which air-freezes to a solid lump. Below the point corresponding to redness an object sends no light that can make it visible, but above that it sends light which will make it visible according to the degree of brightness and other circumstances. I exclude the moon and the planets for the moment. Jupiter is only bright because it reflects back to us a little sunlight. Were Jupiter to pass out to where the stars in that picture are, you would not see it at all; and all the objects we see in the heavens, excluding the planets, are objects which shine by their own light. They are objects of which the temperature would be on *this* part of the scale, above the red line. But the simplest consideration shows us that every hot body tends to get cold, and every one of those objects that we look at is radiating its heat, and is generally tending to cool, and consequently, tending to come down and pass this line. When once they get down there they may stay at that temperature to all eternity, unless some tremendous change takes place to bring them up again. There is a general tendency of bodies in space to come down to the colder temperatures. When we look up at the heavens above and their myriads of objects, we must remember that we only see the bright objects, the dark ones are invisible. The earth only has a two-thousand millionth part of the light from the sun, and therefore you

see that these stars, or sunlighted bodies and planets around them, only get a two-thousand millionth part of the light and are not seen. The brilliant objects that we see, though they are overwhelmingly numerous, yet they must be absolutely as nothing in comparison with the myriads of dark objects which are totally invisible to us, except when certain very remarkable circumstances arise. The probability is, when we look at the stars, we do not see a thousandth, part of the actual amount of matter up there, because it is much more usual for a body to be dark than it is for that body to be bright. Brightness is a temporary stage, and darkness is a stage of indefinitely long duration.

When we look up at the heavens, I sometimes think that the view we get may be paralleled with that a being from some other part would get of this city of London if, instead of looking at us in daylight, he came and stood on the Monument, at night, and looked down on the sleeping city. What would he see? He would not see the buildings, and of the wondrous life of that city he would see nothing—merely lights here and there dissipating the gloom slightly. If that being were to go away thinking he had seen London, simply because he had seen those lights, how very inadequate would be his knowledge. In a somewhat similar way we must interpret the lights in heaven. It is the dark things that are most numerous, and we have only become acquainted with a very few. Occasionally it happens that by some remarkable incident in the heavens, the dark objects, or some of them, become known to us. We are no longer left merely to conjecture as to their existence, but they became actually apparent; and such an instance we found in that new star which broke out last February in the constellation of *Perseus*. For the examination of stars in these modern days, methods are provided by the spectroscope. We now analyze them in a way which was impossible before the spectrum analysis was available. I will illustrate this by showing some photographs that were taken by Father Sidgreaves of Stonyhurst College, to whose kindness I am so greatly indebted.

I had the privilege of looking at the spectrum of this new star in *Perseus*, and it was a most striking sight. If there were nothing else than that spectrum, if nobody knew anything further about the history of the star he would at once have said, "Surely this is a star of the most remarkable character and quite unlike ordinary stars"; for there are

several brilliant lines crossing the spectrum. Here we get nature to speak for herself—we are looking at the actual photographs. In these days there is no excuse for giving illustrations which are not absolute photographs.*

The spectroscope shows in *Nova Persei* the presence of a great mass of blazing incandescent hydrogen, and when you accompany this with the fact that the star suddenly broke out and declined again, it becomes of great interest indeed. I pointed out this statement how in the spectrum of this star the dark lines and bright lines of hydrogen are close side by side. It would take too long to go into more detail; but there is no doubt, from the evidence that these photographs contain, that there were two bodies concerned. Those two bodies were moving with different velocities. The dark line belongs to one and the bright line (speaking generally) may be said to belong to the other. Taking that into account, and taking into account the suddenness of its outbreak, and the indications of blazing hydrogen, it is quite easy for us to form a supposition, which is not an unnatural one, as to what was the cause of that remarkable star. I mentioned that, of the stars above us, the dark stars are in all probability incomparably more numerous than the brilliant ones. We do not see those dark stars under ordinary circumstances; but, in their myriads, it does sometimes happen that one of those dark stars, hurrying along, comes into collision with another. I have no doubt that the occurrence of such a collision is excessively rare. We must remember that these bodies are moving at enormously high velocities in vast numbers, and there is just a possibility of two of them striking. It is not unlike supposing that two rifle shots fired at random, in the air, should strike in the course of their flight. I need not tell you that if one man were firing a rifle in one place and another man a mile away were firing in an opposite direction, that it is most unlikely the two bullets should strike each other. If myriads of rifle bullets were being fired in every sort of direction then it would be conceivable that some pair of those bullets would strike each other. It is not so very unlikely—in fact there is the very best reason for believing that it may sometimes happen. I believe it is recorded that on a field of battle one rifle bullet has been known to pierce another. I think I have

* For spectra of *Nova Persei*, 1901, see "Observations on the star of *Nova Persei*," by Sir Norman Lockyer, *Proc. Royal Society* for Feb. 28, March 7, and June 20, 1901.

seen a photograph of such a remarkable coincidence having occurred. So it seems to have happened in this instance, that two of the dark bodies in space have come together. They need not have been very large bodies. The probability is that they were not very large bodies. Also it is not necessary to suppose that they came actually square together. It may have been hardly a collision at all—a mere grazing collision. If they came excessively close it is conceivable that the blow would produce a tremendous amount of friction, and it would develop a considerable quantity of heat. It may be said, "Yes, but if they come together at a temperature so cold as that at which we know even air itself is a solid lump, is it conceivable that the mere knocking together of those two bodies can create a temperature so great as to render incandescent those vast bodies of hydrogen, whose light is radiated millions and millions of miles throughout the universe?" A few figures will show that it is conceivable this might take place.

I am not going to trouble you with more figures than are absolutely necessary. You remember that a rifle bullet when fired from a rifle and hitting a target, is warm when it is picked up. That warmth is due to its motion being stopped by the blow against the target. If a body moving at a velocity far faster than that of a rifle bullet strikes against another, the heat developed in that body would be greater still. Take a piece of coal and suppose it to be sent through space at a velocity of five miles a second—ten times the velocity of any bullet fired from a rifle, then that piece of coal, if it struck against a wall, or came into collision with another piece of coal travelling in the opposite direction, would develop from the blow as much heat as could be produced by the combustion of the coal itself. But these objects move at a pace far greater than five miles a second. This earth moves at a velocity of about four times that. A number of the stars move at a far greater velocity. It is certain that those bodies in the new star had speeds which may have amounted to hundreds of miles a second. Let us suppose it to be two hundred miles a second, which is not unreasonable. A body going at five miles a second has as much energy in virtue of its motion as an equal weight of coal would yield in perfect combustion, so that if it is going at two hundred miles a second, that means it has as much energy as sixteen hundred globes of coal of the same size. Imagine two such bodies meeting in space; the energy

produced by the collision of those two bodies is equivalent to the amount of heat produced, which is sixteen hundred times as great as all the heat that could be produced by the burning of two masses of coal as big as those two bodies.

Is it any wonder, then, that by such a collision a flash can be produced that carried its message throughout the whole extent of millions and millions of miles between where we are situated and where that incident took place? Such we believe to be the origin of this star. We are not left altogether to speculation in regard to it. There are many other confirmatory circumstances. In fact, remembering the myriads of such bodies that are there it is exceedingly likely that such a collision should occur, and that it should produce such an effect as we have seen. If any one doubts that a collision can produce such a glorious radiance they have only to look at the shooting stars. A shooting star is a brilliant streak of light. In one brief fraction of a second that little object is transformed by a temperature far greater than we could produce in our most powerful furnaces into heat. It can be shown that an object a child can carry would, if it were launched as a meteor dashing into our atmosphere, produce sufficient light to astonish a large part of the earth. It has been calculated that a meteor which appeared in America some months ago and was not heavier than a pound or so, produced so much light and heat by collision with the air, that the light was as great as could be produced by an electric engine driven by a 40,000 horse-power engine, and the noise that it made was as great as if that light were accompanied by music from fog-horns, blown by another 40,000 horses.

I must add a few words as to the process of evolution, so to speak, which we see going on around us in the heavens. This subject has come very much before the attention of astronomers lately in consequence of discoveries that have recently been made. One of the greatest of philosophers, Immanuel Kant, laid the foundation of that remarkable nebular theory which ordinarily goes by the name of Laplace. Had Laplace and Sir William Herschel lived to these days, they would have heard with unbounded interest of the development of our knowledge which has arisen from photography. Here* is another point in the heavens, and here is some trace of the nebulous material—this glowing

* *Pointing to the screen.*

material which Kant imagined—for in his days they could hardly have known much of its existence.

What I want you to look at in this picture is the faint diffused light—light not from a solid material—not from the stars at a distance, but light from incandescent gas. In this picture we have instances of nebulae which are chaotic, and here you see nebulae in strange wisps. You might think they were little bits of cloud in the sky; but they are there, night after night, hardly to be seen with the aid of the best telescope.

There we have one of the great glories of the heavens—the great nebula in Orion, this being the famous picture taken by Dr. Isaac Roberts, and here we have parts of it above and below extending to a vast distance. [*Exhibiting on the screen.*] In this we have the nebulous gaseous material, as it were, drawing itself into shape.

Now we will look at another. This is the famous “Dumb-bell Nebula.” This gives an astonishing illustration of the possibilities of the photographic plate. It has a patience and delicacy that no human eye possesses.

Now we come to another—the “Crab Nebula,” as it is called. I have shown this with the view of illustrating as it were the varieties of these nebulae. We may look at different trees in a forest—the old veteran that weathers the centuries, and then we come down gradually to the little sapling until we come to the little acorn just sprouting. We can read the history of the oak by looking at individuals in the forest. So we try to learn what nebulae have to tell us by their structure as to the history of the individual objects.

But here is a form still more advanced. [*Exhibiting on the screen.*] Here we have a photograph of one of the most interesting subjects in the universe. That is the great spiral nebula. You can magnify it, and it will bear the test that it ought to stand. It was taken by Mr. W. E. Wilson, in Ireland—a most accomplished astronomical photographer, and I ask you to observe in this that sort of evolution that Laplace explains. Parts of it tend to form what may in all probability be the planets that are ultimately to attend on that sun in the centre. You see here indications of the direction in which the rotation proceeds. They are all moving round the same way. We see this planetary system lying near the same plane, and now there is an astonishing fact that I have to state. Here is another spiral taken by Dr. Roberts. We look at this with more interest

because in it we are looking at an object that no human eye has ever seen. The photographic plate sees it but we do not. The late Professor Keeler commenced a survey of the heavens. He took a square degree here, and one here. He took, if I may use the expression, samples of the heavens on photographic plates. On one of those plates he found three new nebulae; on another ten; on another twenty, and on another even as many as thirty—not less than three on any one. If he were to photograph the whole heavens he would want 40,000 plates. He had only taken a dozen or so, and had not found fewer than three on any one, and ten times that number on some. If there were three new nebulae at least on each of those 40,000 plates, that means 120,000 new nebulae in the heavens. There is an astonishing fact to be added, and that is, of these more than one-half are spirals—hence spiral nebulae assume great importance in the celestial economy.

Here is the last one we shall look at. It was taken by Dr. Roberts, and is generally believed to be the most remarkable astronomical photograph ever taken. It is a picture of the great nebula in Andromeda. If it could have been turned into a better position we should have found another great spiral.

These pictures show how the theory suggested by Kant and developed by Laplace is borne out in the most astonishing manner by these more recent observations with photography.

My lecture is at an end. I began with a statement of the origin, so far as we are able to discover it, of these stars which occasionally and suddenly burst into view.

I have shown how those stars arise from a collision, and I have tried to show how by a contraction of a nebula, as most of us believe, the great sun that we know in heaven came into being with its planets.

The whole tendency of modern science so far as we have been able to understand it, has been to show that what Kant and Laplace and Herschel laid down is, in the main, the actual order of events that has taken place in nature. In concluding my lecture to this Institute, where it has given me such pleasure to appear, I cannot help saying that the more we study these things, the greater is the mass of difficulties, which seem to us insuperable if we try to unravel them by the light of science alone. It is true, we believe—I myself certainly do—that our solar system has originated

from the nebula, just as I believe the adult came from the child; but if you ask me where that nebula came from?—well, we may say it came from the collision of two stars. But then comes the question, “Where did the two stars come from?” To that science really gives no answer; and as far as I can understand these things, the very circumstance of the heavens seem to me to bear written on them the impress of the fact that they cannot have gone on from all time as they are now. There must have been, so far as we can understand it, some beginning—some time at which there was an intervention of force and action such as science is not able to take cognizance of. Hence it is I cannot but express hearty sympathy with the efforts, and successful efforts, which have been made by this Institute to show that in our endeavours to understand the wonders of nature, we have ever brought before us the fact that there are innumerable mysteries in nature which can never be accounted for by the operations with which science makes us familiar, but which demands the intervention of some Higher Power than anything that man’s intellect can comprehend. [Loud applause.]

The PRESIDENT.—Ladies and gentlemen, I am sure you will agree with me that we ought to pass a hearty vote of thanks to Sir Robert Ball for this most interesting and most suggestive lecture that we have just heard. Perhaps it is not quite usual to propose a vote of thanks from the chair, but in the absence of Sir Joseph Fayrer, who has been obliged to leave, and who had undertaken to move the vote of thanks, I have great pleasure in doing so. (Applause.)

I need not occupy your time—in fact, it has been so delightfully occupied during the whole of this lecture, that anything I could say now would only be coming down from a ladder. Perhaps some one here will have the goodness to second this resolution.

Dr. WALTER KIDD, F.Z.S.—I beg to second the vote of thanks to Sir Robert Ball for his valuable lecture.

[The resolution was then put and carried with acclamation.]

The SECRETARY.—I wish to be permitted to add one word to the thanks that have been accorded to my distinguished friend—a

very old friend and former colleague—Sir Robert Ball, for his kindness in coming forward on this anniversary of our Institute, at great inconvenience to himself; for to-morrow morning he is bound to start for Glasgow to attend a function in that city to which all eyes are at this present moment turned. Therefore, we thank him, not only for the fact of this most remarkable lecture, which has carried us into regions of thought and delight beyond expression, but we beg to thank him for having put himself to so much inconvenience, in order to gratify and instruct us as he has done this evening.

SIR ROBERT BALL.—I am much obliged for the very kind way in which you have received my address. When I sat down, I was only conscious of the things I ought to have said which I left unsaid.

THE REV. CANON GIRDLESTONE, M.A.—I am sure you will allow me to propose that the thanks of the meeting be presented to our President, who occupies his position, I am sure, to-night with infinite pleasure. He has never, I should say, presided at a gathering which has had more interest and satisfaction to his own mind, for we have been carried in thought into the magnitude of creation. We have been brought to a contemplation of many little specks in the universe, and of our sun, the centre of our system; but we have felt too the marvellous gift which is given to man to read the nature of the stars, thanks to the spectrum analysis, so that there has been thrown on this sheet the interpretation of this wonderful event which has been occupying our minds this evening; and as we think of the closing words of the lecturer, I cannot help rejoicing in the conviction that the Being who has scattered all these material globes through space is one we can call, "Our Father in Christ"—that we can still say in the depth of our conviction, "In the beginning it was God who created the heavens and the earth." (Applause.)

I have great pleasure in proposing that the thanks of the meeting be presented to our President.

DR. THEOPHILUS PINCHES.—I beg to second the resolution.

[The resolution was then put and carried unanimously.]

The PRESIDENT having acknowledged the vote of thanks, the proceedings then terminated.

ORDINARY MEETING.*

THE PRESIDENT, SIR G. G. STOKES, BART., LL.D.,
F.R.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections took place :—

MEMBERS:—Rev. H. G. Rosedale, B.D., London; Rev. J. S. Tucker, M.A., Trent College.

ASSOCIATES :—E. Gordon Hull, Esq., M.A., M.D., London; H. Hargreaves Bolton, Esq., J.P., Lancashire; Professor J. Logan Lobley, F.G.S., London; Robert Kydd, Esq., Mech. Eng., Glasgow.

The President stated that he had conveyed to Mrs. Petrie the vote of condolence on the death of the late Hon. Secretary passed by the Special General Meeting on the 5th November last.

The SECRETARY (Prof. HULL, LL.D., F.R.S.)—Mr. President, ladies and gentlemen, I think it is only right that at this first meeting of Members of the Institute since my election as Secretary, I should take the opportunity of expressing to you, Mr. President, gentlemen of the Council, and lady and gentlemen Members, my deep appreciation of your kindness, and also of the honour you have done me, by electing me Secretary of the Institute, particularly as following so able a man as the late Secretary, Captain Petrie.

I assure you I count it a very high honour, and I may say that after the experience of about six months of office I have found the work of the Institute increasingly interesting, and such as falls within my own views and expectations.

I hope you will have no reason to regret your choice, and I will say that I shall do everything in my power, as long as I hold this office, to advance the interests of the Institute and those high principles for which it was founded.

* Monday, 3rd December, 1900.

I may also say that I have derived very great satisfaction from the services of your clerk, Mr. Montague, and I take this opportunity of bearing testimony to his unwearied diligence in his duties, his great conscientiousness, his intelligence, and, above all, for his remarkable memory, to which I am often indebted, and which often saves me much trouble and research.

I am directed to say that the Council at this meeting have passed a vote to increase his salary from the beginning of next year (Hear, hear.)

Again I thank you for your kindness. (Applause.)

The PRESIDENT.—The last resolution contained a request that I should communicate that resolution to Mrs. Petrie. I have done so. She expressed the hope that it might appear in the forthcoming volume of our Transactions, but it was too late, because the sheets were already in the hands of the binder.

The following Paper was then read by the Author:—

“The Proceedings of the Congress for the History of Religions, Paris,” by Theophilus G. Pinches, Esq., M.R.A.S.

*A SHORT ACCOUNT OF THE CONGRÈS INTERNATIONAL D'HISTOIRE DES RELIGIONS, held at Paris from the 3rd to the 8th of September, 1900. By THEOPHILUS G. PINCHES, LL.D., M.R.A.S.**

TO all those who took part in the delightful little Congress of Religious History held this year in Paris, though he may not have paid much attention to the matter before, the thought must have come that this was the outcome—modest in its way, but of infinite value—of the great “World’s Parliament of Religions,” held at Chicago on the occasion of the great International Exhibition held in that progressive American city in 1893. But it was not only an outcome—it was also a contrast. The unique assemblage gathered together in the capital of Illinois consisted largely of the representatives of the principal religions of the world, who seem to have hailed the opportunity thus presented of placing their religious views before mankind, each claiming

* Read, Monday, 3rd December, 1900.

to be in the possession of the true road to everlasting life, and some of them showing, as was to be expected, a certain amount of intolerance, or at least of the spirit of self-righteousness, as when the Japanese Kinza Hirai denounced the iniquities of Christian nations amid wild applause from those assembled, and the Rev. Jenkin-Jones, accepting the situation, "flung his arm around him, in the fervour of the moment." It was to all appearance a happy family which had assembled there. In our little Congress for the study of the history of religion held at Paris, however, the members were principally laymen, who had come together to study, calmly and dispassionately, the great subject of the origin, development, and the infinitely varied form of religious belief, both the old and the new, the refined and the coarse, monotheism and polytheism, in every land, and age, and nation. The idea was excellent; the members of the Congress threw themselves into the work with a will, and the result was a beginning such as must have gratified the originators of the Congress as it did the members, showing that a real want in this branch of science had been met.

To all appearance it was felt that here was an opportunity to take part in something very analogous to the great religious parliament of Chicago without any of the possible disputes which the statement of personal and sectarian religious opinions and beliefs would necessarily entail, for nothing could be pleasanter to the student and the scholar who interested himself in the thoughts and opinions of others as to the origin and nature of the Deity, and the way in which He had been and should be worshipped, than this, in which every kind of theological discussion was rigorously excluded, and disputes, other than purely scientific ones, were utterly impossible. It was an assemblage in which scientifically provable facts were discussed, and theories and opinions set aside, and the feeling of brotherhood, upon which so much stress had been laid in speaking of the Chicago religious parliament, was present in much greater reality than, probably, ever before.

The Congress was divided into eight sections, as follows:—

- A. The Religions of non-civilized peoples and of pre-Columbian America.
- B. The Religions of the Far East.
- C. The Religions of Egypt.

- D. The Semitic Religions (Assyro-Chaldea, Western Asia, Judaism, Islamism).
- E. The Religions of India and Iran.
- F. The Religions of Greece and Rome.
- G. The Religions of the Germans, the Celts, and the Slavs.
- H. Christianity.

The following were set forth as the subjects to be touched upon:—

SECTION A.—*Non-civilized peoples and pre-Columbian America.*

Totemism, the functions of sacrifice. The condition of souls after death.

The table of the movable festivals in central pre-Columbian America, with special reference to those of the Mayas.

The figured representations of Mexican divinities and divinities of central America, especially those of the Codices and the monuments.

SECTION B.—*China, Japan, Indo-China; Mongols, Finns.*

The relations of the religions of China with the state (state-religions, policy of the Government with regard to Buddhism, Taoism, Islamism, and Christianity).

The moral of Choang-tse.

The historical evolution of Buddhism in China, Corea, and Japan (propagation, the various schools, relations with civil life, present condition).

The organization, doctrines, and ritual of the Buddhist sects at present in Japan.

The distribution of Pali Buddhism and Chinese Buddhism in Indo-China.

SECTION C.—*Egypt.*

The funeral rites at the Thinite periods, as revealed by the most recent discoveries (Petrie, Amélineau, Morgan). The differences which they show compared with the rites of later times, and that which has reference to their practice in the unerary texts as far as they are at present known (Book of the Dead; Pyramid-Texts; Book of Hades; Embalmment-tual).

Phtah of Memphis. His primitive character, theological

and political development, relation with the gods Sokaris, Osiris, Nopher-tumu, Im-hotep, and Sokhit. What he is with relation to the Apis-bull. How and why the Greeks identified him with their Hephæstes.

The cults and popular religions of Egypt, more especially those of Thebes. The animal-gods, the bird-gods (the swallow, the duck, the heron, etc.), the serpent-gods (Ramuit, Maritsokhu). The votive offerings after convalescence or benefits received; amulets against serpents, crocodiles, and the evil eye.

Why the god Khnumu, especially he of Elephantine, became popular in later times, and how his person and worship spread during the Roman period and formed the Chnuphis-Kneph of the gnostic sects and the hermetic or magical writings.

SECTION D.—*Semitic Religions.*

How are we to reconcile the Chaldean belief in the eternity of the world with the account of the creation of the heaven, the earth, the gods, and the stars? What were their exact ideas as to the primordial abyss and chaos giving birth to the universe? What was the relation of these beliefs with the Jewish tradition of a creative divinity having no beginning?

What were the Chaldean conceptions as to the end of the existing universe?

Which were the divinities originally Sumerian, and which of them have been assimilated with the Semitic divinities, by a proceeding analogous to that which was employed in the assimilation of the Roman gods with those of Greece?

Did there exist in Chaldea a belief in the survival of the soul after death, and its pre-existence before birth?

As to totemism in Arab paganism. The gods of Yemen.

Antiquities bearing upon the religion of the Israelites before Ezra and Nehemiah.

The tombs, places of worship, and of pilgrimage in Palestine and the neighbouring districts.

The reaction of Christianity upon Judaism.

The value of the Talmud for the history of the religious ideas of the Jews, and the history of nascent Christianity.

The influence exercised by conquered Persia upon conquering Islamism, etc.

The origin of Babism.

Musulman associations and propaganda in Africa.

SECTION E.—*Persia and Iran.*

Has the theory called “naturism” its justification in the Vedic hymns?

Was the liturgy of the Brahmans and the Sutras before or after the hymns of the *Rig-Veda*?

The relation of the northern Buddhist Scriptures with corresponding works in Pali.

The origin and history of religious iconography in India.

Ancestor-worship in Hindooism.

The institution of pilgrimages in Hindooism.

Try to find the exact relations between the religion of the Persians at the time of the Achæmenides and the Avestic worship adopted by the Sassanides.

Determine critically which are the most ancient parts of the Gathas and the Avasta (*i.e.*, those of the period before the Sassanians).

SECTION F.—*Greece and Rome.*

What are the surest methods to apply to the study of the Greek religions?

The Homeric poems.

The worship of Apollo at Delphos.

The contributions of recent archæological discoveries to a knowledge of the Etruscan religion.

The diffusion of Oriental paganism in the provinces of the Roman empire (Africa, Spain, Portugal, Gaul, Britain, the Rhein and Danube provinces).

The survival and adaptation of Italian pagan myths, etc., in Italy and Greece.

SECTION G.—*German, Celtic, and Slavonic.*

Celtic eschatology.

The origins of the Celtic church in Ireland, Scotland, Wales, and Gaul.

The origin of the Germanic divinities Woden, Donar, Tiu, etc. Do they belong to the Indo-Germanic pantheon, or are they the development of demons in their nature?

The original or derived character of the principal myths of the Edda.

The god of thunder among the German and Slav nations.

What are the existing pagan monuments of Slavonic paganism in Northern Germany?

What indications of Slavonic paganism exist in the place-names of Northern Germany?

SECTION H.—*Christianity.*

The earlier centuries: Can Essenism be considered as one of the factors of Christianity as it was at first?

What contributions to a knowledge of the evolution of the ideas and rites of primitive Christianity have new Christian texts, discovered within the last thirty years, furnished?

What part had Greece and Judea in the elaboration of ancient Christian eschatology?

What is our real knowledge to-day of the origin and history of Gnosticism?

Is it possible to reconcile the system of Basilides (according to Irene) and the parallel system of Hypolitus?

The middle ages: The Asiatic (Greek, Latin, Arab, Jewish, and Byzantine) sources from which the theologians of the West drew in the middle ages.

The relations of Byzance with pagan Russia in the eleventh century, and particularly concerning the foundation of the first Christian churches in Russia.

Modern times: The influence of Kant's and Hegel's philosophies upon historical criticism as applied to the origins of Christianity.

As will be seen from this *résumé*, the Congress had set itself no light task, and there is every reason to believe that those who had offered to write papers did not realise what was expected of them. Indeed, I doubt whether some of the questions were capable of being answered, but no doubt the originators of the Congress wished to provide material for many years to come, and if this was the case, they have succeeded. Of course I am not capable of speaking with regard to all the points, but this is certainly the case in my own speciality. In the first question of the Semitic section we are asked how we are to reconcile the Chaldean belief in the eternity of the world with the account of the creation of the heavens, the earth, the gods, and the stars? We have, however, it seems to me, first to prove that the Chaldeans really had a belief in the eternity of the world before we try to

reconcile that belief with the account of the creation. Then, again, in the third part of the first paragraph, ought it not to be proved that the ancient Jews believed that God had no beginning, before we go on to compare that belief with the beliefs of the ancient Babylonians? In saying this I take it that the admitted existence of God before the creation of the universe does not prove that the Jews of early times believed that He had no beginning. Upon the premises themselves interesting papers might be written.

And so it happened that, in the combined Semitic and Egyptian sections, no serious attempt was made to carry out the programme placed before the Congress. In all probability the writers of papers gave such material as they had available, not having time to work up the special papers which would be necessary in most cases to treat properly the subjects of a very special nature set out for their examination. In any case, this was the difficulty which I myself experienced, but I was fortunate enough to find, in the course of writing the paper which I thought of giving, references to one of the points touched upon, namely, the beliefs of the ancient Chaldeans (they would be better described as Babylonians) as to the fate and destination of the soul after death, and I felt that this circumstance gave my paper compliance, as it were, with the aims of the Congress as set forth in the circular giving the programme of the work which it had to do.

The opening session was held at the Exhibition, in the Congress Palace—a building the severity of whose lines was emblematic of the work performed therein. There M. Albert Réville, the renowned President of the Religious Science Section of the *École des Hautes Études*, President of the Congress, set forth, in an eloquent speech, the nature and special interest of the science of religion, indicating the place which it ought to occupy in the body corporate of contemporary science. The representative of the Minister of Public Instruction then welcomed the members of the Congress in the name of the Minister, and Mr. Paul Carus, secretary of the Religious Parliament Extension, Chicago, the official delegate of the United States, also saluted the Congress in the name of his fellow-countrymen, and brought the good wishes of “the Religious Parliament Extension,” the outcome of the Chicago Parliament of Religions, to which reference has already been made.

In the second general sitting at the Sorbonne, September

4th, M. A. Sabatier read a paper upon "Biblical Criticism and the Science of Religion," in which he treated the subject very exhaustively. He began by showing how Biblical criticism had been at first dogmatic, aiming at a reconciliation of the texts which seemed to contradict each other. Compelled to apply philology to the study of the text, criticism freed itself from dogma, and became rationalist. Finally it simply took a historical character, not seeking a sense according with established doctrine, or with modern ideas, but seeking to replace the documents in the surroundings among which they had their birth.

These statements were illustrated by examples giving the results acquired by the criticisms referred to. These were, the composition of the Pentateuch, the nature and the signification of the Apocalypse, the genesis of the primitive Catholic Church, and the formation of the Gospels. He strove to show how Biblical criticism, making clear the intimate relations between the religions of the Bible and the world around, naturally resulted in the science of religion in general. Such criticism exercised, therefore, a pacific action, setting forth, as it did, what was valid and historically necessary in all forms of religion.

To many among my audience this will naturally seem to be a matter of opinion. There can be no doubt that Biblical criticism is of great value, but the question perforce arises whether this has conduced to a pacific (*irénique*) result. And it is equally doubtful whether it will do so in the future. That it may help to show what is valuable and historically necessary is possible, and even probable; but will the various Christian sects accept this, and is it not likely to lead to further religious disputes? The *odium theologicum*, as we know well, has passed into a proverb.

Exceedingly interesting was M. Jean Réville's report upon the present state of the teaching of religious history in Europe and America. This study was a favourite one in England, where, however, it has no professors, and though studied in Germany, it is not in reality officially recognised. Though it has made considerable progress during the last quarter of a century, it is still far from occupying its proper place. The lecturer distinguished three types of teaching with regard to the science of the history of religion, namely, teaching of a theological nature born in the theological faculties of Holland; the strictly historical type which saw the light in France; and, lastly, the varied American type,

having a moral, social, philosophical, or educational end in view, together with historical instruction. It might be an advantage, according to circumstances and surroundings, to develop the teaching of this new science in one of these three directions, but the important thing was that it should be recognized in university circles as a necessary element for a healthy understanding of human evolution in the past, and even for the psychological, moral, and social problems of the present, for at the present time the struggle for life is carried on between men of every race and every form of religious belief.

This, naturally, was placing the objects of the Congress upon a very high level indeed, and though it may not have come to all who heard the lecture with all the force which it deserved, it must have been recognized by many as a noteworthy utterance. Indeed, it is one which all ought to keep in mind, for it has a practical bearing on the everyday life of hundreds and thousands who have now, or who will have in the future, dealings with those of other religions and of other nationalities. If all who travel in other lands understood rightly the thoughts and feelings of those of other races and religions with whom they came into contact, there would not only be a better understanding and sympathy between them, but the possessor of this knowledge would be in a better position to discuss with such persons the things whereon they differed and agreed, and whenever such might be the case, he would assuredly have a much greater power for good, and setting aside in this connection the chances of conversion, would at least find greater respect, if nothing more.

At the next general meeting, September 6th, at the Sorbonne, a paper upon Islam and Parseism, by Professor Goldzieher, was read. The author showed, by examples drawn from the Hadith, the most ancient Mohammedan tradition, that it was not only Judaism and Christianity which exercised their influence on the historical formation of the religion of Mohammed, but that we must also recognise the influence exercised by the religion of the Persians, namely, Mazdeism. The subject was an interesting one, especially proceeding as it did from such a scholar as Professor Goldzieher.

Count Goblet d'Alviella spoke of the historical relations between religion and morals. Religion has acted, from its beginning, as a force tending strongly to social consolidation.

It acted by developing the spirit of sacrifice, by enforcing the principle of authority, by evoking the fear of vengeance hereafter, by inculcating (through the taboo) respect for property, by sanctioning customs (worship of ancestors, etc.), by guaranteeing oaths. The progress of morals, in its turn, forces religious and theological traditions to modify themselves, and finishes by obliging men to place ethics above rites and ceremonies. The idea of retribution, whether in this world or in the next, has contributed much to the strengthening of morals. Here, again, however, religious ritualism has, at a later date, fettered the upward rising towards a higher moral state. But religion contains other motives than fear and interest, namely, love of God, and the desire for communion with divine activity having good for its object. Thus there are continuous and successive action and reaction. The feeling of duty regenerates the feeling of religion, which, again, strengthens the feeling of duty.

M. Marillier, one of the Secretaries of the Congress, then read a paper upon "The Relations between Folklore and the Science of Religion." In a series of well-chosen examples, he showed how much the survival of ancient beliefs or practices in the popular traditions of our civilized countries, and how much the methodical study of the religious beliefs of non-civilised peoples at the present time, explain the origin and evolution of historical religions, and what precious elements they furnish for religious psychology.

The fourth general sitting was held on the 8th of September, at the Sorbonne. The only paper recorded as being read is that of M. Fournier de Flaix, who, with running comments, gave an account of the statistics of the religions in the year 1900, from the censuses, the estimates given by missionaries, the works of economists, and consular agents. These offered a basis for comparison with the statements published in former years, and some of the estimates made were sufficiently noteworthy. In all probability statistics had never been listened to more patiently than on this occasion.

After announcing the works presented to the Congress, the various resolutions passed in the different sections were read. They were as follows:—

M. Marillier to draw up a report upon the terms in use in the history of religions, and especially those used by non-civilized peoples.

The Buddhist churches in Japan to unite in the creation

of a journal in which bibliographical notices would be published of the principal works dealing with the Buddhist religion appearing in Japan and in the Japanese language.

A group of savants to draw up an inventory of Arab Christian literature, Judeo-Arabic literature, and non-Mussulman literature in general.

The reading, by Professor Réville, President of the Congress, of a remarkable paper from the pen of Mr. Conybeare, of Oxford, gave rise to the resolution that the attention of learned men and historians should be directed more and more to the liturgies, rites, and practices of the Christian Churches of the East, beyond the influence of Greece and Rome, so as to complete our present knowledge of ancient Christianity, which is founded almost exclusively upon documents of Græco-Roman origin. (The paper in question, which refers to sacrifices in the early Christian Churches, will be noticed in its place.)

Upon the motion of M. Camerlynck, of Amiens, the Congress agreed to the following resolution :—

That at the next Congress attention be drawn to the relations which may have existed, at the commencement, between Buddhism and Christianity.

Certain other resolutions, namely,

That the Philosophy of Religion should be included within the scope of the Congress ;

That future Congresses should apply themselves to the task of resolving the problem as to the order in which the various religions have appeared upon the earth ; and

That the Congress, in view of the religious elements in Dante, should contribute to the constitution of a Dante Society,
were rejected.

The question of periodicity was then considered, and it was decided that the Congress should meet every four years. In consequence of this, the proposal of the secretaries of the British group of the International School at the Paris Exhibition, that the Congress should be held in Glasgow in 1901, in connection with the Glasgow Exhibition, and that of the Organizing Committee of the Universal Exhibition to be held at Liége in 1903, that the Congress should reunite there in that year, were declined. It was decided that the present commission should continue in power, and constitute an international commission, which should choose the city where the Congress should next be held, and procure, in that

city, the formation of a national committee which should organize the same.

The fifth and last General Meeting of the Congress was held at the Exhibition, in the Congress-Hall, on the 8th of September. On that occasion Mr. Carus read a notice sent by Professor Bonney upon the Parliament of Religions held at Chicago on the occasion of the International Exhibition held there in 1893, to which reference has already been made. In this communication the great value of such a reunion as that at Chicago was emphasized, forming an apt illustration of what Count Goblet d'Alviella had said in his paper upon the historical relations between religion and morals. In this "Parliament" a Roman Catholic Cardinal took a leading part, and the meetings were closed with the Lord's Prayer, led on one occasion by Rabbi Dr. Hirsch, and on another by Mr. Mozoomdar, of the Brahma-Somaj. It must be admitted that Dr. Bonney has good reason to be satisfied with the great assembly over which he presided, for out of the "Parliament of Religions" the Congress for the History of Religions of this and future years has undoubtedly grown.

After this, Count Angelo de Gubernatis spoke at great length, in French, upon the future of the science of religion. He rendered homage to what France and French historians had done in this work, and referred to the *Révue de l'Histoire des Religions*, in its forty volumes. He showed how study renders all religions worthy of respect. He referred to the part of popular inspiration in the various religions, that of artists and poets, who have made them live, and emphasized the fact that, to understand them well, it is needful not only to analyze and dissect them, but to have, at the same time, such religious feeling as will permit one to seize and to reconstruct them as they were when they had a living reality. It is, it is true, possible at the present time to approach the study of the comparative history of religion, but this comparison can only be of use for the popular and spontaneous elements of the subject. The ritual element instituted by the churches, and the moral elements furnished in general by individuals, are too diversified to be easily made the subject of fruitful comparison. He insisted upon the importance of folklore seriously studied as an aid to the comparative study of religions, and strongly recommended his colleagues to work quietly and to seize the inherent logic of religious history, which is a popular logic.

The abstract which I have had to use for the above is evidently far from being satisfactory, and the subject and argument of the latter part of it at least seems weak. As a matter of fact, Count Gubernatis introduced some ideas into his long address which were, it seemed to me, worthy of being noted, but which are not included in the *procès-verbaux*. One of these was a practical illustration as to the way in which, in the heathen past, a single goddess became, in consequence of being viewed in two different aspects and worshipped at two different places, two distinct goddesses. This he illustrated by the veneration given in Catholic countries to the Virgin Mary, who, though regarded by all educated persons as a single personage, became, in the eyes of the lower classes, a different personality for each aspect under which she was venerated. Nevertheless, the learned professor spoke of the Catholic Church with every respect.

After thanks to the Count de Gubernatis, the President, Professor Réville, spoke of the work of the Congress and its success, congratulating the members upon the excellent spirit which they had caused to reign over all their deliberations. They were going to separate, he said, with that feeling of human fraternity which unites conscientious men above diversities of opinion or of confession. The Congress for the History of Religions had thus created a precedent which would determine the character of all future Congresses. M. Jules Oppert then congratulated the President of the Congress in his turn, attributing to him the merit of this success.

Of the papers read in the sections only very summary reports have been published, so that, not having been able to hear them all, I am not in a position to give a very full account of them. This, however, is in all probability not a thing to be regretted, as, to say the truth, I do not feel by any means competent to report lectures upon so complex a subject. The feeling of bewilderment which I had after listening to a paper at one of the general meetings upon, I believe, certain aspects of Brahmanism, I can hardly describe. It was so interlarded with Indian words, expressions, and technical terms as to be quite incomprehensible to me, and in all probability many others who heard it were in similar case to myself.

The following were among the principal papers read:—

SECTIONS A and G united.—*Germans, Celts, Slavs, non-civilised races.*

A long and very remarkable paper by M. Wenceslas Sieroszewski upon the religion, the beliefs, the rites, and the customs of the Yacoutas, and particularly upon Shamanism and the practice of sorcery.

Count Goblet d'Alviella, the President of the Section, read a paper upon the employment of the comparative method in the study of religious phenomena, with a view of determining where it has its application, and where the strictly historical method alone is permissible.

A paper by M. Raoul de la Grasserie was read upon the social part played by sacrifice, to which M. Marillier added some observations tending to complete the study of the subject.

A paper by M. de la Grasserie upon Totemism in its relation with the formation of the clan, Zoolatry, and Metensomatose (? transmigration of the body).

M. de Zmigrodski read a paper upon the history of primitive religion referring to the sun and fire, being an explanation at the same time historical and philosophical of a diagram on cloth 12 metres long bearing 1,500 figures (different forms of the swastica or solar wheel). The theories put forward in connection with this did not find general acceptance.

Professor Oltramare, of the University of Geneva, then read a communication upon the application of the law of evolution with regard to religion. Religions, as he showed, were subject to change, but these changes are not reducible to uniform laws.

M. L. Pineau read a paper upon the song of Hagbard and Signe, and the Myth of Jupiter and Danaë, the origin of which he regarded as a solar myth. The connection of the two legends was admitted, but not the explanation.

M. W. Bugiel read a communication upon the demonology of the people of Poland.

Mr. Carus spoke of the influence of science upon religion.

Captain Bertrand spoke of the transformation which has taken place, under the influence of Christian missions, in the religion of the ba-Rotsi and the ba-Ssouta.

Two papers were then read by M. Prato, the first upon the ancient religious beliefs of Mexico and Peru, and their relations with those of the ancient world; and the second upon the worship of Ptah, the Egyptian god of fire, compared with that of Hephæstes and Vulcan.

(It will be remembered that this latter point was one of those set down for discussion in the Egyptian Section, in which, one would imagine, it ought to have been read. There may, however, have been some special reason for the course adopted.)

The last paper of this section mentioned in the *procès-verbaux* is one by the indefatigable M. de la Grasserie, which was read by the Secretary of the Section, M. Marillier. It was upon non-sexuality and sexuality in divinities.

SECTIONS B and E united.—*The Far East, India, and Iran.*

M. V. Henry read a study of the relations between Buddhism and positivism, insisting particularly upon the differences between them. He was followed by Mr. J. A. Cree, who referred to the attitude of Auguste Comte with regard to Buddhism. A further contribution to the study of the same religion was the paper by Mr. Ryavon Fujishima, professor at Kyoto, upon the crisis recently experienced by Buddhism in Japan, and its present state. This gave M. Fournier de Flaix an opportunity to ask the author for information upon the religious statistics of Japan. The answer was to the effect that the constant interchanging (*pénétration réciproque*) between the sects belonging to Buddhism and Shintoism rendered a religious census almost impossible.

The next paper was by M. Minas Tcheraz, upon some very curious legends concerning Alexander the Great, written down at the mouth of old Armenian story-tellers.

At the next sitting of the combined sections the interesting question of Bâbism came under discussion, in consequence of the reading of a paper by Mr. Arkélian, who had studied its doctrines in Persia at first hand. More information was asked for concerning the present forms of worship and the literature of the Bâbis.

(It will probably be remembered that the great interest of this new religion is that it has grown up within quite recent

years, and that we have here a faith of which all the stages of its development are known.)

After this Buddhism was again the subject of discussion, opened by a very original paper by Mr. Chikazumi upon its evolution in Japan. M. Levi then spoke of the expansion of this faith, and the continually increasing relations between the different churches and the different countries professing the Buddhist faith.

This was followed by a very learned paper by M. Chavannes upon the origins, naturist on one side, animist on the other, of the old religion of China, establishing a relation of historical filiation between the divine pair "god of the sun and ancestor," and the divine pair "goddess of the earth and god of heaven." Count Gubernatis referred to the analogies in the Italian cult of Terminus (Jupiter as god of boundaries) associated with the Lares and Manes. M. G. Oppert said that there were analogies in the worship of the aborigines of India.

At the next meeting (September 7th) M. G. Oppert gave an account of the ideas and worship attached to the Câlâgrâma, a kind of ammonite found in Gandaki, which had become an emblem of Vishnu, and which had probably been originally an emblem of feminine energy.

This was followed by an expression of opinion by the Svami Vivekanandra upon the development of the Hindu religion from its commencement, and was of great interest as containing the views of a native of the country and a professor of the faith under discussion. He accorded greater influence to animism and the worship of ancestors than to naturism, and distinguished, besides, as important factors, two other elements, the one philosophic, and the other magic. He defended Indian tradition against the theories of Western Indianists.

After this, Buddhism again held the field, and M. A. Fourcher presented a copy of his *Étude sur l'Iconographie Bouddhique de l'Inde*, in which he gave a summary of the results of the inquiry which he had made in the course of a mission in India. To this M. S. Lévy added some picturesque accounts of his recent journey to Nepal and described the state of Buddhism in that country, where its disappearance is at present only a question of years. With regard to this M. Sénart, the President, remarked that this disappearance of Buddhism was no more caused in ancient times by religious persecutions than it is to-day.

SECTIONS D and C united.—*Semitic religions and the religions of Egypt.*

As it was the Semitic Section in which I had inscribed myself, it was here that I found my home during the time the Congress lasted, and as I heard most of the papers read, I am able to describe what happened more from my own notes and observations. Of this united section of the religions of Egypt and the Semitic races, M. Ed. Naville, one of the Hon. Corresponding Members of this Institute, was elected president, and Professors Goldzieher, of Budapesth, Montet, of Geneva, vice-presidents. In consequence of the very comprehensive nature of the subject from such diverse elements being united, the papers read were of very varying nature, and some of them were of considerable importance.

The variations of certain dogmas of Islamism were first commented upon by M. Clément Huart, after which M. Maurice Vernes read a paper upon the sanctuaries of the Canaanitish region which were frequented concurrently by the Israelites and the inhabitants of the neighbouring regions. The paper gave rise to a considerable amount of discussion, in which MM. Huart, Derenbourg, Capart, Mayer-Lambert, Montet, and Offord took part.

Countess Martinengo Cesaresco then read a paper entitled "The Hebrew Conception of Animals," in English, in which, among other points, the belief that they could speak (as instanced by Balaam's ass) was referred to.

At the second meeting of the section, M. Capart, of the Egyptian Museum at Brussels, read a paper entitled, "The Festival of Striking the Anu." This he explained as the festival commemorating the defeat of the people so called, and there was a long disquisition as to the identity of this ancient nationality.

A short paper of some interest was then read by Professor Naville for Mr. Offord, upon Apollo-Alasiotas and Apollo-Reseph, in which the suggestion was made that the place-name Alasia is the Alasia of the Tel-el-Amarna tablets, and therefore in Syria, and if that be the case, the place in question cannot be identified with the island of Cyprus (the received identification). Another point of the paper was the possible connection of the word Apollo in this case with the *Aplu* of the Assyro-Babylonian inscriptions, *aplu kenu* being the translation of the name *Dumuzi*[*da*], "everlasting

offspring" or "son," the Tammuz of the Bible, and the Adonis of Greek mythology. With regard to the latter statement, I have nothing to say against it, and as for the former, it certainly seems to me to be very reasonable, though Professor Sayce, I believe, does not agree with it.

At the next sitting came my own communication, upon the religion of the Babylonians 2,000 years before Christ. This was a paper based upon the proper names of men found in the numerous inscriptions of the time of the first dynasty of Babylon (that to which Hammurabi or Amraphel belonged), and was therefore similar to one that I read in April, 1894, before the Victoria Institute, which, however, referred to a period about 1,500 years later. In this paper concerning the earlier period, I was able to make a reference to one of the points set down for discussion in the programme of the Congress, and to show that the Babylonians of that period not only believed in a life beyond the grave, but that they also thought that, after they had departed this life, they went to dwell with the deity whom they had worshipped on the earth, just as the Chaldean Noah, Pir-napištim, in the Babylonian story of the Flood, announced it as being his intention to do. The identification of the gods with each other was likewise touched upon, together with the deification of cities, rivers, etc. The discussion which took place showed that the scholars present were interested in the subject. An attempt to identify the goddess Ištar with the sun-god Šamaš fell to the ground, and the scholar proposing it had to give way to convincing argument.

After a thesis by M. Dussaud, "History and Religion of the Nosairis," a Mussulman sect which flourished in the twelfth century and which still exists upon the Syrian coast, Dr. Garnaud read a paper in which he spoke at great length upon prophesying and ventriloquism. That the prophets of the Old Testament were at the same time ventriloquists was strongly opposed by MM. Israel Levy and Klein, whilst Dr. Oppert made the jocular remark that the prophets did not speak "du ventre," but from the mouth.

At the fourth session of the Egypto-Semitic Section Mr. Schmidt, of Cornell University, read a communication upon the evolution of religious life before Mohanmed, which I did not, unfortunately, hear. He was followed by M. Philippe Berger, the well-known Phœnician scholar, upon the conquest of Palestine according to the Tel-el-Amarna tablets. He was of opinion that these documents tended

to show that the Hebrews took possession of the country in a series of partial and successive invasions, of which that led by Moses was but the last phase. There is, in all probability, nothing against this theory, except that no mention of it occurs anywhere in the Bible. Surely, if the Hebrews, on their arrival, had found in the promised land friends who had gone before, they would have spoken of the joy of meeting again those who had valiantly fought to prepare the way for the last remnant of the captivity of Egypt.

The last paper was merely mentioned at the meeting, the conversation being rather too general to allow of a really good summary being made on the spur of the moment. It was by Professor Ira M. Price, of the Chicago University, and treated shortly of the religion of the state of Lagash according to one of the great cylinders of the *patesi* Gudea. A great deal of interesting material exists for an examination of the religion of Babylonia during this period, and I hope to turn my attention to it before long, examining, as I have done for the later periods, the personal names.

SECTION E.—*Religions of Greece and Rome.*

The president of this section was M. Cumont.

After the secretary of the section, M. J. Toutain, had spoken of the proper method to study Greek mythology, the Abbé Fourrière offered some curious comparisons between the Greek legend of Asclepius and the history of the prophet Elias, to which M. Audollent and the president made objections.

At the second session of the section the thing principally spoken of was the worship of Mithra, concerning the bas-reliefs illustrating which M. Toutain read some notes. Of these he proposed a methodic classification, and sought to obtain from them information concerning the legend of Mithra and the character of Mithraism, which was at the same time naturalistic, astronomical, and moral.

This was followed by a paper by the Abbé Fourrière, who, in a special study, sought to set forth the relations which, according to him, must have existed between Mithraism, Greek mythology, and Biblical history.

The president of the section, M. Cumont, then read a note upon the Zeus Stratiotes of Mithridates, in which he com-

municated the results of a recent journey which he had made in Pontus. Zeus Stratios is a divinity of the natives of that district.

At the third sitting of this section the connection between Greek mythology and Biblical history again came to the fore, and it was again a communication from the Abbé Fourrière, who wished to show, in a note upon the signification of the number 50, a connection between Greek mythology and the history of the prophet Elijah and the tribe of Dan.

Next came the turn of pagan ideas in Christianity, the first being a communication upon the pagan religious beliefs found in the Divine Comedy of Dante, and the second some remarks by M. A. Audollent, of Clermont-Ferrand, who demonstrated the survival of pagan ideas in the Latin literature of Christian Africa in the 6th century, especially in the works of the poets Luxorius and Dracontius. As to the cause of this, it was probably due to the school of the Arians, or because it was a neutral ground with regard to the Vandals.

A kindred subject was that of the paper read by M. Toutain, entitled "La Solidarité entre le Culte de la Madonne et le Culte d'Astarte," by M. Hugo de Lomnitz. He added to this a short account of the results of the excavations carried on at Mont-Saint-Bernard, from which it was manifest that the original Gaulish worship on that spot had been followed by a Roman cult, which, in its turn, had given place to the Christian cult, represented by that celebrated hospice.

The last paper read in the section was by M. Derenbourg, and was of less general interest. It treated of the words *Taurobole* and *Criobole*, in which he explained the ending *bole* as a Græcised form of the word Baal or Bel. These two words signified therefore respectively "bull" and "ram of Baal." A recent Himyaritic inscription, he said, gave the word *Shur-Baalam*, meaning "bull of Baal."

SECTION H.—*Christianity.*

This section sat under the presidency of M. Sabatier, and takes up more space in the *compte-rendu* than any of the sections. I do not intend, therefore, to speak of all the papers read, as that might make this portion of my report of

inordinate length. I shall only refer to those which seem to be the most interesting to English readers.

Averroism occupied the first place, the opening paper of this section being "Averroism and Averroists of the Thirteenth Century," according to the *De Unitate Intellectus contra Averroistas* of St. Thomas of Aquinas, by M. Picavet. He showed that the Averroists, from the thirteenth century onwards, opposed reason to faith. M. Alphandéry followed with a paper entitled, "Was there a popular Averroism in the Thirteenth Century?"—a question which he answered in the negative.

The next paper was by Mr. Conybeare, of Oxford, upon the sacrifice of animals in the Oriental churches, notably that of the Armenians, and how these sacrifices persisted to an exceedingly late date in certain parts of Christendom. In the discussion which followed, references were made to the relation of these sacrifices with love-feasts and the Eucharist, and the outcome of the matter was the passing of a resolution recommending the study by scholars of those aspects of Christianity in the East which had escaped the action of Græco-Roman civilization.

At the second meeting of this section the opening paper was by M. Piepenbring, who read and made abstracts of a long paper upon the fundamental principles of the teaching of Jesus, in four parts—the authority of the Old Testament according to Jesus; His ideas of the Kingdom of God; His conception of the Messiah; and the way in which Jesus represents the Heavenly Father. An interesting discussion followed, the consensus of opinion being that M. Piepenbring had enclosed the Saviour too closely in the current Jewish Apocalyptic element, without taking account of other influences (prophetism, etc.); and of having spoken too strongly against the exaggerated spiritualization of the teaching of Jesus in a modern sense, falling into an excess the other way.

Rabbi Klein, of Stockholm, then communicated a long paper in German relative to the influence of Essenism on Christianity. This was summed up by the acting president, M. Bonet-Maury, in French. Herr Klein emphasized the continued existence, in Israel, of a small Church within the large one—a society of "pious folk" (*anavim, ebionim*), of which he finds traces even in the ninth century before Christ. He distinguished between the Essenians by race and those forming a community of initiated.

Continuing his paper the next day, Rabbi Klein tried to show that Christ borrowed from Essenism, as the author had determined it, the principles of his gospel.

In the discussion which followed, Professor Albert Réville showed that true Essenism is an extreme manifestation of the Pharisee principle—that of the separation of the pure and the impure. It could not therefore have inspired the gospel of Christ.

Mr. Fries, of Stockholm, then commenced the reading of his paper upon “The Conceptions of Jesus as to the Resurrection of the Dead,” which he finished at the next sitting (the fourth) of this section. He showed that according to Christ, the just, on dying, entered immediately and integrally into eternal life.

In the discussion which followed Professor Oppert contested that there had never been in Mosaic Judaism, apart from Jewish mythology, any doctrine whatever as to the lot of man after death.

It was at the final sitting that M. Camerlynck, of Amiens, asked that the relations between Christianity and Buddhism should be studied more closely, leading to the resolution to that effect already referred to. The remarks made led M. A. Réville to set forth some of the most striking analogies between the two religions, but he insisted upon the radical differences of tendency which separates them, the one having as its ideal the constantly increasing expansion of life into life eternal, and the other tending to annihilation as being the supreme happiness of the soul.

The last paper of this section was that of Professor Jean Réville, one of the Secretaries of the Congress, who spoke of the testimony brought by the *Book of the Shepherd* of Hermas (from 125 to 140 A.D.) as to the history of the first Christian community at Rome. This was a mundane community, comprising rich people in its numbers, and but little tormented with doctrinal preoccupations, though the worries of discipline already manifested themselves in it. There was not yet a monarchic episcopacy at Rome in their days.

I have tried to produce a fairly complete statement of the work done at the First Congress for the History of Religions held at Paris in September last, and though I have not been able to give as much information at first hand as I should have liked, I trust that it will not on that account have lost much of its interest. The principal thing wanting about it

will probably be some want of spontaneity—the reason being that it is based on the *Comptes-rendus* sent out a few days before the date fixed for reading. Nevertheless, I trust that it will have been found interesting to most of my hearers. In conclusion, I have only to add that this Congress was in every way a success, and that it has taken its place among the most important periodical learned assemblages of the time. It is difficult, from what has been published, to give a complete account of the full value of its work—that will only be done when its transactions have been given to the world. If I have enabled you to gather a faint idea of its importance, I shall be content. Of one thing, however, there can be no doubt, and that is, that it promises to be the most effective means of finding out the general ideas of mankind respecting man's Maker, and man's relations with Him.

DISCUSSION.

The PRESIDENT.—I think the Members of the Institute will feel that they are under a great obligation to Mr. Pinches for this interesting report of what was spread over a considerable number of days in Paris. Of course a great variety of subjects came before the Congress, as may be gathered from this communication.

I will now invite any Members of the Institute, who wish to do so, to ask questions or make remarks with respect to certain special points.

Mr. MARTIN L. ROUSE.—The exceedingly comprehensive account we have just listened to has, I doubt not, fallen on very interested ears, though it is very difficult to retain in one's mind so great comprehensiveness.

Now the points that struck me most were those which referred to Mr. Pinches' favourite subject, Assyriology and Oriental research, and I should like, first of all, to ask him the exact form of that title of Apollo?

Mr. PINCHES.—“Alasiotas.”

Mr. ROUSE.—And who was the gentleman who discovered that that meant Apollo of Alasiya?

Mr. PINCHES.—It was a suggestion of Mr. Offord's.

Mr. ROUSE.—Those who have not yet read the full translation into English of the Tell-Amarna tablets made by Colonel Conder should not fail to do so at the earliest opportunity. Among the fascinating letters in that compilation are several written by a king of Alasiya, a country hitherto unheard of in secular history, but bearing a name very like that of a group of islands mentioned by the prophet Ezekiel (xxvii, 7), namely, Elishah, and being like them a maritime region, for only ships are mentioned as the means of conveying the products exchanged between it and Egypt, and a region within or near to the Greek settlements of Asia Minor, for its neighbours were the northern Hittites and the Lukki—*i.e.*, either the Lycians or the Ligyans. Again, the name Elishah occurs only once besides in the Bible, namely, in Genesis x, where it is given to one of the sons of Javan the son of Japheth; and wherever Greece is mentioned throughout the sacred volume it is by the name Javan, as, for instance, where it is stated (in Daniel viii and xi) to be an empire that is to overthrow that of Persia.

Now the Greeks fixed as their earliest ancestor one Japetos, a son of Heaven and Earth, whose name is evidently only a modification of Japheth. Again, as Gladstone tells us, the two names under which Homer groups the rank and file of the Greek army at Troy were *Argeioi* and *Jaones* (Homer, pp. 101 and 103); and as the awkwardly concurring vowel sounds in *Argeioi* had once been severed by the digamma (for the Latins wrote it *Argivi*), so in all likelihood had they been in *Jaones*—an unstable form, which drifted into *Iones*, but must originally have been *Javones*; and we learn from Æschylus, in his dramas *The Persians* (lines 178, 563) that this nation knew the Greeks at large as *Jaones*—that is, *Javones*. It would not therefore be surprising to discover that the Greeks drew one of the titles of their ancient and favourite god Apollo from Alasiyah, or Elishah, which, taking its name from the head of one of their earliest tribes, must have been one of their earliest settlements. In the flourishing days of Tyre's commerce we had read in the book of Ezekiel that the land of Elishah exported to that city fine fabrics in blue and purple. And now we read on the Tell-Amarna tablets

that, eight or nine centuries earlier, Elishah (or Alasiyah) exported copper and bronze to Egypt.

As regards the 'Abiri* and their invasion of Canaan recounted in the Tell-Amarna letters from Jerusalem and probably in some from other southern towns also, I am convinced that they were really the Hebrews. They are, as Conder points out, called a "tribe" and a "race" (*Tell-Amarna Tab.*, pp. 144 and 147), and so could not have been merely confederates, as was at first thought. They are stated to have completely overrun the southern hill country and among other captures to have taken and destroyed the Ajalon of Joshua x (pp. 145 and 149). Addressing the King of Egypt as suzerain of Southern Canaan, the King of Jerusalem laments, "The land of the king my lord has been ruined, and *all the rulers have been slain within this same year*" (p. 147); and again, "The lands of the city of Jerusalem are *deserted*," and "*no man is my subject*" (pp. 149 and 147). And finally he writes, "We are leaving the city of Jerusalem—the chiefs of the garrison have left, without an order—through the wastings of this fellow whom I fear" (p. 151). Moreover, as this letter is written on a different kind of clay from the rest, it was almost certainly written during the flight, and perhaps in that last refuge which the divine record tells of—the cave of Makkedah (p. 150; and Josh. x, 16).

This king also writes that the city Beth Baalatn had rebelled to the chief of the 'Abiri (p. 143); and we know that Baalah or Baale, otherwise called Kirjath-Jearim, was one of the four cities of the Gibeonites, the only ones that voluntarily submitted to Joshua (*cf.* Josh. ix, 17, and xv, 60; 1 Sam. vii, 1; 2 Sam. vi, 2; and 1 Chron. xiii, 5, 6). The only general of the 'Abiri clearly mentioned on the tablets bears a Hebrew name—Ilimelec. He was doubtless one of Joshua's captains in charge of a special raid; for the great Hebrew leader did not always command in person (*see* Josh. x, 15-18). And, lastly, a contemporary letter from Suardata, of Keilah, states that his enemy has *put to shame thirty temples of the gods* (p. 155), a deed which superstition would have prevented all but the worshippers of Jehovah from performing.

* The name, says Conder, always begins, not with *h*, but with the guttural *ain* (p. 141).

As for the objection that the Exodus is usually assigned to the reign of Meneptah, 150 years later than that of Amenophis IV, to whom these letters were written, an inscription of Meneptah proves that the Israelites were already in his time settled in Canaan; for, speaking of an expedition that he made along the Canaanite coast, he says, "Ashkelon has been led away captive, Gezer has been taken, Inoam has been annihilated, and Isri'il has been laid waste and its seed destroyed" (Hommel, *Hebrew Tradition*, p. 266).

It is remarkable that from the time of the division of the kingdom of Israel the *tribe of Dan* is not once named in its history; but, on the other hand, Ezekiel speaks of a certain Dan as trading in the fairs of Tyre in company with Javan, as though these were kindred peoples (xxvii, 19).* Again, in the times of Jonathan and Simon Maccabeus messages passed between the Jews and the Lacedæmonians, or Spartans, stating that they were brethren, being equally descended from Abraham. The letters that bore them were full of the friendliest expressions; and the first sent by the Jews says that since they discovered it they had not ceased to remember them at their festivals, in their sacrifices and in their prayers, as they would hardly have done if the Spartans had been related to them only as closely as the Midianites or the Edomites; therefore we may conclude that the Spartans were children of Jacob also—part or all of a banished tribe of Israel which had settled in the land of Javan (1 Macc. xii and xiv; cf. Josephus Ant. xii, 10, and xiii, 8).

Now Greek tradition tells us that certain descendants of Hercules, with the help of the Dorians, about two generations after the Trojan War, conquered the Peloponnesus, establishing the dynasties and predominances there found in the earliest times of regular history, which begins with the first Olympiad in B.C. 776. Again, besides the Grecian Hercules there was an Egyptian, an Indian, and a Phœnician Hercules; and it must be from the last-named that the two mighty rocks which guard the Straits of Gibraltar took their appellation, since to the Greeks in Homer's time, about 800 B.C., the region beyond Italy was all

* The Hebrew *v'Dan v'Javan* = and Dan and Javan, is rendered by the R.V., Vedan and Javan; but the name of no tribe in the least resembling Vedan is on record east of Liguria.

misty and fabulous, whereas the Phœnicians were familiar with those straits 1,000 years before our era. Again, Samson the Danite, by his gigantic strength, his rending of a lion with his mere hands, and his pulling down by the sheer force of his shoulders the pillars that upheld the Philistine theatre, was the prototype of the Phœnician and the Greek Hercules combined. What then more likely than that if the Danites went to settle in Greece they should bring the story of their hero with them and call themselves his children, suffering him then or thereafter to take a Grecian name and to have his feats augmented by many a Grecian fable. That they did settle there is confirmed by Homer, who applies the term *Danaoi* sometimes to the Greek army at large, sometimes to the inhabitants of Argolis, a state just north of Lacedæmon in the Peloponnesus, and having the brother of the King of Sparta for its ruler.

There is another proof that the story of Samson had spread round the Mediterranean in the annual custom of sending foxes into the circus at Rome with torches tied to their backs, a custom which Ovid can explain only by saying that an obscure country boy had once set corn-fields on fire in a somewhat similar way (*Fæsti* IV, 681 *et seq.*).

The Rev. F. A. WALKER, D.D.—I think it will be agreed by all present that so many religions have been touched on, and so many centuries referred to, and so many different nations, that we scarcely know which to remark on first, Mr. Pinches' paper has been so prolific of interest in every respect.

With regard to the last subject, I think Mr. Pinches is quite right in saying that Dan disappeared almost altogether after the time of Solomon. It is a notable fact that in the Book of the Revelation, when all the sons of the patriarch Jacob have been named, apparently the name of Dan nowhere occurs.

Then the last speaker referred to some relation between the Spartans and the Maccabees. There is some mysterious connection between the Spartans and the Eastern Nations. Cræsus, King of Lydia, was in the habit of consulting the oracles of Greece that were held in best repute. The Dorian Hexapolis, situate on the coast of Western Asia, would further facilitate intercourse between the Spartan and Oriental, and perhaps we are only partially acquainted with the various points of contact. As an instance, when visiting the ruins of Sardis, I learned that a part of

the ancient citadel was termed Gerousia (assembly of elders). Now the Spartans were the only people of Greece that possessed a representative body of that name.

Mr. Pinches touched on bas-reliefs in connection with oriental religions in Western Europe. A very curious circumstance fell under my notice thirty years ago, showing how orientalism had been introduced into the west of the Roman Empire. I was in a subterranean portion of an old castle in Newcastle-on-Tyne, where I noticed a bas-relief enclosing an effigy of the Persian god, Mithral leaning against a column; and it could only have been placed there through some Roman legionary, having served at the two opposite ends of the empire, first towards the rising, and subsequently towards the setting sun, at the then boundary of the Roman power between England and Scotland.

It is very remarkable how far the Roman Empire extended and how far the soldiers were affected by Eastern religions. The old man who showed me round the dungeon made the remark, "The Romans were never at a loss for the want of a god or two."

Then as to the mixture of Mosaic ritual together with the Eucharist and the Armenian churches practising sacrifice in their worship. I can readily believe that, as I have been told of the modern star worshippers of Babylon practising an amalgamation (1) of heathen rites along with (2) the Mosaic ordinance of dipping the live bird in the blood of the slain and letting it go free, and (3) of Christian Holy Communion.

About Babism, the modern sect of the Persians, I may, perhaps, direct your attention to a work on the subject of religious sects in Persia including views on Babism, written, I think, by Brown in Persia. Our Lord is said by one authority to have borrowed the principles of His gospel from Essenism. I cannot, while not holding with that, accept the suggestion that Essenism is allied with the principles of the Pharisees; for the Essenes were religious and simple in their lives. At any rate, they were never objects of our Lord's blame, while the Pharisees and Sadducees were.

Then as to the question of the identification of deities, two volumes* were published by a Fellow of Exeter College, Oxford,

* *Cults of the Greek States.*

L. R. Farnell, M.A., dwelling a good deal on that subject, with the different titles and names of the gods or goddesses. I think that is pushed a little too far. I can agree with Hercules being identified with Samson of the Scriptures, but I do not see how you can identify Apollo, god of the sun, with Adonis, as doomed to spend six months in the shades of the nether regions, the Tammuz of Ezekiel's vision wept for by Jewish women, and whom the poet Milton commemorates in the mention of the river of Syria, that ran red to the sea—really owing to the soil washed out of the mountains in its course, but according to the legendary account with the blood of Tammuz yearly slain. It is very likely that there are many points of contact between Hercules and Samson, and not only in one city, but in many, of Greece was there a local Heracles with minor differences of detail as regards the particular surnames and diversities of ritual.

Mr. PINCHES.—I have not much to say in reply.

My object, this evening, was to place before you an account of what took place at the Congress for the History of Religions, and I have put down, as concisely as I could, the opinions of other people who, unfortunately, are not here to reply.

With regard to the question whether Elishah of the Old Testament is the Alasiya of the Tel-el-Amarna Tablets, that I am inclined to leave undecided. There is a great likeness between the two words, no doubt. The definition that is generally accepted by Assyriologists is that the Alasiya of the Tel-el-Amarna Tablets is the island of Cyprus. That, of course, is very possible, but some hold it to be not proven.

Mention was made by Mr. Rouse of the word *Javan* being used for *Greece* by the Persians. In the Assyrio-Babylonian inscriptions the common word for Greece is Yawannu. Professor Sayce thought he had found another form in the Tel-el-Amarna Tablets; but it requires more proof.

I am in doubt, referring to another point raised by Mr. Rouse, whether the Ḫabiri are the Hebrews or not, and I am equally in doubt whether it means the confederates. It is supposed to be represented by the characters *sa-gas*, and in that case it is written ideographically. In this case it would be more logical to apply it to a number of wandering tribes than to the Hebrews. But still it is necessary to admit that it is not certain that *sagas* is the equivalent of *Ḫabari*.

There are many other points that might be referred to, but as it is late and they are many, I think I may leave them for the present, as some of them will be touched upon in all probability later on, and I can only say, with regard to the long and interesting notes that Dr. Walker made, I wish I had half his knowledge so as to be able to make a few comments upon them. (Applause.)

The vote of thanks having been duly carried, the meeting adjourned.

ORDINARY MEETING.*

D. HOWARD, ESQ., D.L., F.C.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

VITALITY. Lecture by Professor LIONEL S. BEALE, F.R.C.P., F.R.S. Second Part. For Part I, see Vol. XXXII, page 337.

MR. CHAIRMAN, LADIES AND GENTLEMEN:—This subject of vitality is just now of the very greatest interest, not only to the scientific, but to everyone. The question of vitality is a very old problem. Many and very different views concerning it have been entertained, and it seems to me to be time that those conclusions, which are justified by science concerning the problem of vitality, should now be considered from the point of view of modern minute inquiry and microscopical investigation. This has not yet been carried out. The broad general question of the nature of life certainly has been discussed by the wisest for ages, but the bearing of the facts ascertained by recent investigation—the structure and the manner of growth of living things—have not been adequately considered and debated of late years by the light of our new knowledge.

Vitality has an important bearing, not only upon fundamental questions of minute anatomy, physiology, biology, botany, zoology, medicine, and surgery, but views concerning the real nature of life have always had considerable influence upon the religion and philosophy prevalent at the time. All scientific men who regard with interest our whole living world, in which man occupies the most important place, hope, sooner or later, to learn something more definite than has yet

* Monday, March 6th, 1899.

been discovered concerning the general nature, and if possible the origin, of life. The differences of opinion now entertained are extreme and irreconcilable. Some authorities maintain that living things are entirely dependent upon *physical and chemical changes only*, and that varying conditions acting from without also exert a powerful influence. Indeed, by many this external influence is supposed to be all sufficient to account for the vital phenomena occurring within every living organism. Some look upon living things, including ourselves, as mere machines—as *machines such as are made by man*. On the other hand, in favour of the view that all actions occurring in living organisms depend upon vital power, and that there is nothing mechanical in *life, growth, and vital action*, the evidence is strong.

Again, some hold that there is no evidence of design—no plan or purpose in creation. Twelve months ago Dr. Walter Kidd gave us a most interesting paper on this great question, and it is to be regretted that he has not been rewarded for his trouble by adequate intelligent discussion and criticism. Many papers read here certainly deserve more notice, more consideration and discussion than they meet with; and scientific men who differ ought certainly to state the grounds of their opinions, instead of repeating conflicting doctrines again and again without replying to the objections which have already been raised to their strange physical views. Having asserted their physical doctrines, they leave the problem of life as it was, severely alone, in the hope, I suppose, that no more will be said. But in the interests of scientific truth this cannot be right. For in science, if a contention concerning a broad principle long held, and strongly insisted upon by authority, and taught in schools, remains unproved for years, and is not defended by those who maintain it, it should certainly be subjected to full discussion. It has been asserted again and again that by chemistry, physics, and mechanics vital changes are to be explained, but no one has yet succeeded in explaining them.

There is in every vital action what has been learnedly called the operation of a “factor,” which factor unquestionably has nothing to do with physics and chemistry. There exists in all living a *power* of making definite arrangements, a governing, a guiding power—a power which compels component material particles (atoms?) to take certain definite positions with respect to one another, but which operates only in living matter—a power which somehow exercises in

life a control over the materials, which control is lost *the moment the matter ceases to live*. This must be admitted. What power this something actually is, what it ought to be called, is another matter. Most of the German authorities now seem to prefer to call it "energy"; but then they use the word "energy" as some distinguished scientific philosophers use some other words—in more than one sense. It is this varied use of words and vague definition which is really one of the greatest difficulties in discussing some of the most elementary scientific questions. One of our greatest philosophers has exposed himself to this accusation—I mean Herbert Spencer. Were one driven to do so, one could pick out not a few passages in which a word is used in one particular way, and a little farther on the same word is used in a totally different sense. Especially is this the case with respect to the words "*organic*" and "*growth*." The first will include *living* and *dead matter*, and the second is made to include *lifeless aggregation* as well as *living growth*. Here I think no compromise is possible. The two opposite views as to vitality—one attributing it to mechanical agency and chemical and physical changes—the other referring all vital phenomena to some force or power which cannot be isolated, estimated, measured, or weighed, and which is so to say not material, not a necessary property of any form of non-living matter. This power is a factor which acts on matter, but it does not come from matter. It is an agency *which ceases to act when living matter dies*. These two views, *the physical and the vital view*, are irreconcilable. They cannot both be true. One must yield. Whether it shall yield now, or ten years or a hundred years hence, it is not possible to say; but one of these two views must be wrong—not only erroneous, but absolutely untenable. I have no objection whatever to admit that I am wrong; for I am old and ready to admit my mistakes as soon as they are made clear, but let them be proved and then exposed. Those who differ from me, as many do differ and have differed for more than forty years, should clearly express their points of difference as regards broad principles, and reply to the many "appeals" I have made. (Applause.)

In the *Spectator* of this week there is an interesting paper on what the author calls "The Uses of Agnosticism." It is a very curious communication, and I would recommend all interested in this discussion to look at it. I must not, of course, enter into a consideration of all that is said, for it

would take much time; but like many of the scientific articles that appear in the *Spectator*, an opinion seems to be almost accepted in one place, and gently condemned and doubted in another, leaving the reader to infer that neither of two opposite views is wholly right or wholly wrong. The *Spectator* does not assert, and no paper has yet said, that the agnostic holds such and such views correctly. Many people call themselves agnostics, but when you talk to them or read what they have written on the subject you find that they evidently consider that they know all that can be known, and lay down the law in a way that is not considerate towards anyone who doubts whether he *knows*—who in truth is agnostic concerning many things. But the “agnostic” is most knowing. In the time of the ancient Greeks the same sort of thing occurred. Certain people advanced reasons, and advocated *reasoning* in the most patient and considerate way; but some seem to have been devoted to dogma of the most tremendous kind. In modern days I do not say that great scientific authorities are more dogmatic than ancient philosophers; but those who a few years ago were proud of their agnosticism would say, for example: “Man is a machine, and all his actions are mechanical”—a rather confident assertion for an unsophisticated, simple, not knowing, modest agnostic. No man, animal, or plant is a machine or is formed as every machine from the very first in existence was made—in pieces; and no human, no vital action is purely mechanical or chemical. Again, with regard to the word “evolution,” which is in everybody’s mouth, and is applied to politics, philosophy, religion, music, poetry, history, thought, and learning as well as to wind-mills, water-mills, instruments of all kinds, and articles of dress!

Evolution unquestionably occurs in all life; *but the seat of this evolution is the inconspicuous, colourless, structureless living matter.* Different kinds of living matter may be examined by the highest magnifying powers, and yet we shall obtain no indications of structure. Such is the only material in which true evolution occurs in all life. Living matter comes from living matter which existed before it, and the last from previously existing living matter, and so on, as far back as we may proceed. As to *structure, when evolution is proceeding, there is none.*

Structure is not produced from the structureless, for some time. This seems to me to be the truth with regard to

evolution, and those who talk of animals being evolved from more simple or lower creatures existing before them do not make their meaning clear, and they say that such vast time is required for the performance of the changes assumed that we are lost in a sort of vague cloud-land, where anything or everything *may be*, but nothing capable of demonstration *is*.

Like many wild notions of our time, not a few of our philosophical ideas are so vaguely and yet so cleverly stated that it is impossible to contradict them; but, as it seems to me, the word evolution, as generally used, refers to modifications affecting the whole creature *as it is*. While in truth the changes assumed are prepared for, and can only occur in the living matter at a very early period of development when the minute germ is structureless, and the semi-fluid matter of which it consists is so delicate that without the greatest care its arrangement and relations cannot be studied with success, it is to such minute particles of living matter that any process of evolution must be restricted.

Next, with regard to the use of the words *living* and *dead*. Many seem to think that living things gradually die; gradually pass from the living to the dead state. This is not the fact. The passage from the living to the dead condition of a given living particle occurs suddenly, and the difference between the two states of the matter is absolute. There is no gradation, no slow transition from life to death, in the case of any form of living matter, and nothing that does not live can die. There is no transition that can be made out. A particle of living matter is either *living*, or *it has ceased to live*—either *living* or *dead*; and as far as I know all instances of dormant vitality that have been brought forward and called dormant because they are not active are really alive. There is no instance in which life can cease for a moment without *death* occurring. The difference, I repeat, is in all cases *absolute*. The particle of matter that dies *never lives again*, and this seems to me a point which ought to have been considered long ago, but it has been evaded. There is only one way in which non-living matter can pass into the living state, and that is by the agency of a living particle of some kind. There is no instance known of any non-living matter of any kind becoming *living*, *except by the direct and immediate influence of living matter which existed before it* upon the non-living matter that it takes up or that is brought to it. The living matter always takes up the non-living matter and communicates its *vital* power to this

matter, which then becomes living, and this, as far as we know, is the only way in which living matter has ever been produced. There is no gap, no jumping of the non-living particle into the living state. There must be absolute contact, an absolute mingling or blending, and as it were an interpenetration of the non-living into the living. The power or property of the living is communicated to the new matter, which up to that moment was but the food introduced from without. In attempts to explain there has been much confusion, as I have said before, in the use of words. "Organic," for instance, has been used where living or "vital" is meant. "Organic" is applied to much matter which is not alive; that which is organic need not have been made by living things at all. There are hundreds of substances which are "organic" and can now be made in the laboratory, but no chemist has yet turned out a living particle, though some enthusiasts who are not chemists have confidently declared that the thing will be done. Everyone who patiently studies living matter itself, and the important part which this structureless living matter plays in the formation of tissue, knows that this artificial manufacture is and will ever remain impossible.

No one who has studied the subject would dream of the chemical production of life, or of the *spontaneous origin of life*, even as a very remote possibility. Thousands of things that are organic are kept in bottles and are not, of course, alive, or capable of living. Therefore, the word "organic" ought to be restricted to its proper meaning. So with regard to the words "increase" and "growth." Increase applies equally to living and non-living. Growth is applicable to living matter and things only. There is no true *growth* in anything except through the agency of living matter. When we talk of the *growth* of a stone or a crystal, we mean only that they increase in size; but they do not *grow*. In the same way a number of instances will occur to every one, in which there is increase in dimensions but no *growth*, as I have for forty years contended, and so far only one or two have expressed any objection to my conclusions. Of these, one opponent in my own profession committed himself to the opinion that, like trees, volcanoes *grow*. The same has been said of glaciers and many other things. But really it ought to be unnecessary to enter upon a discussion of so obvious a fact.

Again, there are the words and the processes of "*integration*"

and "disintegration," and a number of others that I might mention as applicable to non-living matter, which are also applied to things alive. It is of course necessary to insist that in any discussion the exact meaning attached to the words used should alone be adopted. We must remember that the Greeks taught us the necessity of moderation, of limitation, of restraint in reasoning and philosophical discussion.

Now, the conclusions which I venture to bring forward with regard to vitality are conclusions which rest on facts of actual observation on the nature of things I have myself seen and examined many times.

It may seem strange for an advocate of minute investigation and microscopical research towards the close of the nineteenth century and familiar with the best instruments and the highest magnifying powers, who therefore must be greatly interested in modern work, to extol Greek methods and Greek thought. I cannot, however, help alluding to a word which has been particularly advocated and explained by Mr. Benn, who is the distinguished author of an excellent book published within the last three or four months, called *The Philosophy of Greece*. Now in this book Mr. Benn tells us much about Sophrosyne, which according to him should be understood to mean "*self-knowledge*," *self-control*, the ruling principle of Greek life, Greek art, and Greek thought.

We, as followers, ought to be moderate in our views, at least until we are perfectly certain we are right. Even in science we ought not to be too certain, or to claim authority except it rest upon evidence. Few things do more harm by retarding real progress, and by interfering with the progress of knowledge, than the fashion of raising up "authorities" one after the other in science. There is no authority in science. The question is not as to authority, but as to fact. It is by the finding out and the demonstration of new facts that science is advanced. And scientific discoveries are more difficult, and far more laborious, than making the generalizations which indeed usually follow almost as a matter of course.

There ought indeed to be exercise of self-restraint, and, as Mr. Benn says, "Socrates applied to words and to their correlative mental representations the old Greek method of limit and circumscription, imposing the duty of Sophrosyne on thought itself" (p. 174, *The Philosophy of Greece*, by Alfred William Benn, London, Grant Richards). I will just give one more extract from this very interesting and

highly instructive book:—"People cannot carry on a discussion profitably, or even decorously, unless they are agreed about the meaning of terms. If you and I are to play dialectic together, the pieces—in this instance words—must have the same value for us both, and we must stick to the rules of the game, otherwise, as Aristotle says, 'there will be a disgraceful scene.'" (*The Philosophy of Greece*, p. 174.)

I never read an extract that seemed more interesting to the student of science or more pertinent to modern ideas than this, which relates to the philosophic views of more than two thousand years ago. As we all know, there might be "terrible scenes" if the representatives of conflicting philosophies met for discussing the merits of their several doctrines at this time. The difference between thoughtful persons is great and unfortunately a great many words, as I have before remarked, are used in more than one sense. There must be many scientific controversies, many crises, much strife, which might bring about "terrible scenes." Among the most terrible things that have been said of late is perhaps the comparison between the changes that take place in the "growth" of a volcano which does *not grow*, and an oak tree which does *grow*. Mr. Herbert Spencer is in great part responsible for this. I shall have something more to say about this question of growth later on. But is it not very extraordinary that anyone should attempt to compare the changes taking place in a non-living volcano with those, constant during its life, of a living oak tree? Are they not obviously, absolutely different? Between them there is no analogy. It would be very interesting if those who accept such comparisons would put their views into plain English, so that we may discuss them. One word let me say with regard to this matter, though it may be perhaps a little personal as regards the discussion into which I have entered. There has been a slight tendency on the part of some who differ from me to call me names. One controversialist denominated me a "Spiritualist." Now I never was a "Spiritualist." The term "Spiritualist" is not applicable to me, because, as I said before, my views entirely depend upon the demonstration and repetition of facts of observation made in the course of my own investigations with very high magnifying powers, the results of which have been published in several memoirs and scientific papers communicated to the Royal Society, the Royal Microscopical

Society, and to the Victoria Institute, and several works—*Protoplasm, Bioplasm, Vitality*, etc.

Biological investigation has been indirectly greatly advanced by bacteriology. Very high powers, of good definition, magnifying 600 times or more, are required in both departments. We have been able to discern living particles which are less than $\frac{1}{10,000}$ th of an inch in diameter, and many important facts relating to "life" have been made out. Bacteria in their millions might lie in a space less than a quarter of an inch square without being crowded. Many of these minute organisms are unpleasant creatures, and some are dangerous, but the great majority of them are perfectly harmless. Millions and millions of harmless bacteria exist outside and inside most living things, multitudes are present in the food we eat. In every cell of vegetables which are kept by the greengrocer for twenty-four hours, or even less, they abound; so that there is nothing to be feared except in regard of certain specific kinds.

I am old enough to recollect the time when because one talked of things being magnified 700 or 800 diameters we were looked upon as very fanciful creatures, speaking familiarly about strange and unheard-of things. But now microscopic powers may be used, and with success, which magnify more than 1,500 diameters. Let us consider what this enlargement means. By "one thousand linear" or "one thousand diameters" we mean that a little particle, whatever may be its nature, is made to appear a thousand times longer or wider than it is, and the use of the word *linear* is important. We measure merely in one direction, either from right to left or from above downwards over the field in one direction only.

A thousand diameters in these days is not very much; but if a thing were enlarged only 300 or 400 diameters you would be surprised how large it would appear. If the body, say, of a frog, could be magnified in this degree 200 or 300 diameters, it would appear to be 60 or 70 feet long. So, a man magnified in the same degree as a particle of one of his tissues might be under the microscope, would appear to be as tall as a high mountain.

The relative proportion of bioplasm or living matter in a tissue is much larger in young than in fully formed animals of the same kind, and in old age the proportion becomes less and less. The proportion of living matter in the growing embryo is considerable, and the very young embryo consists

almost entirely of living matter, which contains perhaps more than 90 per cent. of water. As growth proceeds, in many tissues, the little living particles of bioplasm become gradually separated a little from one another by the material which is slowly formed on the surface of or between each. This matter has been *formed* by the living matter, but it is no longer living. It may be called formed matter. In this diagram the living matter is coloured red, but the formed matter is not coloured. If I take a very thin piece of cartilage of a kitten at birth, and compare it with that of another six weeks old, and with yet another from a young cat, and lastly with one from a mature animal, all having been prepared and stained in precisely the same manner, you will find the proportion of living matter in the cartilage tissue, relatively to the amount of intervening formed material, is *much greater in the young* than in the older and fully developed animals. These changes are continually going on, not only in one, but in all the tissues of the body, and at the same time, as the several textures advance towards their fully developed state—towards maturity.

Now this *colourless material* in each drawing is that which does *not* take up the carmine colouring matter. It is *formed matter, structure, which is no longer living, and is incapable of growth and of forming more matter like itself*; and in cartilage, fibrous tissue, hair, nail, horn, the tissue or formed matter becomes nearly dry. On the other hand, the living matter, in its natural living state, is invariably structureless and colourless, and contains a very large proportion of water—very often as much as, and I think sometimes even more than, 95 per cent. But I do not think a single instance can be brought forward in which living growing matter contained much less than 80 per cent. of water. In a very active state of vitality, no doubt living matter may be associated with a much larger percentage of water for a time. You cannot have living matter without a large quantity of water being associated with the minute amount of solid matter. This living matter or bioplasm is, as I have said, colourless and structureless. All matter that is alive—that exhibits *vital action*, which is concerned in vital movements, changes, and the living matter which takes part in touch, taste, sight, or hearing, and is present in all sense organs, in all forms of animal life—is living, and upon it alone *vital* activity entirely depends.

I do not believe there is an action, a thought, or a vital

movement in which a proportion of bioplasm does not cease to live. In active life, the place of the minute portion which is changed—which “dies”—giving rise perhaps to vital movement and other phenomena, is taken by the conversion of a corresponding portion of non-living matter (nutriment) into the living. These views lead one to try to form a sort of mental picture of life in action—changes absolutely impossible to see and study in the case of a complex organism like man and that of the higher animals, but to be demonstrated without difficulty in the case of some low and comparatively simple living organisms.

No man could in a portion, say, of the active part of the brain, or indeed of any part of the body the size of the head of a very small pin, see, as it were, mentally, at the same moment, all the vital and other changes which are taking place in that one small piece of brain matter—perhaps in the thinnest section, the thousandth part of an inch in extent; but it might be possible, from observation of the arrangement of the structures, to form a conception, though hardly a mental picture, of the wonderful changes going on during one moment of action or rest from action, but this probably is the utmost that can yet be gained by one who has a good knowledge of the facts known concerning the development and growth of the so-called “brain cells” and their phenomena during life.

In some of the lower living organisms, the comparatively simple amoeba for example, a correct general idea of what occurs in the bioplasm or living matter of the minute living particles concerned in mental vital action may perhaps be formed. A young amoeba possibly contains, in a given minute portion, more matter actually alive at one moment than any other living particle that can be examined separately without causing death or irreparable injury. This living matter seems to be, to the highest magnifying powers obtainable, as structureless as water. By the spontaneous movements effected by vital power, small portions may be detached, and these may further divide and subdivide. Thus from one small living particle a great number may be produced, every one possessing precisely the same powers as the original particle from which they originated.

Let me now offer a few remarks upon some organ which in its active state will help us to form some idea of the wonderful changes which are going on in our bodies during

life. The organ which I think is most suitable is the heart. Consider for a moment how very interesting and important are the changes which take place from moment to moment in the heart, in every part of the muscular substance of the heart, which is continuously at work from before birth to old age and death. The alternate shortening and lengthening of the muscular fibres never stops for many seconds. The heart never *rests*. The nerve cells and the ganglia which govern its action and determine the healthy regularity of its beats never sleep. The sustained action of the heart, and as I venture to think of all muscular tissue, is indirectly dependent on the living matter of the muscular fibres and that of the nerves and ganglia connected with it. But I dare say this view will be contradicted, though probably not in print. I should like those who differ from me to state the ground of their objection. All muscles and all kinds of muscular tissue are everywhere supplied with nerves. There are nerve ganglia in the heart itself, by which the activity, regularity, and equality of the muscular contraction in its several parts is provided for. Remember that the heart is not the only one of our organs which never rests and never goes to sleep during life. Its "nutrition" proceeds without interruption, and the perpetual removal of the products of decay are provided for by a number of complex changes which do not cease during life, and our health and strength and working power are maintained and longevity rendered possible. On the other hand the muscles of the limbs and body generally do require rest, and if worked too hard become tired, and then rest for a time becomes imperative. The heart continues to beat perhaps sixty or more times a minute, perhaps nine or ten million beats in a year. Many of us in this room now have experienced many millions of beats since our heart was first formed, hardly conscious of the necessary and wonderful work incessantly going on in our body. But the wonder is increased if we consider the steps of the formation which proceed early in life, for while its work goes on in the early years, at the same time that the heart continues to *grow*. The heart is one of the first organs that performs actual work in the organism. In the chick the heart and corresponding part of the nervous system are formed very early in the period of incubation. In a few days, and in the eggs of small birds probably within forty-eight hours of the egg being laid, there would be indications of the heart, and not only so, but the red blood is at the

same time formed and is ready to circulate in the vessels also developed very early. Again, the heart, if it is in good order, is the most remarkable organ for undertaking a *varying* amount of work without damage. It may be called upon at any time to perform much more than double its ordinary work in a given time. If you run for a short distance you will find the heart beats twice, or more than twice, as quickly as ordinarily, the number of beats rising to one hundred and twenty or more per minute; and if the heart is healthy, and we rest for four or five minutes, it will generally be found to have returned to its normal rate of action. If at any time you find the increased action goes on for long it is very desirable not to allow the heart to be again unduly excited. There are people whose hearts are so sound and strong that they can do at the age of sixty or seventy almost as much as at twenty; but such organisms are not very common.

The heart requires no attention, no direction, and no thought on our part. Many of us unless we feel our pulse or put our hand where the heart is situated are not conscious that we have a heart steadily working without interruption, day and night, from months before birth to death, at the average rate of sixty or seventy beats per minute. The heart does an enormous amount of work, and when we consider the circulation in the case of large animals—for instance, the elephant or the whale—the amount of work done by the heart is indeed enormous, each forcible contraction driving the blood through the vessels continually—contractions succeeding one another at certain short but definite intervals during the whole life of the creature.

I can only briefly refer incidentally to a few points in connexion with the structure of the heart; but the inquiry is of the greatest interest as regards the principles and nature of nervous and muscular action. A very thin section must be made; or, better, you may appeal to some small animal, parts of whose heart are naturally so thin and transparent that a section is not required. In my favourite little *Hyla viridis*, or Green Tree Frog, which is better known in Germany than in England, I have seen perfectly what I have seldom demonstrated in other animals.

The *Hyla* is a beautiful little creature with tactile tips to each toe, acting like suckers, so that it can stick to the smoothest surface of leaves or even of glass. It jumps, for

its size, a long distance. It is of a beautiful green colour, changing from light green to dark greenish brown, and may easily escape notice on a leaf. Many of these animals are brought over to England every year, and people keep them as pets and feed them with flies.

The muscular walls of the auricle of the heart of the Hyla are so wonderfully thin that you can easily see the delicate individual muscular fibres and the finest nerve fibres distributed near to, and over and under them. Such thin tissue in its natural state is far better than any section that can be made, and if the extremely thin tissue is properly prepared and preserved in glycerine you can see all the different structures, and can make out distinctly the relation of the delicate nerves and their bioplasts to the muscular tissue, and can form some idea of the manner in which they act on the muscular fibres. You may in such a specimen work out a number of disputed points in connexion with the ultimate nerve network and its relation to muscular fibres and judge how it acts. These anatomical facts are of great interest and importance.

One cause of the difficulty in forming a conception of the changes which take place in living things generally arises from the misapprehension that every part of a living organism is *alive at any one moment*. This is a great mistake, for the greater part even of a single hair or feather for instance is as *dead* while yet connected with the living organism as it is after the severing action of a pair of scissors. The free end of a nail which is almost dry, is just as *dead* before it is removed by the knife as it is after the free portion is cut away from the rest of the nail. This is, of course, a rather important matter, if we bear in mind that a similar statement holds good with regard to the internal tissues of the body. Parts of the fibrous tissues, and many other tissues, such as the dentine and enamel of fully formed teeth, are just as far removed from the living state while they remain part of the living body as at any time after they have been removed.

Another source of confusion as regards "life" and "living" is the idea that the tissues of the whole living body are absorbed and removed in a certain moderate and definite period of time. We used to be assured that every part of us was removed and renewed once in each period of about seven years. Now that this is a fallacy is easily proved. The actual enamel of the tooth formed during childhood

remains the same enamel in the tooth of the adult. After enamel has been formed it is not "replenished" or renewed at any time. Or to take a still more striking instance—the tusk of the elephant; the whole of the tusk of this huge creature was in the early stage of its development and growth structureless, consisting entirely of clear, soft, colourless living matter. Indeed, if you were to examine the part near to the soft, highly vascular living tooth-pulp of the full-grown animal you would find in what originally were the so-called "cells," really in the form matter of the bioplasts, that minute particles of inorganic earthy matter were being gradually deposited, and as these increase, the soft living matter is slowly converted into a matrix which when impregnated with calcareous matter becomes the hard ivory. The outer oldest portion of the tusk of a living growing elephant may weigh 70 or 80 lbs., which in an old animal is non-living, though, of course, it is very firmly connected with the socket and the remainder of the "pulp" on the surface of which the continuous growth takes place. The greater part of the ivory of the tusk of an elephant one hundred years old is as dead, though the base is still firmly connected with [the living animal, as when, long afterwards, part of it has been converted into billiard balls which may last for many years without perceptible change.

Connexion and disconnexion with the living body does not determine whether a given texture ought to be considered living or dead, but the fact of any matter being alive is proved by its "*growth*," a *living process*. The living matter which manifests this *power of growth* is invariably colourless, structureless, soft, and sometimes diffuent from the large quantity of water present in all matter that is alive, living matter that grows and changes quickly often containing more than 90 per cent. of water.

[The lecturer then explained his drawings and diagrams to the audience.]

DISCUSSION.

The CHAIRMAN.—We shall be very glad to hear some remarks on this very interesting paper. It is one of the most fascinating subjects we can have to deal with, as well as one of the most difficult, if not *the* most difficult.

Dr. SCHOFIELD.—Perhaps I might ask a question of Professor Beale, viz., Whether he considers the nucleus of the cell to be living matter, and if so whether he considers it to be absolutely structureless?

Professor BEALE.—Yes, the nucleus, at any rate at first, is structureless, and some of the many changes depicted and described as occurring in the nucleus I think take place in consequence of some particles of the living matter *ceasing* to live. You may have bioplasm—living matter—without any nucleus at all, and under certain circumstances living matter may give rise to very many nuclei which appear *in its substance*.

The nucleus seems to me to be a new living *centre* which is evolved in the very substance of already existing living matter.

In reply to a question by a member of the audience regarding the distinction between certain actions of matter and of living organisms, the lecturer added:—My idea is that living *vital* power is distinct from all forces and energies. With regard to motion, it must be borne in mind that motion in living matter is one thing, and that other forms or modes of motion irrespective of life are altogether distinct. The motion of living matter has been called *spontaneous*—you cannot explain it. Then there is another point in which vital movement differs from every other kind of movement known. It is this, that in all living things the movement of the living matter is *independent of gravitation*. You might ask me to prove that. For instance, are not the particles of which a tree is composed lifted up one above the other often to a great height? It seems to me that this can never be explained by physical law. Newton, it has been said, made the great discovery of gravitation when contemplating the fall of an apple; but we microscopical people naturally ask, how was the scaffold raised—formed “bit by bit”—from which that apple fell? (Applause.)

The CHAIRMAN.—It was the result of the death of the stem that made the apple fall.

Professor LIONEL BEALE.—Yes, it was the weight of the *dead* matter of the apple that caused it to fall; but the living germ (bioplasm) wonderfully protected in the “seed” may, after having been some time in the damp earth, grow and form roots that grow *downwards*, and a stem that grows *upwards*, with leaves and branches, and at length flowers, followed by fruit containing year

after year many seeds, from which generation after generation of new apple trees may grow.

Professor E. HULL.—This being a purely biological question, I am unwilling to take part in it beyond making a few remarks. I apprehend that Dr. Beale holds and maintains that you cannot have life except from life.

Professor LIONEL BEALE.—Certainly.

Professor E. HULL.—I may remind you that some years ago, when this very question was being much agitated among men of science, attempts were made to prove, or to disprove, this great principle. It was attempted to show, or the reverse, that the amœba, or some form of microscopic structure, could be generated without contact with the air—which we know is full of organic vital forms—and it was asserted on one side that if in a certain preparation, such as a gelatinous preparation, organic living forms occurred, it was in consequence of contact with the air. The greatest care was taken to ascertain this point, and I think it was Professor Tyndall who carried out some experiments, and he came to the conclusion, which he announced, and I think Professor Huxley endorsed it absolutely, that it is quite impossible to produce life without the presence of some organisms already living. I think that is a point in which the lecturer thoroughly concurs.

Professor LIONEL BEALE.—Yes, that is assented to—that there is no such thing as *spontaneous generation*. That is settled for ever.

Professor E. HULL.—If this were a geological subject I should go on a little farther; but I do not wish to trespass.

Professor LIONEL BEALE.—That I think would much interest us.

Professor E. HULL.—I would refer to the fact that this world, as all geologists and physicists admit, exists as a mass which was once in a molten condition at a temperature in which life could not possibly have existed. There must have been a period at which life originated on the surface. Where did life come from? That is a question which Lord Kelvin endeavoured to answer at a meeting of the British Association in Glasgow, and we all know what the answer was.

Dr. SCHOFIELD.—I hope Professor Beale will pardon me, but I do not gather that he means that the nucleus and segmentation of sperm and so on is *post-mortem*.

Professor LIONEL BEALE.—No; but there are various appearances

seen in the nucleus, such as radiating particles and many geometrical figures, which I should maintain were not living.

Dr. SCHOFIELD.—Is the nucleus structureless when divided in that way?

Professor LIONEL BEALE.—According to my belief the only *living matter* of the nucleus is structureless. I should be very glad to have a talk with Dr. Schofield on this diagram, but it would, I fear, take too long a time to attempt to do so now. Every particle of matter that is alive I believe to be structureless, and the facts I have brought forward render this almost certain.

Canon GIRDLESTONE, M.A.—I think we owe a great debt to Professor Beale for giving us a lecture on this subject. It is not only a vital subject, but it is vital to us in many respects. First of all I thank him especially for discussing the use of words, for I think that half the quarrels in science and in theology and other matters hang on the use of words, and if we could only attach a definite meaning to every word we use we should have no broken bones. But we shall have to wait, I fear, until we get into another world for that. For instance, when a young lady refers to the state of her heart she is not at all thinking of these little particles of living matter connected with the muscles and nerves of the heart. She has quite a different idea. The Professor told us that we should not think too much of our hearts, but still we are liable to think of other people's hearts, or I do not think life would be worth living.

One idea struck me in regard to the word *Bios* in Biology. It is rather a mistake, I think, though it is late to alter it, that a distinction is not made between *Zoe*, which stands for the principle of life, and the word *Bios*, which stands, really, for the external condition of life. Perhaps I see it rather from the Greek Testament point of view, but *Zoe* gives the idea of the principle of life which we all feel, and concerning which we owe much to Professor Beale for his lecture. But if we could remember the difference between the conditions under which structure exists and that process or power, whatever you like to call it, which brings about those states of structure, it would be a great help to us in our discussions.

I sometimes think there is a difference between the process of construction and the structure which is its result. It seems to me that some of our scientific men have mixed the two, but

Professor Beale has always drawn a clear line between them. Supposing I said a lady was made up of a bonnet, a dress, a pair of boots, and a pair of gloves, I should have mistaken the things she had got on for the person herself, and yet it often happens that some of these minute things which we see under a microscope are spoken of as if they were self-constructed.

I might pursue my illustration farther and talk of a building making itself, but we know that buildings do not make themselves, and we have very high authority for saying that every house is made by someone. When a lady goes into a shop to provide these things, each of which is practically a construction of itself, she has an idea of what she wants, and proceeds to build up her external structure. She is the *Zoe*, the real agent by which all these various things are built up. She is the *Ego* which applies the matter in all its varied forms, and I think that has been especially brought out to-day with regard to the initial forms of life.

One other point struck me in regard to these little life particles. At first sight it would seem as if they were independent of one another, but Professor Beale brought us to think that we must go back to the origin and we shall find that all these little particles spring from one or at most a few, and thus you get at the true idea of the living growth, as contrasted with the crystal. Science speaks of an organic being as that life which proceeded from a centre and worked on a plan through and from that centre, growing in this direction rather than in that direction, until you get the true organic being. So after all, organization springs from life, and life springs from living organisms.

Professor ORCHARD.—I may express my thorough concurrence in what has been so ably put forward by Canon Girdlestone. We all thank Professor Lionel Beale very much for his kindness in coming amongst us this evening, and not least for drawing attention to that abuse of words which, as was observed, is often the cause of intellectual dissent.

John Stuart Mill called attention, I remember, to this practice of using words in different senses; he himself unhappily was not free from blame in that respect, though that must not be taken to lessen the value of his caution. The word *evolution* is a notable example; nor am I certain that Professor Lionel

Beale himself did not a little trip this evening when he referred to evolution going on in living matter. If that word is applied to the changes that living matter produces, or which are produced through living matter, the word is not used in its ordinary acceptation, for evolution implies the transmutation of species, and the transmutation of species I am sure Professor Lionel Beale would be the first to say was not proved by science.

I would ask the Professor, with regard to the conversion of non-living matter into living matter, whether he considers that it is *living matter* that effects that transmutation, or whether it is not rather *the vital principle* in that living matter which does so?

Professor LIONEL BEALE.—But the living matter is produced in the substance of existing living matter. It is here that the non-living matter introduced as the nutriment becomes living, and acquires from the already living matter itself vital powers of the same kind.

Professor ORCHARD.—Exactly.

Professor LIONEL BEALE.—And so in evolution I should say there is no example of evolution and transmutation dependent upon any changes except those which take place in the bioplasm—the actual living matter. You cannot have altered form, colour, and other specific changes in successive developments of creatures without every one of them beginning as living matter, which is structureless. You must consider the earliest stages to form an idea of the nature of the changes which result in the production of colour, structure, physical characters, chemical composition and properties.

Professor ORCHARD.—The word *development* would better express what I mean.

Professor LIONEL BEALE.—You have evolution in development, and may not development be applied to all forms of evolution.

Professor ORCHARD.—I should never myself use the word in that way. I think it is convenient to keep the word to a distinct theory which involves and postulates the transmutation of species. I do not think it quite answers the question as to the change of the non-living into the actual living matter. Is it not, rather, the vitalism, or the principle of life in the living matter which does this?

Professor LIONEL BEALE.—Yes; but the new matter becomes

part of the living matter which caused it to live. Let me say that, in discussing the actual phenomena of life, I have been led to consider what takes place at a point beyond that to which at present our sight can penetrate, though possibly our mind may "see."

Professor ORCHARD.—Quite so. But what effects the change?

Professor LIONEL BEALE.—Vitality—and then we must consider every change that occurs in the bioplasm, the only seat of vital action through nature.

As regards evolution, I should like to know something about the evolution of the bat, and particularly the nature of the transformations occurring at a very early period of germ life antecedent to the formation of tissues and organs and anything like a bat. But Professor Orchard's "evolutionists" do not explain even the evolution of his wings, and I doubt whether they have the least idea of the structure or mode of formation of the smallest portion of the thin membranous portion of the wing, to say nothing of the bat himself.

The CHAIRMAN.—I am only a chemist, and it has been the struggle of chemists to keep clear of biology; but biology invaded us. By adopting the word *organic* we thought at any rate we should be safe and that organs were living, and so we used the word to imply the structure of organisms, and then we found that chemistry was invaded by the result of formless organs; and so, with all our science, we find we cannot get away from this utterly mysterious problem that not even the whole of our bodies are living; but that minute fractions of them possess properties so marvellous that they take the entire bulk, both dead and living, out of the ordinary category of the non-living and make it a totally different thing.

Professor Beale has brought us face to face with the great problem of all others, and I think perhaps that some of us, though we may not use the Greek form, are obliged to confess ourselves in the living form *ignoramus*.

Professor LIONEL BEALE.—Judging by Professor Japp's paper on "Vitalism" we are going to have much help from chemists before long.

Perhaps I might ask the Chairman whether it would be possible to organize a few meetings to discuss some of these questions amongst ourselves. It might be well considered by

the Council whether something of the kind might be carried out.

I have ventured to put some of my conclusions on slips of paper like these, and I think you will find that I am not likely to advocate anything that may be against the principles of the Victoria Institute. If so, I hope whoever may be in the chair will call me to account, and then I will give way.

The CHAIRMAN.—I can only say that as far as my vote is wanted in favour of such discussions it will most certainly be given. It is the discussion of these points that is the great desideratum.

I entirely concur with what Professor Beale said about words. Ambiguity causes great difficulty, and it is very important that words should have their definite meanings so that we may know how to fit them in.

The meeting then terminated.

ORDINARY GENERAL MEETING.*

DAVID HOWARD, ESQ., D.L., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections were announced :—

MEMBER :—Richard D. Dicker, Esq., Philadelphia, U.S.A.

ASSOCIATES :—Professor G. F. Fitzgerald, F.R.S., Trin. Coll., Dublin ;
Rev. E. H. M. Waller, M.A., Allahabad.

The following paper was read by the Author :—

ON THE BEING OF GOD. By the Venerable Arch-
deacon W. MACDONALD SINCLAIR, D.D.

I. THE EXISTENCE OF GOD.

1. *Science investigating the Works of God.*

THE question “Do you believe in God?” is not as certain now of receiving an affirmative answer as it would have been one hundred years ago, but in many cases the answer would be more intelligent. Whatever may be the faults of the times in which we live, it is an inspiring thought that our day has come in an age which seems to bring us, in some sense, very near to His self-existent Being.

Never was investigation so patient and so close into the myriad ways of His working in Creation. In a sense that never before was known, *the Heavens are declaring His glory, and the firmament showing His handywork.* The ray of light which left its distant orb scores or hundreds, it may be thousands of years ago, yields up its secret in the prism, and tells us the very elements of which that remote world is composed. The principles on which the very Creation itself is being perpetually built up, seem to be, in some small degree, revealing themselves to the understanding of man.

Man halts, of course, and makes mistakes; he forms a supposition, and it may be that more than one generation

* Monday, May 7th, 1900.

will pass before the supposition becomes verified. It is probable that each supposition which succeeds the other will be greatly changed from its original appearance before it is generally adopted. But the majestic uniformities and combinations of nature are ever shining forth in more august and sublime proportions to the reverent gaze of the genuine student. Absolute Atheism seems to be more widely discredited, and the scientists who do not believe are for the most part saying just what we should expect; not that they *deny*, but that in the technical scientific sense they do not *know*. They are unconsciously echoing the very words of the Book of Job:—

Canst thou by searching find out God?
 Canst thou find out the Almighty to perfection?
 It is high as heaven; what canst thou do?
 Deeper than the depth; what canst thou know?

2. *What is meant by Agnosticism.*

That is most of what is really meant by the spectral bugbear of Agnosticism: Belief is not intended to be scientific knowledge. We seem to hear in the language of such men some note of the exclamation of St. Paul: *Here we see through a glass darkly*. "Whatever may be the difficulty," says the late Professor Diman, "of demonstrating the existence of God, to prove that there is not a God is manifestly beyond the power of human intellect. That the Eternal Being exists is a proposition, the truth of which it may be possible to deduce from a circle of facts lying within our immediate range; but to prove that God does not exist we must have sounded the Universe in all its length and breadth. Even if you suppose that He had left no traces of His existence in the narrow field open to our inspection, we yet cannot affirm that no such trace exists in the measureless space which we have never explored; even if He has never uttered His voice during the brief years that we have lived, we still could not declare with certainty that He has never revealed Himself to other beings during the eternal round of Time."

3. *What is meant by Evolution.*

And when some of us shrink back from the idea of the purpose of God in creation being unfolded as a contemporaneous process, and, neglecting the warning of St. Paul

that *the earnest expectation of the creature waiteth for the manifestation of the sons of God, and that the whole creation groaneth and travaileth in pain together until now, waiting for the adoption, we cling rather to the more clumsy and less enlightened notion that this purpose ceased when in the beginning He foresaw everything that was to be, the same writer continues :—*

“Creation by fabrication (or actual direct handiwork) seems less a matter for admiration than creation by evolution; a man can bring a machine together; he cannot make a machine that develops itself. That our harmonious universe should formerly have existed undeveloped in a state of diffused matter, without form, and that it should gradually have attained its present organization, is much more marvellous than its formation according to the artificial method supposed by the unlearned would be.” “*Thou art worthy, O Lord, to receive glory, and honour and power: for Thou hast created all things, and for Thy pleasure they are, and were created.*” “*My Father worketh hitherto.*”

4. *Matter the Externalization of the Thought of the Eternal.*

If we want some adequate though necessarily imperfect notion of the method of creation, we may remind ourselves that it is impossible to conceive of the Eternal Self-existent Being as subsisting without thought; and the expression or externalization of His thoughts was the beginning of matter. If He wished to create an infinite series of minds capable of enjoying His own happiness, it was, as far as we can see, necessary that they should have a mode of existence differentiated from His own. He thought of forming such a series, that His own illimitable perfection might be shared; and instantaneously the whole Universe glowed and shivered with unthinkable myriads of atoms, the materials for providing a differentiated existence for the innumerable mental units designed. Matter became a mode of being differentiated from spiritual self-existence. The processes of Evolution correspond to the execution of the Divine thoughts in their perfection. “The created Universe is a form of Divine force, endowed with such an existence as the Eternal found necessary to effect His creature purposes.”

5. *The same idea in verse.*

These considerations have been put with point by a recent poet:—

“What are stars
But God’s thoughts indurate—the burning words
That rolled forth blazing from His mighty lips?

For thought is one
As souls are in their essence, and it works
By kindred laws and processes in all;—
Whether it flames within Thy Mind, O God,
Or publishes itself in spheres of light,
In worlds of spirits (affluences of Thee),
Or show its mighty convoluted throes
In embryonic suns and nebulas.

What are suns,
Systems, and worlds, but mighty thoughts of God
All waiting to become the thoughts of man?

Books are man’s worlds—his great attempts to speak
The meaning of the oracle within;
And worlds are God’s books, in the which He writes
A memoir of Himself in love to man.”

The world is but the Echo of the words
Spoken by Him to old Eternity.*

6. *Little real hostility to a reasonable Faith.*

The writers who have influenced thought on these subjects are not dogmatically hostile. Darwin never denied God, and will probably be some day claimed as a revealer of His Nature. Tyndall declared that in his happier moods he shared the common faith and the common hopes of mankind. “Many of the most illustrious scientific men of the present day are clear confessors of theistic faith.” Fiske, treating of Darwinism, says that it may convince us that the existence of highly complicated organisms is the result of a combination of circumstances infinitely various, each so minute as separately to seem trivial or accidental; yet the consistent believer in God will always occupy an impregnable position in maintaining that the entire series, in each and every one of its incidents, is an immediate manifestation of His creative action. “Yes,” says a thoughtful American writer, Washington Gladden, in dealing with this most tremendous of all subjects, “the sublime statement with which the Holy Scrip-

* J. Stanyan Bigg.

tures begin is as worthy of belief as it ever was: *In the beginning God created the heavens and the earth.* There never were, and there never will be, more than two great theories of the origin of the Universe; it is the product either of *Chance* or of *Purpose*. Between these two theories you must take your choice. That it is born of purpose is intelligible, reasonable, probable. That it grew by chance always was preposterous, but it is tenfold more preposterous to-day than it was fifty years ago. We are sure that the sublime movements of the planets over our heads, and the crystalline glories of the earth beneath our feet, and the wonderful and beautiful forms of life about us, are not the outcome of any chance. The unity, the harmony, the progress that we see, disclose to us the working of an eternal Purpose. It is in that Purpose that Nature reveals to us the existence of that God who, in the beginning, created the heaven and the earth. It is not a demonstration, but the inference is clear and strong. Purpose means Intelligence, Purpose means Will; one Intelligence, one Will, one God."

II. THE OPERATION OF GOD.

1. *The Purpose of God in Creation suggested in Romans viii.*

What is that Purpose? With regard to the final destiny of the Universe, a recent writer (W. W. Howard) says: "Revelation here, as elsewhere, anticipates Reason. In Holy Scripture it is over and over again stated expressly, and nowhere with such fulness as in the eighth chapter of St. Paul's Epistle to the Romans. And it turns out to be nothing short of the EVOLUTION OF ALL CREATION INTO RATIONAL FORMS, CAPABLE OF KNOWING GOD, PRAISING GOD, AND SENSIBLY ENJOYING HIS FAVOURS. A most magnificent conception:—

"Too bold to believe it true :
If not far bolder still to disbelieve.

... "The Creation and the Creator assumed, what would pure Reason conclude to be the ultimate object involved in the bringing of all things into being? Would not that final aim be the highest that Reason could conceive? In possession of a perfect Deity as the universal Creator, could Reason hesitate to ascribe to Him the very highest purpose in His creative efforts? And can any purpose above this

be conceived by Reason in her greatest and most exalted flights? . . .

“Can Reason feel satisfied in concluding that God has created dead and thoughtless matter to remain dead and thoughtless for ever? Would the artist be satisfied to stop short of painting his picture when he had prepared his paints and stretched his canvas? Nay: when he had finished his production, would he not, like Pygmalion, go on to put mind and life into it, were it in his power to do so? . . . It is always assumed by us that a mechanician, an artist, a poet, a philosopher, a man of science, will carry his work to the highest perfection in his power—if indeed he be endowed with wisdom. Can we then conceive that God, whose perfection is infinite, will fail in contemplating, in His work, anything short of the very best? And is there anything else equal to the end we have referred to as involved in what the Bible affirms to be the ultimate end of the Universe?”

“Hallowed be Thy name—Hallelujah !
 Infinite Ideality !
 Immeasurable Reality !
 Infinite Personality !
 Hallowed be Thy name—Hallelujah !

We feel we are nothing—for all is Thou and in Thee ;
 We feel we are something—*that* also has come from Thee ;
 We know we are nothing—but Thou will help us to be.
 Hallowed by Thy name—Hallelujah !”

Tennyson.

2. *Suggestions from the Higher Pantheism.*

The thoughts, I submit, of a Pantheist may be of use to us, because the transition seems so natural and reasonable from the admission of a Divine omnipresent Power to that Personal Father of all things whom we ourselves worship.

“The whole tendency of modern thought,” says a writer whom I have already quoted (Fiske), “is to impress upon us ever more forcibly the truth that the entire knowable Universe is an immense unit, animated through all its parts by a single principle of life. . . . The fathomless abysses of space can no longer be talked of as empty; they are filled with a wonderful substance unlike any of the forms of matter which we can weigh or measure. . . . Radiating in every direction, from countless centric points, run shivers of undulation manifested in endless metamor-

phoses as heat, light, actinism, magnetism, electricity. Crossing one another in every imaginable way, as if all space were crowded with a mesh-work of nerve threads, these motions go on for ever in a harmony that nothing disturbs. . . . It means that the Universe, as a whole, is thrilling in every fibre with Life . . . all is quivering with Energy. From particle to particle without cessation the movement passes on."

Such language, I say, brings us not indeed to God Himself, but very near to His vesture. The unity of Matter leads us to think of the Divine Unity of Mind. We seem to approach to the very shadow of the Divine Being, to feel His omnipotent hand, to be encompassed by the externalization of His omnipresent Thought. We are reminded of the powerful way in which Tennyson converted Pantheism into Theistic thought:

3. *The Higher Pantheism turned by Tennyson to Theism.*

"The sun, the moon, the stars, the seas, the hills and the plains,
Are not these, O Soul, the vision of Him who reigns ?

Earth, these solid stars, this weight of body and limb,
Are they not sign and symbol of thy division from Him ?

Dark is the world to thee : thyself art the reason why :
For is He not all but that which has power to feel 'I am I' ?

Glory about thee, without thee ; and thou fulfillest thy doom,
Making Him *broken* gleam, and a *stifled* splendour and gloom.

Speak to Him thou, for He hears, and Spirit with spirit can meet—
Closer is He than breathing, and nearer than hands and feet."

4. *Suggestions from Herbert Spencer.*

Valuable as are to us as a step the meditations of a writer who seems unable to escape from the hampering ties of Pantheism,* still more welcome are the frank admissions of one who declares himself to be an Agnostic. The most conspicuous of modern Agnostics, Herbert Spencer, insists, like Tennyson, that this force which is thus revealed to us is not self-existent ; that it does not set itself in motion ; that it is caused ; and that behind all is the unknowable Cause. We know, not only the results of Force which

* *I.e.*, Fiske.

present themselves to our senses; we know that behind these results is an Infinite Reality. With most convincing Logic he shows that this Power behind all appearances is the necessary groundwork of all our reasoning; that we cannot think without assuming it; that "among our necessary beliefs this has the highest validity of any." He calls this Reality behind all appearances "the Unknowable Cause of all effects which constitute the knowable world." He calls it that Inscrutable Existence which Science, in the last resort, is compelled to recognize as unrevealed by its deepest analyses of matter, motion, thought and feeling. He calls it "the Infinite and Eternal Energy; the Ultimate Existence; the Ultimate Cause from which Humanity has proceeded." "This Inscrutable Existence . . . stands towards our general conception of things in substantially the same relation as the Creative Power asserted by Theology." "Very likely," he says, "there will ever remain a need to give shape to that indefinite sense of an Ultimate Existence which forms the basis of our Intelligence. We shall always be under the necessity of contemplating it as some mode of Being." "Religion," he writes in another place, "everywhere present as a web running through the warp of human history, expresses some eternal fact." And to return for a moment to the Pantheistic writer, "The Presence of God," he says, "is the one all-pervading fact of life, from which there is no escape; and while, in the deepest sense, the nature of Deity is unknowable by finite man, nevertheless the exigencies of our thinking oblige us to symbolize that Nature in some form that has a real meaning for us; we cannot symbolize that Nature as in anywise Matter; we are bound to symbolize it as in some sense Soul."

5. *The Nature of Human Belief.*

These words of the most austere exponents of Science and Philosophy are to us a great help, because they show us that there need be no antagonism between the sternest and most abstract of their principles, and those vital beliefs for which we are prepared to die. When they say that the Infinite and Eternal Power that is manifested in every pulsation of the Universe is none other than the manifestation of the Living God, but that He is unknowable in the scientific sense of knowledge, we reply that such an answer

is exactly what we expect to hear. It was the Son of God Himself who said that *no man hath seen God at any time*. To the eye of Faith alone He is visible; by the Moral and Religious Sense He can be known; in the Conscience He can be recognized; in History His footsteps can be traced; in the Soul His still, small voice can be heard. "And falling," as one has said,

"Upon the great world's altar-stairs
That slope through darkness up to God,"

we join our voices with the hosts of light above us, and with the innumerable company of believing souls on earth, humble and firm in their unshakable trust; and we cry:—

"We praise Thee, O God!
We acknowledge Thee to be the Lord!
All the earth doth worship Thee,
The Father everlasting!"

III. THE PROVINCE OF FAITH.

1. *The Reasonableness of Faith.*

These are the gropings of Science and Philosophy in the direction of Faith, a region with which they suppose themselves not to be primarily concerned; and I say they are a help to us, because, if by any possible accident a reasonable account could be given of the material Universe without Almighty God, it might to some be a stumbling-block.

But, since the day when, in its earliest cradle, the human race first meditated on the riddle of existence, it has been the glorious province of a well-grounded Faith to hold devout communion with the omnipresent Being, and to learn that He is not only Power, but Light; not only Light, but Love.

The oldest writing in the world is perhaps the papyrus scroll of the mummy of the ancient Egyptian High Priest, Ahabanuk. Ahabanuk is supposed to have lived about 2800 years before Christ, 1000 years before the date at which it used to be said that Abram left Ur of the Chaldees. In Ahabanuk's tomb was found a copy of the Book of Prayers of that primitive race. From that venerable document has been translated this sublime passage:—

"There is a Most Holy One, a Creator of the fulness of the earth, a ruler of days: He is the God of gods, the exalted

Maker of the stars and of the heavenly hosts, which are praising Him above our head; the Creator of the exalted race of mighty Princes and Governors who sit in judgment, who condemn the wicked: He is the Ruler of the world, the Light which convicts the evil doer; the Judge of every deed, the Preserver of the Laws; He is the Light; with Him is no Night; He dwells in the exalted land of Light; in Him is joined together the glory of the Sun and the glory of the King of the world. The Most Holy One lives; He seeth as ye see; He heareth as ye hear; He standeth as ye stand; He sitteth as ye sit. Let the Lord God be exalted in His holy temple, and be worshipped on bended knees: for He is the End and the Beginning of all things."

There speaks the voice of Faith, in the dim and distant youth of the world. Without Faith, as was taught by the greatest master of modern philosophy, the German Emanuel Kant, without Belief in God and the Soul, no moral conduct is possible, and therefore no happiness. It is Faith which, telling you that the Eternal is Mind and not merely Force, Love and not merely Mind, raises you above the brute, and brings to maturity within you that life for which you were intended.

2. *Various Reasons for Belief.*

Whether your faith is grounded, like that of Kant, on the inherent necessity of a moral life, or like that of Cicero on the intelligent witness of all mankind, or that of Bacon on the mirror of the Divine Being which he found in the mind of man, or like the faith of Anselm and Coleridge on the impossibility of the very conception of the idea of God unless it were true, or like the thin faith of Spencer and Tyndall on the need of an ultimate Cause, or like the richer and warmer faith of Newton and Faraday on the splendid wonders of the Creation, or like the faith of Abraham, Moses, David, and Isajah, on the voice of Revelation within, or the united voice of the great cloud of witnesses in the Catholic Church, or like that of the humblest Christian on the Divine Personality of the Lord Jesus Christ; whatever in your case may be its origin and development, Faith is the most perfect flower, the highest outcome of your soul, its noblest privilege, its healthiest exercise.

3. *Duty of Gratitude for what we can see.*

“God is unsearchable; the ages of His Eternity cannot be numbered, nor the spaces of His immensity measured; the depths of His Wisdom cannot be fathomed, nor the reaches of His Power bounded; the brightness of His Glory can never be described, nor an inventory made of the treasures of His Goodness. This is good reason why we should always speak of the Eternal with humility and caution, and never prescribe to him or quarrel with Him; why we should be thankful for what He has revealed of Himself, and long to be there, where we shall see Him as He is.”

4. *Immensity and Nearness of Deity.*

“A million beats of man’s united heart (so writes an Eastern poet)
 Are fainter than one throb of ocean’s pulse,
 Which thrills her awful veins in every part,
 And throws up waifs and shells and crimson dulse.
 A million tides of ocean’s weltering breast
 Are weaker than one glance that lights the sun,
 When in the bannered East he breaks his rest,
 His race gigantic round the sky to run.
 A million journeys of the sun’s swift foot
 Are smaller than one limit of the space
 Through which the tree of life from Being’s root
 Upsprings, powdered with stars, in heaven’s face.
 A million trees of life, with all their loads
 But poorly God’s profound domain reveal:
 The crowd of worlds that throng heaven’s thickest roads
 Are letters of a word His lips unseal.
 A million worlds, with universes rife,
 His all-creative might can no-wise drain:
 When closing order bounds chaotic strife,
 His fulness as before doth still remain.
 That fulness such, in earth’s stupendous force,
 That, to His thought serene and tender gaze,
 The frailest insect, humming in its course,
 Is just as near as seraph in his blaze.
 Yes, though all worlds of space would be, combined,
 Too small to fit His finger to a ring,
 Yet is He not to humblest creatures blind,
 But daily spreads their board, and hears them sing.
 Each tear forlorn that trickles down man’s cheeks
 He marks, and pities every aching sigh;
 To give them consolation ever seeks;
 Their life-woes shares; and takes them when they die.”

IV. GOD CAN BE LOVED.

1. *We can love as well as Believe.*

This omnipotent, omnipresent, eternal Mind, before Whom the very angels bow their faces, and Whom even to contemplate is our delight, to us who have received the revelation of Jesus Christ is given the inexpressible privilege of *loving*.

2. *The Lovable Qualities of God.*

To us the Eternal is no mere abstract idea, that we should find it hard to give Him our hearts. Throughout His Word, in perfect harmony with the voice of Nature, He has revealed Himself as the source of all goodness, beauty, truth, strength, loving-kindness, pity, purity, light, love; of every virtue, of every excellence. To us He has spoken in tones suited to the apprehension of our race in its different stages, by the long array of psalmists and prophets; in their incomparable words we have His message clothed with varying degrees of clearness. But, above all, we know Him in the Divine and Unique Person of Jesus of Nazareth. "*He that hath seen Me hath seen the Father.*" "*God, who at sundry times and in divers manners spake in times past unto the fathers by the prophets, hath in these last days spoken unto us by His Son; Whom He hath appointed heir of all things; by Whom also He made the worlds: Who, being the brightness of His glory and the express image of His Substance, and upholding all things by the word of His Power, when He had by Himself purged our sins, sat down on the right hand of the Majesty on High.*"

3. *The Revelation of God's Love.*

The Eternal as He revealed Himself to Moses, was, indeed, an object of the most exalted affection and the deepest devotion:—"The Lord passed by before him," we are told, and proclaimed, "The Lord, The Lord God, merciful and gracious, long-suffering and abundant in goodness and truth, keeping mercy for thousands, forgiving iniquity and transgression and sin." The Eternal, as He is revealed in His Son, the Father of all Light and Love, is even more powerful to touch our hearts, because all can see and understand His incarnate truth and glory. It stirs in us an inexpressible motion to find that the lessons of the dread Creator of all

things for His human children are the Blessings of the Sermon on the Mount ; that He is the God of healing and pity, the God of the most righteous and absolute justice, and yet the most tender sympathy and condescension ; the God of the Cross of Calvary.

4. *The Human Response in Self-sacrifice.*

It is to Him, holding as He does in His hands the issue of life and death, watching us at each moment of our lives, and telling us by every line of His message that this life is only the brief preparation for the true life beyond, that in the exercise of our faith, if we desire our religion to be effectual, we cannot withhold the sacrifice of the whole heart and soul and mind and strength. Ah ! my brothers, I know how many are the competing interests. The daily affairs of life, the associations of business, home and ordinary occupations, these humble things are often in combination strong enough to blunt our faculty for the divine, and to hold us back from the full devotion of ourselves to Him Who alone is great. Then there come flocking about us all the various kinds of pleasures and amusements, which, to many, especially to those in the light spirits of youth, are a still more potent spell to hinder. Sometimes there are intellectual substitutes for the Eternal which claim our allegiance, and which prevent us from approaching near His spiritual and invisible throne. But all these are transitory and disappointing, and we find them so.

5. *The Devotion of Browning.*

“Therefore to whom turn I, but to Thee, the ineffable Name,
 Builder and Maker Thou of houses not made with hands !
 What ? have fear of change from Thee Who art ever the same ?
 Doubt that Thy power can fill the heart that Thy power expands ?
 There shall never be one lost good ! what was shall live as before ;
 The evil is null, is naught, is silence implying sound ;
 What was good shall be good, with for evil so much good more ;
 On the earth the broken arcs,—in the heaven a perfect round !”

Browning.

6. *Self-devotion in the Smallest Things.*

Moved by such thoughts as these, raised on the wings of devotion and praise, we feel that we can in sincerity dedicate ourselves to Him in whom alone we live and move and have our being. Well would it be for us if we never entered into

the service of His courts without such conscious renewal of our sacrifice ! Too soon, alas ! when we go forth again, the world breaks in on the atmosphere of worship in which our souls have been uplifted. But there is one means by which, in the grace of our Lord Jesus Christ, we can hope that the impulse of absolute, unreserved affection may be persistent. It is contained in the old words : " Whether ye eat, or drink, or whatsoever ye do, do all to the glory of God." In the humblest things, your recreations, your meals, your pastimes, your objects of pursuit, your interests, your occupations, your friendships, your family relations, your domestic duties, you can go through your round of actions either to the Divine glory or not. You can do everything in a right spirit and a wrong. Yes, in the very highest things of all, even in your worship itself, a wrong disposition is just as possible as a right. O, ask God Himself this day that henceforth, in everything connected with your whole lives, things great or things small, all may be solely and wholly for His honour, and the spread of His kingdom on earth !

7. The Ultimate Result in the Future.

And we know, from this intimacy of communion with the Eternal which we have experienced, that He will not throw us away when our work in this life is over. We have seen the King, the Lord of Hosts, face to face, and we know that if we have been found worthy for that sight, He will not forget us. And we have within ourselves the beginnings of this eternal life : faith, hope, charity, wisdom, calmness, humility, self-control, gentleness, strength. We know that these are of God, and can never die. We know that they are eternal, not merely as abstract virtues, or qualities of God, in which we have our share for a time, and then pass away ; but that just as they are all centred in the eternal Personality of God, so also they will never die even in their developments in our own personalities, who are created in His image. All else :—all that is not of God—the wishes of our earthly nature, the deceptive appearances that dazzle our eyes for a time, the shows and mummeries of all that is temporal and external, that which belongs to this world and not to the inner eternal world of virtue, of morality, of faith, of God—this will perish from our character more and more.

But all that is of God, in the same proportions as we have it here (else we should lose our individuality), but, thank God! in a degree that can only be limited by His love and wisdom, this is our insight already into eternal life, and it will be our undying personality hereafter. *God is in the midst of us; therefore shall we not be removed for ever. We know that if our earthly tabernacle be dissolved we have a house not made with hands, eternal in the heavens!*

DISCUSSION.

MR. E. SCHINZEL.—Before speaking on this subject I wish to convey the customary thanks to the able lecturer. It strikes me forcibly, however, that he is somewhat imperfectly acquainted with the first part of his subject; he will, I hope, forgive me if I try to correct his view of the subject.

The author in his treatise recommends to our notice Darwin's theory of evolution, and then later on he unconcernedly speaks of purpose and design. These are the words he uses, "The unity, the harmony, the progress that we see, disclose to us the working of an eternal purpose. It is in that purpose that nature reveals to us the existence of that God who, in the beginning, created the heaven and the earth. It is not a demonstration, but the inference is clear and strong. Purpose means intelligence, purpose means will; one Intelligence, one Will, one God." I quite agree with that view. Darwin, in the *Origin*, says, at p. 382, "Nothing can be more hopeless than to attempt to explain the formation of animals by utility, or by the doctrine of final causes." And boldly attacking the venerable champion he says, "The old argument from design in nature as given by Paley fails now that the law of Natural Selection has been discovered."

It has never been discovered—it has been *conjectured*—"There seems to be no more design in the variability of organic beings than in the cause which the wind blows." And further on he says, "No shadow of reason can be assigned for the belief that variations were intentionally or specially guided." (*Variation of Animals and Plants*, first edition, II, p. 431.) Huxley and

Professor Sidgwick (the latter Darwin's opponent) confirm my opinion. The former, in an essay of December 26th, 1859, says—

Archdeacon SINCLAIR.—I think I may save a little trouble if I say that I am not in the least a supporter of either Darwin or Spencer. I say on page 4 of my paper, "yet the consistent believer in God will always occupy an impregnable position in maintaining that the entire series, in each and every one of its incidents, is an immediate manifestation of His creative action."

Professor ORCHARD.—We are all, I am sure, glad to have the author's disavowal so frankly and sincerely made to us. I am sure also, we shall all concur in thanking the author very much for bringing before us so interesting a paper, so poetical and so eloquent.

There are one or two points in the paper in which I cannot altogether concur. For instance, the author appears to say that most of what is really meant by the spectral bugbear of Agnosticism is that belief is not intended to be scientific knowledge. He appears to connect that with the fact that man cannot find out the Almighty to perfection. No one in his senses, I suppose, would assert that by searching any one could find out God to perfection, certainly no Christian would do so. But by Agnosticism, as taught by Herbert Spencer, and others, something very different indeed to this is meant. It is meant that it is impossible, by any process whatever, to *know* God. That is what Herbert Spencer avers, and that is, undoubtedly, the essential idea of Agnosticism, that God is, from His very nature and character, absolutely unknowable.

The author also quotes, apparently with approbation, some words by Professor Diman, "Creation by fabrication (or actual direct handiwork) seems less a matter for admiration than creation by evolution; a man can bring a machine together; he cannot make a machine that develops itself." I have met with a variety of statements in this controversy, but I must say that this is one of the most unfair that I have met with. Who denies that man cannot make a machine that develops itself—or who denies that God does make such machines? Who, knowing anything of biology, denies that the human body, or dog or toad, can develop itself? But what has that to do with evolution? It is absolutely beside the question. We all know that God makes machines to develop themselves; but believing that does not make me an

evolutionist. In order to make me an evolutionist I must accept something that is very monstrous; I must believe that God made machines which not only developed themselves and produced others for immense periods of time, but that all at once those machines made something quite different, and that after that God went on making machines of broader character until at last machines were produced which had little or no relationship to the original machines. We do not believe such statements without a particle of evidence; but instead of having evidence for it, it is devoid of evidence. It is an unfair statement of the difference between two processes, and I hope the Archdeacon does not himself adopt it. I do not suppose he does. Professor Diman proceeds, "That our harmonious universe should formerly have existed undeveloped, in a state of diffused matter, without form, and that it should gradually have attained its present organization, is much more marvellous than its formation according to the artificial method supposed by the unlearned would be." The idea that evolution is a very marvellous theory has a certain truth in it, because it supposes so many extraordinary miracles, one on the other, without ground or reason; but to suppose that the theory of evolution is a grander theory than the theory of special creation is to propose what to my mind is quite preposterous.

There is a very interesting and beautiful thought that the author has brought before us, "the expression, or externalization of His thoughts was the beginning of matter." I think that very beautiful, and I wish to express my thanks to the author for it.

I would also thank the author very much for what he says on page 8 in regard to faith not being antagonistic to science and philosophy. He says "there need be no antagonism between the sternest and most abstract of their principles and those vital beliefs for which we are prepared to die."

The CHAIRMAN.—I hope in discussing this paper we shall keep quite clearly before our minds what I suggest is the most important part of it, and that is that true belief in the being of God is not merely compatible with certain particular modes of thought; but, if carefully examined, it will be found that even very different modes of thought and very different views lead up as a necessity to a belief in the existence of God.

I do not think it is exactly in point to discuss particular processes of creation. Probably, if we do, we shall then represent

other views of creation in a somewhat grotesque manner. But it is a matter of the most vital importance to see how the very views which are sometimes thought to be destructive of any belief in God are found to be not one whit more antagonistic to a belief in God, when worked out reasonably and when not taken as mere weapons to fight faith, than those of a different nature, and it is very instructive to find how a particular attack on faith has failed. The real result of modern thought seems to me to be this, that with regard to "Agnosticism" (it is a most perplexing word from the Greek, and one wishes there was something simpler to express it in English), the mere fact of not knowing a thing is no evidence of its non-existence. Which of us understands the telephone? Which of us has the faintest knowledge of what electricity is? Which of us has the dimmest conception of the forces of gravitation? On those points I am an Agnostic. I have not a full comprehension of any one of those points, and yet one's whole practical life is made up of the acceptance of such things, and therefore the one point in the argument of Agnosticism—that full knowledge is necessary to belief—is a thing that the more one thinks of it the more absurd it is. The fact that every thinker who seems to have tried hard to get away from the acknowledgment of design underlying creation has to come back to underlying laws, suggests the question, "If there be laws who and where the law-giver?" Those who have tried to escape from belief by Agnosticism find themselves compelled to acknowledge underlying verities. It seems to me we may consider that if we follow, upon the lines of this paper, the study of modern thought and the investigation of nature we shall find that though men may proceed by difficult paths, if that study be fairly and honestly followed, it leads up to God. (Applause.)

The Rev. JOHN TUCKWELL, M.B.A.S.—There is an allusion to a subject in the paper which seems to me to be of very great importance, and I should like, if I may, to call attention to it so that it may be a little more fully considered than it has yet been.

In the paper we have some very felicitous expressions concerning the method of creation. It is suggested that "we may remind ourselves that it is impossible to conceive of the Eternal Self-existent Being as subsisting without thought." We all concur in that view—"and the expression or externalization of His thoughts was the beginning of matter." That is very mysterious—

very profound. I think we are obliged to say, concerning that, as concerning electricity—that we do not know much about it. Whether, or not, the beginning of matter was the externalization of the divine thought, and if so, how that was accomplished, is far beyond our powers of conception and, certainly, far beyond our powers of discovery. But we must be on our guard against being led into the substitution of monotheism for modern Pantheism. Monotheism properly understood represents that there is only one Divine Being, or Person, or Substance. But according to certain modern ideas, if there are other beings besides the Divine, He cannot be infinite. It is said there may be other *persons* but there cannot be other *beings*. There must be an error here, I think, in the way in which the term “infinite” is understood. I confess I have not yet been able to solve the question how a variety and multiplicity of personalities should be possible with only one Being. I should certainly like that subject more thoroughly thrashed out, for it seems to me that it certainly leads to something that I am not able to differentiate from Pantheism. If there be only one substance, I am at a loss to understand how there can be different persons, and it leads us to this—that men, angels, demons and God are all of one substance or being, and are in some way inseparable from the Being of God. It leads, therefore, to this, that if I am at one time tempted, it is one part of God tempting another part of God. If I pray, it is one part of God beseeching another part of God for help. There are so many contradictions arising in my mind in this matter that I should like, if possible, that there should be some further discussion of the subject.

Professor ORCHARD.—May I ask you, sir, if you have read the accounts of the conference of Zoologists last year in this country? If so you will find that the testimony of Embryologists was decidedly against the theory of evolution.

Dr. WALTER KIDD, F.Z.S.—I think, sir, we have wandered rather away from the main subject, the Being of God, into by-ways. For the time being the question is;—how modern philosophy and thought bear on this profound question of God's existence—I should say more than His existence—His operations in the world.

It is, I think, manifest that the present trend of human thought is definitely against the mechanical theories of the universe which

were so lately held by men of light and leading; and against the philosophical teachings of Mr. Herbert Spencer, in particular, there appears to be an uprising among eminent men. In so far as this philosopher's teaching is agnostic, we may be thankful for the frequent protests that one now hears. His evolutionary teachings are less opposed, and the number of those who accept his description of the processes by which inorganic and organic existence is carried on is much greater than of those who accept his whole scheme of philosophy, into which metaphysics enters so largely. His doctrine of the Persistence of Force, as laid down by him, is much questioned, and yet to his scheme, as a whole, it is essential, as also is the other principle which he lays down—that *mind* is a series of states of consciousness, which, again, is largely denied.

But his doctrine that there *is* a first cause, and yet that this is unknowable (not merely at present unknown), is the stumbling-block against which many a would-be follower of Mr. Spencer has stumbled. It has often been pointed out what a strange assumption it is for Mr. Spencer to make that;—God is unknowable, when he is prepared to predicate so many profound attributes—such as that the First Cause possesses causal energy, is eternal, is infinite, is inscrutable. The Rev. Jas. Iverach says, “when we gather together into one thought all that Mr. Spencer affirms regarding the ‘unknowable,’ we find that it is an omnipresent power, that it is incomprehensible, and that it is the proper object of religious reverence, and that we are ever in its presence and from it all things proceed. Truly we must come to the conclusion that the word ‘unknowable’ is used only in a Spencertian sense.”

I submit that for every branch of science there is an ultimate beyond which investigation seems unable to go, such as the organism for biology—the atom for chemistry—the ether for physics, and that every special scientist will acknowledge in his own department a remainder, often a very large one, of mystery. No theologian or metaphysician professes to deny that an immense remainder of mystery belongs also to his “ultimate”—which is a personal God. He may, however, just as well object to any teacher, however great, telling him his “ultimate” is “unknowable,” as the chemist if he be told that his atom, or the physicist that his ether is unknowable. We know God in measure and expect to know Him better even in this life. Mr. Iverach again asks :

“If a consciousness like Mr. Spencer’s can do so much (as the construction and conception of the formula of evolution), what may not a greater consciousness effect?” And therefore why may not an originating mind bring into being and lay down for its governance an ordered universe? The originating mind Mr. Spencer stoutly denies, while admitting, as Archdeacon Sinclair has said, that Humanity has proceeded from the ultimate cause which he postulates.

We have as little reason for submitting to this summary taking away of the key of knowledge as would an astronomer, 70 years ago, before Leverrier and Adams, have submitted to be told that the causes, which were found to disturb the movements of the planet Uranus, were unknowable, though, very soon after, it was found that the hitherto unknown Neptune was the disturbing cause.

Surely no better argument for Theism is to be found than that of St. Paul: “The invisible things of Him from the creation of the world are clearly seen, being understood by the things that are made, even His eternal power and Godhead.” An argument summed up also by Kant in his well-known saying: “The starry heaven above me and the moral law within me.” And by Gibbon: “The God of nature has written His existence on all His works and His law in the heart of man.”

The CHAIRMAN.—If there are no others who wish to speak, I will ask you to join with me in a most hearty vote of thanks to Archdeacon Sinclair for this most valuable and interesting paper. There may be some diversity of opinion on the subject; but of the general force of his argument and of its value I am sure we can have no doubt.

The vote of thanks was then put to the meeting and carried unanimously.

The Ven. ARCHDEACON, in reply, said: There is very little that I want to say on the subject, except that I think we may all agree that men of science and philosophy, as a rule, when they are on the unbelieving side, put into the word “know” a restriction which we are not willing to concede to them. They use the word “know” in a scientific and demonstrative sense; and when we use the word “know” in a theological sense, we claim its use in the province of faith; and we are bound to admit, I think, in justice to science with all its restrictions, that the province of Faith and

the province of demonstration are not precisely the same. There is a line that may be drawn between them ; and we are very glad when we find men of science coming to the end of so-called scientific knowledge, or demonstration, obliged to draw on Faith. I believe that many men of science have to do so. I think we should bear that in mind that when in science they use the word "know," they use it as equivalent to having proved a fact by demonstration in mathematics or by personal observation. I think that discussion is important, and may help us a good deal in discussing these matters with men of science. We do not lay claim to the kind of demonstration that they claim. We agree that the province of Faith is a matter where we have to exercise what we consider the higher faculty of mind than that of a mere collection of facts and arguments upon them.

Evolution, I think, is often mixed up with natural selection. There may be evolution which has nothing to do with natural selection. There may be evolution which is strictly divine—the progress of God's creation and every one of its variations, as Darwin has properly pointed out, is due apparently to circumstances which are, in reality, the result of real fixed laws, quite as important as the great uniformities of nature—the particular species having been placed in their position by the Almighty, and subjected to the varying conditions of sun, heat and cold. Those are not blind forces ; but the results of God's laws, just as much as the grandest principle on which the universe is tied together. For my own part, I really cannot see anything in the least antagonistic in that belief to divine power, omnipotence and love, when properly understood.

I am much obliged to you for the kind way in which you have received my paper, and for Dr. Kidd's valuable illustration of the line I have adopted—also to those who dissent from me. If we all agreed, there would be no discussion at all. (Applause.)

The meeting then closed.

COMMUNICATIONS RECEIVED.

The Rev. F. A. WALKER, D.D., F.L.S., writes :—

In reference to Archdeacon Sinclair's paper, "On the Being of God," one cannot refrain from paying a well-deserved tribute to the deep spirit of devotion and reverence which breathes throughout, to the profoundness of thought by which it is characterized, to the wide research displayed by the author; and the knowledge which he exhibits of writers, sacred and profane, of prose as well as of poetry, of ancient as also of modern times. He has ably enlisted in his service quotations from the Pantheist and the Agnostic; he has fortified and established his arguments by adducing passages from philosophers who can hardly be regarded as upholders of Revelation. Of him, in fine, it may indeed be said that since, in the exercise of his sacred office, he became a dignitary of the cathedral church of our great city, in other words,

*Ἐπει Ἰροίης ἱερὸν πολέθρον ἔπερσεν
πολλῶν ἀνθρώπων νόον ἔργω.*

I note that Rev. c. iv, v. 11, is quoted, and in respect of the clause, "For Thy pleasure they are, and were created,"—probably a more literal, and at the same time more correct, rendering of the original Greek than the one given in our Authorized Version would be. "Through (or by reason of) Thy will they exist and were created." Certain superficial readers and students of Holy Writ may otherwise fall into the error of imagining that the words mean "They are created, and were created." It may be objected that few are likely to be guilty of such a transparent blunder, but if it should be made, it gives colour to the theory of what has been termed "the subsequent Creation," and which, I contend, can neither be proved from the pages of Scripture, nor by the researches of modern scientists. On the other hand, the accurate translation, "By reason of Thy will they exist," is simply tantamount in signification to the declaration of another Apostle on Areiopagus, "In Him we live, and move, and have our being." But further, in the words that immediately follow St. John, v. 17, is also quoted, "My Father worketh hitherto." Now the only logical interpretation possible of these words is that the work of

the First Person of the Trinity is constantly being carried on throughout the centuries until the coming of the Son of God upon earth, and until the day when the Son of God uttered these words. It is a manifestation of the ceaseless activity of the everlasting "I Am" with whom is no past, and with whom equally there is no future. It is, in fact, to speak with the utmost reverence, the absolute realization, in fact, of the end which Aristotle would have all votaries of true wisdom seek after, an *ἐνέργεια ἐν ᾧ παροῦσι*.

There have not been wanting those who contended that as Revelation in the historical period covered by Holy Writ was essentially progressive from Moriah to Sinai, from Sinai to Tabor, from Tabor to Calvary, so there was a Revelation in after centuries progressive also. That as from each successive mountain peak an ever-widening vista was disclosed to view of the glory of our God, and at the same time of the Divine counsel and purpose of redemption as its fulfilment drew nigh, so the men of a later age were in their turn in a position to add to the things written in this book.

There have not been wanting those who contended that as creation may possibly have taken æons of years to accomplish with all its right marvellous works, its manifold manifestations, and its elaborate organization, so also the creation of new organic forms of life is continued during the comparatively recent period of man's existence on earth. Now if this assertion cannot be disproved, it is, believe me, equally hard, and probably a great deal more difficult to substantiate. We are all agreed as to the truth of our Lord's own declaration, "My Father worketh hitherto." The point at issue is that we maintain that the passage refers to another work entirely distinct from that of Creation, and that the upholders of "subsequent creation" claim that the coming into being of hitherto unknown forms of life has been going on since, and is even continued now.

Let it be granted that an interval of unknown duration, and it may be too vast for finite minds to grasp, took place between that beginning when God created the heavens and the earth, and the day when the heavens and the earth were finished, and all the host of them. That in the light of one primæval morn there was "a little rift within the lute," and that henceforward from a tiny cavity in the tide-washed boulders the musical echo of the far-

off surge was heard, dashing down once more to be reunited to its native deep, and that in that tiny cavity a few spores of a very elementary species of lichen, one of the lowest forms of all vegetation, settled. Long succeeding years may have intervened before the decomposition of that lichen and the accompanying disintegration of the surrounding rock were continued for a sufficient time to allow of the herb yielding seed within itself to gain a foothold and maintain a local habitation there. Multitudinous centuries may have separated the appearance of the *Eucalyptus* from the development of the more complex and elaborate foliage of the oak, the beech, and such trees as are better calculated to afford shade and rest and refreshment to various products and later manifestations of organic life. I can credit that long (I cannot say how long) ages separated the glacial and thermal periods of our own land, the days when the rocks of Snowdon were grooved by the descending glacier, and of which I have seen the marks in the present day. I reverently believe that *finis coronat opus*, and that though God is Almighty to make such addition, no such addition has been made to the number of existing species since "God saw everything that He had made, and, behold, it was very good."

The Rev. R. C. OULTON, B.D., Rector of Glynn, writes:—

This paper by the Archdeacon of London is valuable as drawing attention to common ground between those who hold the orthodox belief and those who diverge from it. But it appears to me that one passage in the paper (p. 8, No. 5) is open to criticism. The passage runs thus: "When they say that the Infinite and Eternal Power that is manifested in every pulsation of the Universe is none other than the manifestation of the Living God, but that He is unknowable in the scientific sense of knowledge, we reply that such an answer is precisely what we expect to hear. It was the Son of God Himself who said that *no man hath seen God at any time*. To the eye of Faith alone He is visible."

Now, I cannot help thinking the Archdeacon's answer fails to meet the point of the agnostics' objection. That God is not level to the understanding—just what we believe—in a scientific sense, is, to my mind, not an assertion of our opponents. Rather their thesis is that there is *no personal* God, mysterious in His nature and attributes, "in the scientific sense." On the contrary we hold that there *is* such a personal God, though He is not cognizable by

the senses. The late Professor Tyndall in endeavouring to account for primal forms of matter, said that he supposed there was a "Thing" or Force in nature that would account for the origin of such forms. Thus it would appear that the question between us is not the mysteriousness of God, but His *personal existence at all* in "a scientific sense." With this solitary exception, I think the Archdeacon's paper a valuable one.

ORDINARY MEETING.*

SIR G. G. STOKES, LL.D., F.R.S., PRESIDENT, IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections took place :—

HON. CORRESPONDING MEMBER :—Professor R. Etheridge, F.R.S., F.G.S.

ASSOCIATES :—E. John Weightman, Esq., M.D., Lancashire ; Miss I. Alice Weightman.

The following paper was read by the Author :—

THE PHILOSOPHY OF EDUCATION. By A. T. SCHOFIELD, Esq., M.D. (Chairman, Executive Parents' National Educational Union.)

THE practical importance of the subject of this paper is, in the face of the increasing struggle for existence, beyond all dispute; but the difficulty of speaking on it is great, because one is compelled to use terms from which many English psychologists still shrink, and yet which most in some way or another are obliged tacitly to agree to. We refer to the unconscious faculties of the mind. Without actually insisting on the phrase that best expresses these, viz., the unconscious mind, there is no doubt that most advanced educationalists, amongst whom we include Herbert Spencer, Herbart, Pestalozzi, Froebel, J. P. Richter, Preyer, C. Mason, and many others, clearly recognize that the best and most efficacious form of child-training is that which is addressed to unconsciousness rather than to consciousness; in short, each and all admit, though most probably some would

* May 16th, 1898.

shrink from the words, that there are unconscious psychic powers, and that these can be educated; and not only so, but that it is on their proper education rather than on that addressed to consciousness that the most important part of the character of the individual depends. Dr. Carpenter, for example, says:—

“There are two sorts of influence: that which is active and voluntary and which we exert purposively; and that which is unconscious and flows from us unawares to ourselves. The influence we exert unconsciously will hardly ever disagree with our real character.”*

Of course education in the ordinary sense knows nothing of this. “For a long time the error prevailed that for a child’s first learning there was absolute necessity of a teacher, as if only complete thought could be impressed on the child’s brain, and that only by this means the mind would finally be developed in the right manner. *Herein lies a gross fallacy.*”† The fallacy is, in fact, that only the conscious mind is susceptible of education.

What is generally understood by early education and child-training is the guidance of the child consciously, by rules and commands and precepts (a fresh one, may be, each day) enforced by smacks and slaps and other penal measures many times a day, coupled with direct instruction in A, B, C, 1, 2, 3, and other forerunners of intellectual culture.

Herbert Spencer forcibly describes the prevailing ignorance and what ordinarily passes as parental education. “While it is seen that to gain a livelihood an elaborate preparation is needed, it appears to be thought that for the bringing up of children no preparation whatever is needed. Not an hour is spent by either a boy or girl in preparation for that gravest of all responsibilities—the management of a family. No rational plea can be put forward for leaving the act of Education out of our curriculum. The subject which involves all other subjects, and that in which education should culminate is the theory and practice of education. The management of children is lamentably bad. In most cases the treatment adopted on every occasion is that which the impulse of the moment prompts, and varies from hour to hour, as the feelings vary.”‡

* W. B. Carpenter, *Mental Physiology*, 4th edit., p. 542.

† Freyer, *Mental Development of Childhood*, p. 66.

‡ Herbert Spencer, *Education*, pp. 95, 96.

Conscious education has been varied in every conceivable way. There has been reading with tears, and reading without tears, nursery rule, drawing-room rule, schoolroom rule, but every fad and every variety has followed the same mistaken principle, namely: all education, all training worthy of the name, must address itself to the child's consciousness, *i.e.*, the conscious mind. And this is the tap root error of every such system.

Here the practical man intervenes with the pertinent question, "If this generally adopted system is so bad, so vicious and so pernicious, how is it we get as its result good children, good men, and good women with well developed and well balanced minds?"

At first sight this question seems conclusive in favour of the value and sufficiency, for all practical purposes, of conscious education.

But the true answer is that whether the parent likes it or no, whether the parent knows it or not, whether the parent helps it, hinders it, or ignores it, the education of the unconscious is ever going on; aye, and going on faster far than that of the conscious; and whatever the child subsequently turns out to be, will be far rather due to *this* than to all the direct efforts made by the parent.

All around the child lie countless forces, unnoticed and unknown by the parent, while within the child lies a vast receptive capacity, unknown to the parent, and still largely ignored by these psychologists who should be his teachers—the unconscious mind: and it is to the action of these unnoticed forces upon the ignored mind that the child's real early education and character is mainly due. And this proceeds through life, and indeed, is dimly perceived sooner or later by parents. Take, for instance, the value of a public school education. Does not every parent who has a son at Eton or Harrow well know that the greatest value to the boy is the unconscious education he receives, and not the lessons addressed to his conscious mind?

Here is the reason, then, why an untrained child, that is one whose conscious training has been neglected, grows up often so well. This has been a standing puzzle for ages. One parent adopts all the paraphernalia placed at her disposal for the artificial fashioning of her child's mind; the other lets the child run absolutely wild; and the result is often to make the former doubt the wisdom of her methods.

Now the secret is that, through good luck it may be rather than good care, the "wild" child has been cast amongst unnoticed forces, beneficial to its character, that have trained its unconscious mind and produced the better result of the two.

And this brings us to a further point in the education of the unconscious mind. It is *nature's education*, natural, and therefore divine, instead of artificial and thus human. This education is no invention of ours. All that is done here is to point out its existence and its importance, and indicate the methods by which the education may be guided into good and wise channels, instead of bad; always remembering that for good or ill, this education steadily proceeds all our lives, though pre-eminently in childhood.

"The soul (unconsciously) observes and reflects and assimilates the countless products of nature; and art which enter it. The result is formation of character, and all which we call life is impressed. The influences from without make a man what he is."*

"We are momentarily under the influence of outward events, which are registered within, and become, as it were, part of ourselves; being, indeed, factors in most of our feelings and motives."†

"The least valuable part of education is that which we owe to the schoolmaster (conscious); the most precious lessons are those which we learn out of school (unconscious)."‡

Let us not, however, think from this that direct teaching, instruction, and precept, too, have not their right and proper place, but it is indeed a far lower and humbler one than that generally imagined, and far indeed from occupying the exclusive place it has been given.

Three varieties of education are possible with regard to consciousness and unconsciousness: First, there is the ordinary education; the conscious instruction of the conscious; as, for example, in being taught the French language by a master and books. Secondly, there is the unconscious education of the conscious; or in other words, the education of the conscious through the unconscious. In this it is the unconscious mind that is primarily reached, but

* Dr. Jno. Pollock, *Book of Health*, p. 525.

† *Ibid.*, p. 524.

‡ Sir J. C. Browne, *Book of Health*, p. 345.

the education does not stop there, but is passed on by the unconscious into consciousness; as, for example, when French is imbibed from residence in France, without conscious effort or definite instruction, or as the French language is learnt by French children. The knowledge reaches consciousness, and the child in each case knows well it can speak French, only the process of education has been addressed in this case to the unconscious mind. Then, lastly, there is the education of the unconscious mind that does not pass on or rise into consciousness, but, as a rule, terminates there; such as, for instance, all those traits and characteristics that distinguish a child brought up in France from one brought up in England. Under this head, too, come motives, character, conscience, principles, intuitions, all of which have their home in unconsciousness.

On some of these we can, indeed, turn the bull's-eye of consciousness with an effort, but their *sphere* is in the unconscious; and the bringing up of them frequently into consciousness, by careful introspection, often leads to mental hypochondriasis; just as bringing the unconscious organic functions and actions into notice lead to physical hypochondriasis and hysteria. It is well to recognize there are two spheres or divisions of mind, which, to a certain extent, can be made to overlap, but which, nevertheless, have their distinctive properties and value—the springs, the foundations, roots, and principles of life, which lie rather in the Unconscious; the flowers and fruits and actions which lie in the Conscious.

Now, in thus speaking on education, we must, therefore, first distinguish broadly between conscious and unconscious education; and secondly, we can subdivide the latter—unconscious education—as we have seen, into that which eventually rises into consciousness in its results though not in the process, and that where both results and process are sub-conscious. We fully justify, however, the right to apply the term “education of the unconscious mind” to both these latter; and, therefore, to all education received unconsciously, whatever its ultimate fruits may be; and with this explanation shall continue to use all references and quotations referring to such training, as examples of the “education of the unconscious mind”; specially emphasizing, however, those particular processes which do not go further, but expend their whole force on developing this all-important part of our mental life.

The nett result, therefore, of what we have already stated is this : That the conscious education and training by which the greatest store is generally set, is not, after all, the training that is most determining the child's future. This is rather decided by the training and educating of the child's unconscious mind for good or evil that is going on at the same time entirely outside the parents' cognizance.

Now it is to this that we wish to direct especial attention, in order that what we mean by the phrase "the education of the unconscious mind" may be understood.

It is surely all-important, if our children are surrounded with these unnoticed powers, that we should know something of them, and of the laws by which they act ; and of the power we may have to direct them for good and not for evil in their unseen workings on our child's nature.

The object of this education is character rather than learning. Direct instruction, or book-learning as it is called, must be addressed to consciousness ; character in formative education is best carried out through the unconscious. As to character, "Children," Herbart says, "have very marked individuality without possessing character. Children are wanting in that which, above all, goes to make up character—that is Will. Willing determination take place in consciousness ; individuality, on the other hand, is unconscious."*

"In those early impressions of which no one seems to be conscious, least of all the child, and which gathers up power as the rolling avalanche, the elements are collected for future emotions, moods, etc., that make up a greater part of the history of the individual."†

"The strong individual struggles out of individuality into character, the weak lets himself slide out of the domain of the conscious to the unconscious."‡

The fruit, of course, of the education of the unconscious in us is only seen by ourselves by results in consciousness ; others, however, can see results of which we may be wholly unconscious.

One great point in favour of this unconscious education is that it does not interfere with the happiness of childlife, but increases it ; and this is no small matter. A house without sunshine lowers the whole physical health, and a home

* J. F. Herbart, *Science of Education*, 2nd edit., pp. 116, 117.

† Dr. L. Waldstein, *The Subconscious Self*, p. 47.

‡ J. F. Herbart, *Science of Education*, 2nd edit., pp. 116, 117.

without happiness lowers the whole psychical health. The awful effects of a miserable infancy and unhappy childhood are seen afterwards in the adult, who is like a plant which has been reared without sunshine. Happiness in the family is a *sine quâ non* for a mentally healthy child.

We do not require to create happiness in children, but only to see that we do not destroy it. The happiness of a child, in the first instance, is spontaneous, and is drawn largely from within (its own imagination); afterwards from without. In childhood the pains it suffers are mainly physical—few mental; while its pleasures are both physical and largely psychical; therefore, there is a far greater proportion of pleasure than pain in young as compared with adult life, where psychic pain forms the greater part. The balance of increasing pain seems to turn after puberty; when the child gets sadder, and more thoughtful.

“Due care being taken to elicit the benevolent sensibilities, it is the happiest children who will be the most sympathetic and unselfish.”*

“How common it is to meet with irritable minds that spring up in opposition to any calm statement of facts with a sort of instinctive resentment. Such a state of mind may often be traced to circumstances of early life that called forth the principle of self-defence, long before reason had been developed.”† In short, an unhappy childhood.

Bearing then, in considering our subject, these two great points in mind, that the object is the foundation of character and that the means must in no way interfere with that happiness which is the moral health of the child, let us see what general principle of unconscious mind education we can grasp from the teaching of Herbert Spencer.

Speaking of the value of unconscious education from surroundings, as compared with book instruction, he says:—

“Not perceiving the enormous value of that spontaneous education which goes on in early years, but perceiving that a child’s restless observation instead of being ignored or checked, should be diligently ministered to, and made as accurate and complete as possible, parents insist on occupying its eyes and thoughts with things that are for the time being incomprehensible and repugnant. They do not see that only when his acquaintance with the objects and pro-

* Isaac Taylor, *Home Education*, p. 39.

† *Ibid.*, p. 42.

cesses of the household, the streets and the fields is becoming totally exhausted, only then shall a child be introduced to new sources of information which books supply.”*

Anyone reading the above condensed passage will see that the self-education which H. Spencer here commends is largely, and in its earlier stages, acquired wholly unconsciously.

Now let us see the results of a perverted or bad education of the unconscious from the same author: “What kind of moral culture is to be expected from a mother who shakes her infant because it will not take its food? How much sense of justice is likely to be instilled by a father, who, hearing his child scream because its finger is jammed between the window sash and the sill, begins to beat it?”

“Who has not seen a child repeatedly slapped by nurse or parent for a fretfulness arising from bodily derangement? Are not the constant and often quite needless thwartings that the young experience—the injunctions to sit still, which an active child cannot obey without suffering great nervous irritation, the command not to look out of the window when travelling, etc., signs of a terrible lack of sympathy?”†

There are few of us but could extend these instances almost indefinitely; but enough have been given to show what is meant by the bad education of the unconscious mind. Here the education is given to the child probably unconsciously by the parent, and certainly the evil is absorbed unconsciously by the child; and when, in later years, it turns out a tyrant or a bully, there are few who will see that the source of this developed character is this early mal-education of the unconscious mind. And yet so it is.

Is there, then, to be no discipline in education? Certainly there is; but not where not needed, and not capricious and arbitrary in its character. What it should be we will speak of further on.

Having thus surveyed the ground generally, let us consider what are the true methods of unconscious education. Matthew Arnold himself, perhaps, hardly knew when he framed the sentence, “Education is an atmosphere, a discipline, a life,” how much it contained. To us its essential value is that it points out the true methods and principles of the education of the unconscious mind. An “atmosphere”

* Herbert Spencer, *Education*, p. 26.

† *Ibid.*, p. 98.

and a "life" are, at any rate, forces that act unconsciously, and, as we shall point out, that "discipline" does the same; indeed, it is automatic in its action.

We have, as we have seen, to educate the infant, to form its character, to mould its disposition, to develop its brain, and instruct its senses, until the results emerge into full consciousness, the infant's mind and brain being already filled with hereditary tendencies and paths.

"The enormous practical importance of directing the pre-conscious activity through the physical nature may be admitted and systematically acted on; especially in that very earliest stage of infant education, which lays the foundation and moral habits of conscious life."*

"Darwin considered the influence of education as compared with that of heredity as infinitesimal."†

Herbert Spencer, on the other hand, and far more truly, regarded it as almost all-powerful; but then, when he said "A man resembles far more the company he keeps than that from which he descended," he was bringing in the forces of unconscious education, whereas Darwin speaks, I think, only of conscious education.

It is true that the latter, consisting of direct precepts, etc., is not so powerful as the forces of heredity. When we consider that these have their home in the unconscious mind, it is obvious that an education that will drive them out or overcome them must be addressed to unconsciousness.

Even when we consider that the physical structure of the brain is laid down according to inherited tendencies, we still say education is stronger; for we well know the education of the unconscious mind we advocate is all-powerful to change, and modify this very structure in the direction wished for.

Curiously enough, Sir Michael Foster, with a poesy that is somewhat out of place in dealing with physiology, in his address to the British Medical Association,‡ attributes all these mental powers to physiology herself, who here obviously stands for "the Unconscious Mind." "When physiology is dealing with those parts of the body which we call muscular, vascular, glandular tissues, and the like, rightly handled, *she (sic)* points out the way, not only to mend that

* W. B. Carpenter, *Mental Physiology*, 4th edit., p. 353.

† W. Preyer, *Mental Education of Childhood*, p. 164.

‡ Sir Michael Foster, *British Medical Journal*, Aug. 21, 1897.

which is hurt, to repair the damages of bad usage and disease, but so to train the growing tissues, and to guide the grown ones as that the best use may be made of them for the purposes of life. She not only heals, she governs and educates." Surely the poetic spirit could not idealize a science further; with the effect, however, for those who do not turn it into prose, that the real agent—the unconscious mind—is unrecognized.

"Nor," he continues, "does *she* do otherwise when *she* comes to deal with the nervous tissues. Nay, it is the very prerogative of these nervous tissues, that their life is above that of all the other tissues, contingent on the environment and susceptibility of education."

To return to Arnold. "Education is an atmosphere"—what the mind breathes. The air that we breathe is the medium that surrounds us; the atmosphere our spirits breathe is the medium that surround them; in short, it is our environment.

The surroundings of a man are those influences, material or immaterial, which *form the atmosphere* in which he lives; which gives colour to his daily life; and, often themselves unseen, are present with him for good or evil throughout the whole term of his existence. They affect and alter his nature and his happiness.*

A little child is fluid, plastic, receptive. There are two ways of imprinting upon him the shape and outlines you desire as the result of your education. The one a conscious and perceptual, the other unconscious and atmospheric. If I wish to cast a bronze statue, I do not trouble about the bronze; all my care is about the mould. Every line, every curve I wish to see on the statue must be traced *there*, and it is on the perfection of the mould that the beauty of the statue depends. I pour in the liquid bronze. The mould is its environment. Left in there long enough it fills every curve, every line, and reproduces all its features. I break the mould, and there is the statue—the outcome of its surroundings. Again, I wish to mould the child. Education is an *atmosphere*, an environment—that is, an education of the unconscious mind. This then is my first great educational force; and this shall overcome the lines of hereditary evil or defect. I spend all my time in perfecting my mould; in other words, in seeing that the child's surroundings are

* Dr. Jas. Pollock *Book of Health*, pp. 519, 520.

exactly what I wish the child to become. Then I pour the child in, and let him remain a sufficient time until environment has saturated his unconscious mind, and moulded it into its likeness. The child knows nothing of the process. It does not interfere with its happiness, but increases it; and best of all, the result is sure. A child cannot fail to bear the stamp of the atmosphere its mind has unconsciously breathed the first few years of its life, and it is this, and nothing less, that is the real foundation of its character. What a power—what an unknown force is here!

“Life and health are largely acted on (unconsciously) by agents immaterial or psychical. The lives and well-being of natures and individuals owe their colouring to these. They belong to and form part of civilization. They are essential parts of the education from which spring the character.”*

“The schoolmaster, it might with some justice be said, only gives the finishing touches to a process commenced at the moment of birth, if not much earlier. Vast stores of knowledge indispensable and of paramount importance are picked up spontaneously (unconsciously) in babyhood.”†

“Educational experience proves that nothing exerts so great an influence on the psychical organism as the moral atmosphere which is breathed by it. The composition of that atmosphere is of fundamental importance.”‡

But observe, if we had only conscious minds, this force would be useless—there would be nothing to act on in us; for it can only work on unconscious material. The thought, the emotions, and the will are all formed largely thus; for the will itself can be unconscious as well as conscious. We read of “automatic, passive, instructive, and imitative willing.”§

Again, “education is a discipline.” An engine differs from a horse in that it is subject to discipline. It can only run on its rails; it cannot wander like a horse—at will. The laying down of the railroad is the discipline which determines the path the engine must travel. Habit is the railroad of character. “Habit is as strong as ten natures,” and

* Dr. Jas. Pollock, *Book of Health*, p. 520.

† Sir J. C. Browne, *Book of Health*, p. 345.

‡ W. B. Carpenter, *Mental Physiology*, 4th edit., p. 353.

§ Prof. Holman, *Education*, pp. 79, 80.

nature means heredity. Here again, therefore, we have another power in education to overcome inherited evil. If environment is the mould in which the mind may be cast, habit is the track along which it has to travel. Sow an act, reap a habit; sow a habit, reap a character; sow a character, reap a destiny.

Observe again, habit is unconscious education. You say "Do this or that," and you address consciousness; with the usual result that when your back is turned, the thing is not done, and there is continual friction and punishment. You form the habit in the unconscious mind of doing this or that, and, lo and behold, you have laid down a track along which the mind finds it easier and smoother to move than in any other direction; you have provided a physiological basis for the psychic action; henceforth all is easy.

Habit, therefore, is the second great force that acts on and educates the unconscious mind.

The third and last is "Education is a life." We do not know exactly what Matthew Arnold originally meant by this. Probably that education was a vital force. We take it here in another way. Just as the "atmosphere" is the environment or mould, as "discipline" is the habit or railroad, so "life" is the inspiration or ideal before the child.

The atmosphere moulds the mind, the discipline directs its course, and the life before it is its goal and ideal. By the life we mean the parents' life, not the child's. It is the parent that is the child's unconscious (sometimes conscious) ideal, the child's inspirer and model. "The unconscious action of example shapes those feelings which give the tone to the character."*

We have, therefore, in the education of the unconscious, to consider these three things: the moulding or forming of the mind by environment; the action of the mind as disciplined by habit; and lastly, looking on the mind as a living entity—the goal or ideal *before* it rather than *around* it.

And now, leaving our three-fold text we would like, before finally saying good-bye to our subject, to give one or two hints respecting education more or less conscious; and the way in which the unconscious mind may be formed through the conscious.

Herbert Spencer remarks, "We are on the highway towards the doctrine long ago enunciated by Pestalozzi, that

* W. B. Carpenter, *Mental Physiology*, 4th edit., p. 353

education must conform to the natural process of mental evolution. In education we are finding that success is to be achieved only by making our measures subservient to that spontaneous unfolding which all minds go through in their progress to maturity.”*

Froebel's system was a happy combination of the education of the conscious and the unconscious minds, and he also followed clearly the natural course of mental evolution. The unconscious mind can clearly be educated through consciousness. Unconscious apperception can be implanted and learnt by conscious training. The difference in result between the training of the conscious and unconscious in after life is worth noting. A man whose consciousness is better trained than his unconscious mind will only betray bad manners when off guard; his conscious actions will be superior to his instincts, as we say he will appear better than he is; while, on the other hand, a man whose unconscious mind has been thoroughly trained and educated, will have better instincts than conscious actions, and he will be at his best when most unconscious. We all know these two types, and can clearly see the difference between the results of training the Conscious and Unconscious.

Schools, as a rule, train the former, home the latter. The principle of the infant school—most knowledge in shortest time, at cheapest rate—should never be imitated in the nursery.

The guiding principle in all training is not to develop or excite faculties, but to feed them, delaying their display; always thus training for remote and not for immediate results; and, above all, not over-training; for this is one of the great practical results of recognizing the powers of the unconscious mind; that we see at once, if we have a certain sum total of mental force at our disposal, and if our unconscious mind requires a large amount for governing and directing the growth of the body, unless this is supplied, body growth cannot proceed, whatever amount of food may be taken.

This gives the reason why, when all the mental force is used in direct education, and over-pressure ensues, physical growth is stunted or arrested.

Fortunately now, there is increasing conformity in the

* Herbert Spencer, *Education*, pp. 58-59.

artificial education of the conscious, to the earlier natural education of the unconscious.

It must not be imagined, however, that this latter education ceases when school lessons begin. On the contrary, the unconscious mind is being educated all through. Knowledge has been divided into practical (which is unconscious) and rational (which is conscious), and these two go on together.

And now a hint as to details.

The true order of conscious education is "From the known to the unknown; from the simple to the complex; from the concrete to the abstract,"* and if this order were carefully observed in all studies from learning to read, to the study of Christianity and the Bible, fewer blunders would be made, and far more satisfactory results would be obtained.

Discrimination and exact observation by contrast and comparison through the senses should be carefully taught; and all sensations should be cultivated to the last extent by discrimination. The difficulty here, as Preyer has remarked, is that there is a "great want of discriminating terms in tastes, smells, touch: while colours and sounds are well supplied"† with descriptive words. Of course, words alone can do little: no words can teach the difference between red and green; nevertheless, sense discrimination cannot be carried far without words to register its discoveries.

Again, it is as well to get the knowledge into the brain through as many channels as possible. Hence, hearing a subject as well as reading it is a great help; and the former is often the greater educator.

"As a test of the ear and eye impressions received by reading '*As You Like It*,' it was found that when read aloud to the class by the master, they repeated it intelligently and understood the characters described; when, however, the boys were left to learn the task without hearing it read they failed to appreciate its meaning. Good aural impressions produced a mental appreciation which sight of the page failed to effect."‡

* Prof. Holman, *Introduction to Education*, p. 221.

† W. Preyer, *Mental Education of Childhood*, p. 12.

‡ R. P. Hollek, *Education of the Central Nervous System*, 1896. Of course the reason of the above is obviously that in hearing we have Shakespeare's thoughts interpreted through another brain to ours; whereas in reading we have them presented through the unintelligent medium of printed characters.

Attention is most important in education, and it is found that three-quarters of an hour at a time is the longest period at which it can be fully maintained. This, therefore, should be the extent of any one lesson requiring close attention.

Attention directed to any subject may be voluntary (conscious) or involuntary (unconscious). We can fix our attention by an effort which is sometimes very great; and a time may come when the strongest volition can no longer resist the other distractions or the sense of fatigue. In children fixed attention is almost impossible, unless it be involuntary (unconscious), the power of the will being as yet so slight. Children punished for not attending are often punished for what they can't help by effort; whereas a suggestion directing their thoughts automatically would at once succeed. In short, it is easier to secure unconscious than conscious attention.

The mind should be well grounded in nature before it studies art. Natural theology is the impression of the Divine Mind in nature, and should precede doctrinal theology, on the principle we have already given—the concrete before the abstract.

Science, moreover, and natural theology go hand-in-hand. "True science and true religion are twin sisters, and the separation of either from the other is sure to be the death of both. Science prospers exactly in proportion as it is religious. . . . The great deeds of philosophers have been less the fruit of their intellect than of the direction of that intellect by an eminently religious tone of mind."*

As a rule, emotions should be cultivated first and the intellect afterwards. "Do" and not "don't" should be the watchword, and punishments should not be arbitrary, but in the relations of cause and effect. "What a man sows that shall he also reap." And as a last word on the whole subject of child training we cannot do better than direct attention to the profound force of the threefold maxim of Holy Writ, "Offend not—despise not—hinder not, one of these little ones."

* Prof. Huxley, quoted by Herbert Spencer, *Education*, p. 45.

DISCUSSION.

The PRESIDENT.—You have already expressed your thanks, by your applause, to the author for his paper on this subject. I will now invite remarks or questions from any of the audience.

The Rev. A. K. CHERILL, M.A.—I am doubly interested in the subject of this paper—both as a parent and as a schoolmaster; and in both capacities I desire to thank Dr. Schofield for calling attention in so interesting a manner to an aspect of the question, which, as he very justly says, is too often neglected; and as a schoolmaster I specially thank him for his paper; for I conclude, from the position which he holds as Chairman of the Executive Parents' Educational Union, he may be regarded as an authority on the subject of education from the parents' point of view, and it is most useful for a schoolmaster to know this. But on a subject of such difficulty, in which terms of somewhat doubtful significance have to be used—"terms," as we are told—"from which many English psychologists still shrink," though they are obliged in some way or other to accept them, I should have been glad if we could have had a more precise definition of what we are to understand by the "education of the unconscious." We are told there are unconscious psychic powers and that those powers can be educated, and Dr. Carpenter is quoted in illustration. "There are two sorts of influence—that which is active and voluntary, and that which is unconscious and flows from us unawares to ourselves." But surely this influence or power which flows from us is not the psychic power which is being educated in a child, but the power is the teacher's who educates.

It would be very interesting and instructive to trace and illustrate the effect of this unconscious influence in education. Yet from the point of view of a practical educator, there does not seem to be very much to be said about it; for as the influence is, by hypothesis, unconscious, it cannot be consciously used, and therefore the teacher cannot be taught how to use it. But undoubtedly there is an unconscious mind in a child which can be educated and the child receives very much valuable education of which he himself is more or less unconscious. I think,

however, a distinction might here be drawn with advantage. There are some influences of which the child may be altogether unconscious—others of which he is conscious as to their external effects, but he is unconscious of the influences they are exerting on himself; and, I suppose, we might find all degrees and gradations between complete consciousness and complete unconsciousness. But if there are unconscious influences for good, it must surely be admitted that there are also unconscious influences for evil; and therefore I cannot agree with the statement that if one parent adopts all the means “at her disposal for the artificial fashioning of her child’s mind, and another lets the child run absolutely wild, that the result is often to make the former doubt the wisdom of her methods.” It may be that sometimes when a child is allowed to run wild, by a happy accident good influences will predominate; but in the majority of cases the reverse would be the result. As far as my own experience goes, the result of leaving a child to run wild before he has any conscious power of his own to refuse the evil and to choose the good, is simply disastrous.

Nor can I agree with the next point—that “the education of the unconscious mind is *nature’s education*, natural and therefore divine, instead of artificial and thus human”—or at least, I must protest against the idea that seems to be implied that what is human is less divine than what is merely natural; for surely what is truly human is at once the highest and most divine thing in nature, and the conscious powers of man are higher and more divine than his unconscious powers. And what can I say as a schoolmaster to the dictum that “the least valuable part of education is that which we owe to the schoolmaster, and the most precious lessons are those which we learn out of school”? Now of course if we give the widest meaning to the term “education,” so as to make it include the discipline of life with all its efforts and failures, its hopes, fears, joys, and sorrows, it is then a mere truism to say that this is a far greater thing than school education; but taking education in the narrower sense in which the term is generally used, is it true to say that what we owe to the school or schoolmaster is only or even chiefly the conscious training of the intellect? I think not. I perfectly agree with what Dr. Schofield says—that “every parent who has a son at Eton or Harrow, well knows that the greatest value to the boy is the

unconscious education he receives," and with the quotation from Matthew Arnold that "education is an atmosphere, a discipline, a life." But what Matthew Arnold said, Dr. Arnold, the school-master, laboured to realize in fact.

The Rev. F. A. WALKER, D.D.—I should like, in the first place, to echo the words of the last speaker with regard to the great indebtedness we are all under to Dr. Schofield for his most able and instructive paper.

We read in the paper that "Darwin considered the influence of education, as compared with that of heredity, as infinitesimal." I think that had a good deal to do, perhaps, with the scope of Darwin's own studies. His studies of heredity were extended to a great many objects of the lower orders of creation, generation after generation, breeding them, rearing them and experimenting and comparing and registering the results. Then I think we ought not to lose sight of the fact that heredity in human nature is no doubt an important factor for good or evil—more so than in the lower creation—and more really and truly exists. But we are not in a position to observe heredity, as regards our own fellow creatures in the same way that we can note its existence in the lower orders. For example, the ordinary duration of life of most of the lower orders of creation is far less than that of ordinary human beings. With a good reliable pedigree of an animal or bird we can see, for many generations, if it keeps up its character, or harks back on some defect or varied tint, to a remote ancestor, or if the colourings or markings are correct and so forth every year. In insect life we can see how true that adage is that "the child is the father of the man." Heredity in the human is not a thing that "he who runs may read." It cannot be read of all men. It is perfectly true that eccentric peculiarity may not only be inherited by the son from the father, but it may begin to show itself at precisely the same period of life at which the father commenced this eccentricity or mannerism—perhaps at the age of 35, and so it may develop in any particular individual in the case of any particular habit or any mental or moral proclivity. It is very curious how it often begins at exactly the same period of life in the son as it does in the father.

The Rev. Canon R. B. GIRDLESTONE, M.A.—So far as I can gather from Dr. Schofield's paper the teacher and the taught have this psychic or unconscious gift or faculty, or series of

faculties, and so far as I can judge what the teacher teaches unconsciously the learner learns unconsciously; and what the teacher teaches consciously the learner learns consciously. I suppose we might lay that down as a general rule, and that that would be one of the lessons that Dr. Schofield would give us.

Now if that is the case, and if it is the case, as he says, and I believe rightly, that the unconscious part is the most important and most vital and most influential and most permanent, then the question comes, how can we improve our unconscious teaching? If it is the fact that we are teaching, unconsciously, the greatest things then how can we improve our unconscious teaching? There seem to me to be two possible answers. The first is we must set to work and improve our own characters as fast as we can, for our unconscious teaching is rather what we do than what we say. Secondly, before a teacher or parent feels he can do anything, he must surround the child with that companionship which we believe in our hearts to be most effective in this unconscious direction. Those two seem to be possible lessons of a practical kind which we should learn from this part of the subject. But I think it would be very desirable that we should get a clear idea as to the two dominions of the human soul—the conscious and the unconscious.

With regard to the schoolmasters, I do not wonder that schoolmasters receive a shock on page 4 of this paper; but parents, also, have received a shock. We are told that “the least valuable part of education is that which we owe to the schoolmaster (conscious).” We pay dearly for it, and I feel it keenly, and I hope this little sentence will go the round of schoolmasters at public schools and reduce parents’ bills by at least one-half, and I hope it will be done rapidly before I am out of the reach of such a benefit. But I quite agree with my friend here, who spoke as representing the scholastic element—that a great deal of our education is *at* school though not *in* school.

The whole subject we are discussing to-day is clearly the border of a great subject set forth in the Bible. I mean the spiritual side of human nature, and the fact that the human spirit is under an influence higher than its own—an influence which we shall specially think of in Whitsun week—I mean the influence of the Spirit of God Himself, and this may be fairly regarded as

one of the greatest elements—or in fact the greatest element in the training of the unconscious. (Applause.)

Professor ORCHARD.—While acknowledging the ability and the interesting character of Dr. Schofield's paper, I am bound to say I think he has not only given a shock to schoolmasters and parents, but that he has also given a shock to psychologists. To understand that unconsciousness can by any means pass into consciousness, the author should at least have brought forward some kind of proof.

I have endeavoured to make out in what sense he used this term "unconscious," for certainly there was never said a truer thing than that the gap between the unconscious and the conscious is absolutely impassable. Possibly, and probably, Dr. Schofield means something by "unconscious" different from that to which we, who study in a psychological direction, are accustomed to suppose.

The AUTHOR having replied, and having received the thanks of the meeting for his communication, the proceedings terminated.

N.B.—The EDITOR regrets that want of space does not permit the insertion of communications sent by Colonel Alves, Dr. Biddle, Principal Teague of Penzance Collegiate School, and the Rev. Dr. Moule, now Bishop of Liverpool. The same cause has necessitated considerable abridgment in the discussion.

ORDINARY MEETING.*

SIR G. G. STOKES, BART., F.R.S., PRESIDENT,
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following paper was read :—

ETHICS AND RELIGION. By the Rev. Prebendary
WACE, D.D.

THE purpose of this paper is to offer a few materials for consideration in reference to what was correctly described by your Secretary, in a preliminary announcement of my subject, as "An aspect of modern thought." That aspect is the view which is taken by a considerable body of earnest men of the possibility and the desirableness of treating ethics apart from religion. A number of "Ethical Societies," as they designate themselves, have of late years come into existence, which are based upon this conception. An account of them has been given in an interesting volume published this year, entitled *Ethics and Religion*, which is said on the title-page to be "edited by the Society of Ethical Propagandists." The volume consists of Essays by several persons of distinction in the sphere of moral philosophy and literature, such as Sir John Seeley, Professor Sidgwick, and Mr. Leslie Stephen, and it may therefore be regarded as a trustworthy, and even authoritative, exposition of the views in question. In this volume (on p. 72) a statement is put forward as "intended to define the attitude of the ethical movement towards Religion." It has, we are told, never been "passed upon by the Societies, and should not be understood as in the nature of a formal declaration; but it expresses the views of the present lecturers of the

* Monday, May 21st., 1900.

American Ethical Societies." This statement explains that there are two senses in which the word "Religion" is commonly used. "In the one sense it describes a passionate devotion to a supreme cause. In the other sense it is applied to affirmations concerning the connection between man's being and the Universal Being." The ethical movement, then, is said to be a religious movement in the former sense, but not in the latter. "In regard to the connection between man's being and the Universal Being, dissent among members and lecturers of ethical societies is admissible; hence the ethical movement as such is not a religious movement in the latter sense." Lecturers and members of the Societies "are free to hold and to express on the Sunday platform theistic, agnostic, or other philosophical beliefs. But they shall clearly indicate that these beliefs do not characterize the movement." Lecturers are expected to possess a sure conviction of the cardinal truth of the supremacy of the moral end, but they are not even required to express a belief that the moral end is the supreme end of human existence. "For though the supremacy of the moral end is implied in the very nature of morality, it is not to be expected that this implication shall be clear to all whose interest is serious and capable of further development." Accordingly several of the Essays urge this general ethical purpose as supplying the basis of a new fellowship. One is on the "Freedom of Ethical Fellowship," another on "The Ethical bond of Union." It is the aim of the Ethical Societies, says one lecturer (p. 32) . . . to unite "men of diverse opinions and beliefs in the common endeavour to explore the field of duty; to gain clearer perceptions of right and wrong; to study with thorough-going zeal the practical problems of social, political, and individual ethics, and to embody the new insight in individual institutions."

Now such efforts, with which much sympathy must be felt, are necessarily based upon the supposition, which is elsewhere explicitly stated, that ethical questions can be adequately treated without reference to any religious belief. The concluding lecture commences, for instance, with the following three propositions, which the lecturer says are made or implied "in the reports or manifestoes of all Societies for Ethical Culture, so far as I know." They are as follows:—

"1. Character and conduct are the most important factors in life.

“2. These are independent of a man’s religious and theological beliefs.

“3. Material resources, political changes, social institutions, are valuable only so far as they contribute to the moral well-being of the community.”

Of these propositions it would seem that the second ought to come first; for if character and conduct are not independent of a man’s religious and theological beliefs, those beliefs may after all be the most important factors in life, and the value of institutions may to some extent be directly dependent on their promotion of such beliefs. But in any case it is evident that the key to the whole problem discussed in the book, and involved in the position of the Ethical Societies, lies in the question whether ethical and theological principles can properly be separated, so that ethics can be satisfactorily treated apart from theology. Of course, this question is raised from motives which deserve great respect and sympathy, and which are of immediate practical consequence. As the case is put with touching force by one of the lecturers (p. 59):—

“To many of those who have joined the Ethical Societies, this gospel of Righteousness has become a veritable salvation. There was a time when their life seemed utterly dark and desolate. Through no fault of their own, the faith which had been transmitted to them at their mother’s knee had become uncertain; corroding doubt had attacked their most cherished beliefs; and, in the bitterness and anguish of the inner struggle which they underwent, it seemed to them that the world was emptied of all that is most sacred, and that life was robbed of all that gave it worth and meaning. But, as a star in the night, there rose above their heads the star of duty, and, as the dawn of day, there came into their hearts the conviction that, whatever else might go, something infinitely precious and sacred remains, something which they could not lose. They felt that the distinction between the better and the baser life remains, and that they could lead the better life if they only would, and that even in the attempt to do so there is inspiration and support and solace. Though the waters of scepticism might sweep away the whole superstructure of religious belief, the Rock of Righteousness remained upon which they could build up their lives anew.”

Deep homage is due to the spirit which is expressed in such statements, or rather such confessions, as this; and it

will be honoured by none more than by those who are convinced that the attempt to treat religion and morality separately is equally disastrous to both. If a man loses his hold of religious belief, let him by all means cling to his convictions of morality. They are the only means by which his religious belief can be recovered; and they may at least save him from shipwreck. But it is no disparagement to them to consider whether in the long run, and on a large scale, they can be maintained, or whether they can be rendered duly effective, without the support and guidance of religious belief; and this is the sole point on which the suggestions of this paper are respectfully offered for consideration.

Let it then, in the first place, be distinctly understood that no suggestion is here made, such as is sometimes deprecated in these lectures, that morality is destitute of all support if religious beliefs are withdrawn from it. The example of the great ethical teachers of Greece and Rome, and of the East, is sufficient to exhibit the unreasonableness and injustice of such a supposition. Some of the most vital principles of the moral law—such as the golden rule, of doing as you would be done by—are so deeply embedded in human nature as to be universally acknowledged as a general rule of action. The principle on which one of the lecturers in this volume lays such stress—"that duty binds a man"—is not less generally acknowledged. Conscience, and the sense of the supremacy of conscience, have been shown by Bishop Butler to be part of the true nature of man, and they assert themselves by the mere force of nature. The appeal to the obligation of "whatsoever things are just, whatsoever things are true, whatsoever things are lovely, whatsoever things are of good report," comes home to the heart whatever a man's religious beliefs may be. The promoters of the ethical movement hold a position in that respect from which no friend of religion would wish to dislodge them. But it is in no way inconsistent with respect for that position to inquire whether the true interests of ethics do not require an advance beyond it—whether, in short, it is not a position enforced upon those who rest in it by a temporary necessity, and not one to be adopted as the permanent citadel of ethical forces. The view which the following considerations would endeavour to recall is first that the ultimate foundation of Ethics must, in great measure, be sought, not so much in

religion as in revelation, and secondly that their highest and final development is inseparable from the truths of the Christian religion.

On the former of these points, let us first inquire how the general standard which this ethical movement has in view came to be discerned. Its great object is to promote the good life; the star they follow is that of righteousness. The gospel which they preach," we are told (p. 57), "is essentially this, that the good life is preferable to all without the previous acceptance of any creed, irrespective of religious opinion or philosophic theory; that the way of righteousness is open, and can be entered directly without a previous detour through the land of faith or philosophy." But what is a good life, and what is the righteousness here contemplated? It will not, I think, be questioned that, generally speaking, the good life which all these Societies have in view is that which is recognized as the ideal in modern civilization—generally speaking, the ideal of a Christian gentleman.

It must be from this point of view that Sir John Seeley, in the opening lecture of the volume (p. 26), advises the Society he addresses to "enter once for all into the heartiest and most unreserved alliance with Christianity," and says (p. 30) that "After all Christianity is the original Ethical Society. It has the ancient tradition and store of precedents, it has the ubiquitous organization, it has the unapproachable classical literature; it has the long line of prophets and saints. We are all, morally, its children, and most of us are not even its grown up children." A similar recognition of the ethical standard of Christianity, and a similarly generous recognition of the ethical services of the Christian Church pervades all the Essays, with perhaps one exception. "A good life" and a true ethical standard is, in short, in the main the Christian life and the Christian standard, though no doubt these writers and societies reserve the right of questioning and modifying it in detail. But taking it on the whole as indicating the ideal in view, it is pertinent to make some inquiries respecting it.

How was it originally called into existence, and how has it since been maintained? There can, I think, be no question that it was called into existence by the authority of Christ and His Apostles. The primary moral principles of Christianity were asserted, no doubt, by the Jewish Church; and deep and noble moral truths and ideals had grown up under

the influence of the best Greek and Roman Philosophy, particularly under Stoicism. But neither in a Jewish prophet, nor in a Stoic philosopher, will you find that specific ideal which is presented by the Christian life. The reason is a simple one. The Christian family did not exist, and it is from the Christian family life that the specific Christian ideal arises. It is Christian family life which has made the position of women in our civilization; it is the position of women, in its action and reaction upon the other elements of social life, which in great measure involves the specific characteristic of our ethical ideal. It is the Christian family life, and the position held by women which, in great measure, maintains among us the principle of charity in all our relations, and thus softens the action of every other motive.

Now to what is the Christian family life due? Can there be a doubt that it is entirely dependent on the Christian marriage law, as laid down by Christ and by the Apostles, and rigidly enforced in the early Church? It is true, our Lord expressly says that that law is involved in the primary constitution of mankind, and no doubt so far as it is adopted and acted on, its harmony with that constitution is more and more deeply felt. Men and women who have lived up to that law appreciate its unison with their best instincts, and its tendency to develop all the higher capacities of their nature. They realize that it is essential to the "good life" and to the "righteousness," which the Ethical Societies recognize as their aim and as the source of their inspiration. But how could its excellence in this respect be realized until it was put in practice, and how, as a matter of fact, did it come to be put in practice but under the authoritative revelation and command of our Lord? It is evident in St. Paul's Epistles that this Christian law of the relation between the sexes had to be enforced by the severest exertion of Apostolic authority, and similar authority had to be exerted in order to maintain it in subsequent ages. It might be thought that the relation of the sexes in the ancient Germans, as described by Tacitus, affords evidence that the law has a strong hold on uncorrupted human nature. But, a few centuries after Tacitus, it was among some of those Teutonic races that the Church had the most difficult struggle in maintaining that law, and it is difficult to see how it could at any time since then have been effectively upheld without the authoritative sanction of the Christian revelation.

Is there not too much ground for apprehension with

respect to its due observance, if deprived of that support, in modern civilization? Forces sufficiently dangerous are undermining its observance among ourselves, and the statistics as to the relation of the sexes in some parts of the continent exhibit a widespread revolt against it. Now the difficulty in this case arises from the fact that many of those who break away from this law do not recognize that they are violating any principle of righteousness. They do not regard the Christian law on this subject as a just one, and they make a boast of breaking through it. They say that a freer system is in conformity with nature, and they are determined at all events to try the experiment. On the principles of the Ethical Societies, who is to say them nay? The only rule recognized according to the principles of such societies is harmony with the higher dictates of nature; but who is to determine what those dictates are? Mr. Leslie Stephen, in the essay he contributes to this volume on *The Aims of Ethical Societies*, says (pp. 262-266) that "it is naturally our opinion that we should promote all thorough discussion of great ethical problems in a spirit and by methods which are independent of the orthodox dogmas" . . . "We must abandon much of the old guidance. . . . We must question everything, and be prepared to modify or abandon whatever is untenable. We must be scientific in spirit, in so far as we must trust nothing but a thorough and systematic investigation of facts, however the facts may be interpreted." What, on these principles, is to prevent well meaning people—people who would say that they want to lead a "good life"—from saying that they question the Christian law of marriage, and wish to experiment on the Mahommedan law? If I mistake not, this is no more than has been actually said and done.

It will also be obvious, from the latter consideration, that a much wider problem is raised by this simple and everyday difficulty. If, indeed, it were allowed that the Mahommedan civilization is in this point as deserving of respect as our own, the dilemma would arise that a man in pursuit of the good life might legitimately act on either the Mahommedan or the Christian law of marriage, except as far as other and collateral reasons restrained him. But if it be recognized that the Mahommedan law is inconsistent with the best moral development of human nature, by what arguments is a Mahommedan to be persuaded to abandon it? In his view, no such inconsistency exists. An appeal to his higher

instincts on the subject is necessarily ineffectual, for he has a rooted conviction that his own system is most in harmony with those instincts. It may well be doubted whether, if you have no other argument to press upon him, than that it is worth his while to make the experiment of a new system, you have any right to disturb his allegiance to his existing social order. If, however, you can press upon him an authoritative command and revelation, you are then in a justifiable position, and you are offering him an adequate guarantee that he will be right in deserting the law of his race, and of his ancestors. As a matter of fact, nothing less than that conviction established the Christian law on the subject, and nothing less can be expected to maintain it, in conflict with the passions of human nature. There are some moral laws, such as the golden rule, on which, as Hooker says, all nations of the world are agreed. But the true law of the relation of the sexes is not one of them. Take the world as a whole, and it does not prevail except under the authority of the Christian revelation. By that authoritative revelation it was established, and on that law its effective force must always to a great extent depend.

We may observe that on this vital subject—a subject of the most intimate importance to the welfare of human nature—we find ourselves exactly in the position in which human nature is depicted in the earliest of our sacred books. Human nature is laid under a certain prohibition, by an authoritative declaration, and is left to develop its life and its capacities with perfect freedom, subject only to that restriction. “Of every tree of the garden thou mayest freely eat: but of the tree of the knowledge of good and evil, thou shalt not eat of it.” It has often been objected against such a command, and against the form of the Ten Commandments, that they are of a negative and restrictive character; but in point of fact this negative form is really the best fitted to give human nature as much freedom of action as possible. It may be illustrated by an adventure which befel a friend of mine in Ireland. He alighted at a country railway station, and asked the way to a friend’s house. The porter indicated to him a hill in the distance, with a road on its left side, and asked, “Do you see that road? Well,” he said, “you are not to go that way.” Then he pointed out another road, saying, “And you are not to go that way,” and having thus barred several wrong directions which my friend might have

taken, he started him forward on the road at their feet. In the same way, human nature, in pursuing the happiness which it is its instinct to seek, has always been exposed to the danger of taking a wrong road. For the most part, looking at the world at large, it has taken roads which, according to our deepest convictions—according to the convictions, for instance, represented by these Ethical Societies—have led it into customs and rules of life which are fatal to its true welfare. Every man at the outset of life is exposed to a similar peril, and the passions often create illusions by which men and women are exposed to the greatest dangers. Alike at the outset of the human race in the path of civilization, and in the ever fresh experience of individuals, an authoritative warning against certain courses of action is indispensable to moral security. How much our English morality owes to that reiteration, which is peculiar to our public worship, Sunday by Sunday, in every village in the country, of certain “Thou shalt nots,” is perhaps far beyond our appreciation. But their virtue lies, in the main, in their authority. Once begin to speculate about one or two of them, and human nature is soon entangled in a dangerous labyrinth. But let those roads be regarded as authoritatively barred, and its speculation and its experience may range freely over the vast garden of pleasure and knowledge opened before it. In other words, morality cannot, for practical purposes, be left to rest on scientific experience. Human beings had to act, and still have to act, before the experience can be gained. Few among us will doubt that the experience of the Christian centuries has practically demonstrated the supreme excellence and necessity of the Christian laws of marriage and family life. But the demonstration has only been rendered possible by action having been taken in accordance with them, before they were demonstrated, in obedience to an authority believed to be divine. When our Lord said in reference to the existing marriage laws of the Jews, “From the beginning it was not so,” He seems to imply that human nature, or at least that portion of it which was under a revealed dispensation, started under a similarly authoritative law, from which, however, it broke away. Similarly, it is too familiar to us that individuals are continually subject to the temptation of making their own experience for themselves. If they do so, it is often at a grievous, sometimes at a fatal, cost, and it is thus essential, in practice, to the welfare of individuals

and of society alike that the chief false routes of moral life should be barred by plain and authoritative prohibitions.

But there is another ground on which the need of some such authoritative guidance on the main principles of morality is apparent. Perhaps one of the strangest points in the position of human nature is that the primary and fundamental principles on which morality should be based are admitted by the best authorities to be undetermined. No one in this country can be regarded as a more decisive witness on this subject than Professor Sidgwick, of Cambridge, whose methods of ethics and outlines of the history of ethics, are recognized text books among us; and one of his lectures in the volume now under notice has some remarkable statements on this point. He is dealing (pp. 148 *sq.*) with the need which is felt by men of really practical character for some higher guidance than ordinary experience can give them in the difficulties of life—"men whose reflection has made them aware that in their individual efforts after right living they have often to grope and stumble along an imperfectly lighted path." Practical men of this stamp, he says, "will recognize that the effort to construct a theory of right is not a matter of mere speculative interest, but of the deepest practical import." It is desirable, therefore, he says, "that philosophers should co-operate with earnest and thoughtful persons who are not philosophers in constructing an ethical system."

But how is it that this work has not already, after the long centuries during which it has been under discussion, been already accomplished by philosophers? "The reason," says Professor Sidgwick, "why the work remains to be done, lies in the fundamental disagreement that has hitherto existed among philosophers as to the principles and methods of ethical construction; and so long as this disagreement continues, how is co-operation possible?" He thinks there is more willingness now among philosophers to co-operate than there has been in other times; but still he apprehends that "even under these favourable conditions, the labour of this construction is likely to be long; and how in the meantime—so long as their fundamental disagreements are unremoved—can they effectually combine to assist individual and social efforts after right living? So long as they are not agreed on the ultimate end of action—so long as one holds it to be moral perfection, another 'general happiness,' another 'efficiency of the social organism'—how can any counsels

they may combine to give, as to the right way of living so as best to realize the end, be other than discordant and bewildering to those who seek their counsels." What a picture of the state of moral philosophy, apart from the authority of revelation, some two thousand five hundred years after the rise of moral speculation in Greece! Philosophers in complete disagreement as to the ultimate end of human action—so complete that any counsels they might combine to give as to the right way of living could not be otherwise than discordant and bewildering to those who seek their counsels! And this being the condition of moral philosophy after Socrates, and Plato, and Aristotle, and the Stoics, and the Schoolmen, and Spinoza, and Butler, and the English moralists, and the German philosophers, and the evolutionists of our own day, we are seriously expected to believe that morality will be placed on a firmer ground by abandoning its basis in authoritative revelation and trusting to the simple ethical motive of the attraction of a good life, assisted by the speculations of these distracted philosophers!

Professor Sidgwick, "in the perplexing choice of alternatives" which he so candidly confesses, falls back upon the comforting fact that "there is much greater agreement among thoughtful persons on the question what a good life is than on the question why it is good." When philosophers "are trying to define the ultimate end of right actions, the conceptions they respectively apply seem to be so widely divergent that the utmost efforts of mutual criticism are hardly sufficient to enable them even to understand each other." But happily "there is no important difference of opinion among philosophers as to the details and particulars of morality." That is a happy circumstance for philosophers. But unhappily, as has been pointed out, there are the widest differences among mankind on some of these details and particulars, and unless we are to confine our interest in moral problems, and in the development of morality, to the limits of the best Christian civilization, Professor Sidgwick's consolation will not carry us far. But he proceeds most materially to diminish even this degree of consolation for us. When philosophers of the most diverse schools have combined "on the basis of this broad and general agreement with each other," what are they to undertake? "They may hopefully co-operate in efforts . . . to free this current ideal from all that is merely traditional and self-contradictory, and thus to widen and

perfect it." With the charming candour which marks these confessions of the most distinguished of the professors of moral philosophy at our Universities, Professor Sidgwick proceeds to say that he is afraid his hearers "will think that our task, as I conceive it, is like the climbing of a mountain, of which the peaks are hidden one after another behind lower peaks; for when one difficulty is surmounted it brings another into view." We have just seen that the business of the moral philosopher is "to free the current ideal of what is right from all that is merely traditional; but we are also agreed—it is one of our express principles—that the good life is to be realized by accepting and acting in the spirit of such common obligations as are enjoined by the relationship of family and society." But when "we look closer at these common obligations, we find that they are actually determined by tradition and custom to so great an extent that, if we subtracted the traditional element, it would be very difficult to say what the spirit of the obligation was."

That is exactly what a Mahomedan might urge in refusing, on grounds of mere moral philosophy, to entertain any proposal to alter his traditions and customs in the Christian direction. Professor Sidgwick himself proceeds to point the moral by reference to the subject already urged in this paper—that of the family relations. When we turn, he says, "to scrutinize our own ideal of family duty, how are we to tell how much of it belongs to mere tradition, which the river of progress will sweep away, and how much belongs to the indestructible conditions of the well-being of life, propagated as human life must be propagated." Is it not an astonishing and pathetic spectacle? A professor of moral philosophy, whose office it is to instruct our young men in the principles of morality, and who is invited to give some guidance to a London Ethical Society, inquires, in sheer perplexity, how he and his audience are to tell how much of our ideal of family duty—the first and most pressing duty of all—"belongs to mere tradition, which the river of progress will sweep away." The floodgates of "the river of progress" are thus opened on the very standards of family duty, and the Professor stands on the banks, calmly speculating how much of the ideals we have inherited from our parents will be swept away. "Of this difficulty," he concludes, "there is, I think, no complete solution possible, until our task of constructing a theory or science of right has been satisfactorily accomplished"—accomplished, of course, by that mutual

co-operation of philosophers whose conceptions of the ultimate end of right actions "seem to be so widely divergent, that the utmost efforts of mutual criticism are hardly sufficient to enable them even to understand each other." And while these gentlemen are trying to understand each other, the great problems of human civilization and of human society have to be dealt with day by day; men and women, and the young men and women whom such a professor addresses, have to live some sort of family life, and to decide for themselves how much of the old sacred ideal they will pursue as "belonging to the indestructible conditions of the well-being of life."

What wonder if, when such vague speculation on the primary principles of morality are let loose at the fountains-heads of English thought, another honoured writer in this series of lectures, Sir John Seeley, should say (p. 11) that "never surely was the English mind so confused, so wanting in fixed moral principles as at present . . . The scepticism which undermines and enfeebles us now is partly, indeed, but only partly, a scepticism about religion. It extends to everything else. We have misgivings about morality; we suspect law itself to be a pedant, government to be a tyrant, justice and honesty to be Philistine virtues . . . And the old national character seems to have disappeared with the old principles . . . We have everything except decided views and steadfast purpose—everything in short except character. We have emotion, sentiment, thought, knowledge, in abundance, only not character!" What wonder that the fiction of the day has for some time past exhibited precisely that practical perplexity as to the permanent elements in the ideal of family life which Professor Sidgwick confesses from the speculative side? Are we not reminded of that pathetic passage in an ancient moral poem, in which the patriarch exclaims, "Where shall wisdom be found and where is the place of understanding?" And when his eye has ranged nature in vain for an answer, he falls back upon the old solution, "God understandeth the way thereof, and He knoweth the place thereof; for He looketh to the ends of the earth and seeth under the whole heaven . . . and unto man He said, Behold the fear of the Lord, that is wisdom, and to depart from evil is understanding." The ends of morality, about which the philosophers, some thousands of years after Job, are still perplexed, can only

be determined by that omniscient eye which "looketh to the ends of the earth, and seeth under the whole heavens," and it is to an authoritative revelation that we must still look for the answer to such questions as Professor Sidgwick propounds, respecting the "indestructible conditions of the well-being of life." By all means let moral criticism consider from time to time what liberty may be desirable in the details of family and social duty; but let it always be remembered that, in Luther's ever-memorable phrase, it is only Christian liberty—liberty subject to the cardinal prescriptions of the Christian law in essential points—which can be safely indulged, and that moral progress and moral life must thus rest, alike for its permanence and for its freedom, on the authority of the Christian revelation.

It remains to indicate, as may be done more briefly, the manner in which the recognition of this authoritative basis for morality deepens and enhances its whole character. An entire misconception pervades these Essays as to the relation which subsists, from the point of view of Christian philosophy, between morality and religion. It is conceived as a purely speculative relation; whereas, in point of fact, it is mainly practical. There is one Essay in this volume which is entitled "Ethics and Theology," and is expressly directed to the relation between the two, and which starts by saying (p. 161) that "the whole of ethical investigation has exhibited the groundlessness of the statement that morality rests upon theology: we do not find it anywhere necessary to bring the doctrine of theology to the support of morality"; but nevertheless the writer proposes "to subject the doctrine of the independence of ethics to a more special and searching proof."

He proceeds, however, to conduct this searching proof by misapprehending the main propositions which a reasonable statement of the relation of Ethics to theology would involve. He says that the statement to be examined, "declares, if we are to give it a clear and definite meaning, that conscientious, upright conduct, rests on a belief in a personal God, and in the immortality of the soul." It has been sufficiently indicated already that this is in no way the question at issue. No reasonable man could doubt that individuals can and do act in a conscientious and upright manner without the support of these beliefs. The question is whether without the guidance of revelation, which involves theology, men in general can have an adequate assurance of what the highest

dictates of morality are. You may have, of course, and you have, morality without theology; but the question is first, whether without it you have a sufficient basis for such cardinal moral principles as we have been considering, and secondly, whether all moral obligations are not enhanced by the theological and religious motive which the Christian revelation puts forward. I have dealt with the first question, and it only remains to touch on the latter. Now this depends not simply on the question whether there is a personal God, and whether He has given us certain commands, and whether His promise of eternal life is an indispensable motive amidst the dangers and temptations of life; or even whether an enlightened idea of God, purely as such, possesses a high significance for the moral elevation of mankind, or whether the apprehension of God's omnipresence and omnipotence is a valuable support to moral action—which are the points this writer discusses. He is at issue, indeed, even on these points, with one of his colleagues, who admits (p. 299) that “although we emphasize and believe in a direct appeal to the moral sentiments in man, nevertheless we recognize that belief in a personal God, and the hope of immortality, have helped to keep men up to the line of duty; and if we had nothing to fall back upon but the direct love of righteousness, we should count our movement weak indeed.” That admission may well be thought to give up the case of the whole movement, so far as it rests upon the independence and sufficiency of the ethical motive apart from religious beliefs. But, from the point of view of Christian philosophy, it is important to put our own case a great deal higher. The Christian belief—I am not now defending it, which would be out of place at the present moment; I am only stating it—the Christian belief is that a personal God has not merely given revelations of man's moral duty and issued commands, but that He has placed Himself in direct personal relation with us; that He has taken part, side by side with us, in the moral struggle of the world; that He has voluntarily, in human form, submitted to the severest sufferings in that struggle, and that He now adds the appeal of personal obligation and personal affection to that of His supreme authority.

It is only possible, on such an occasion as the present, thus briefly to indicate the nature of the Christian position on this subject; but this will be sufficient to illustrate the nature of the addition which it makes to ordinary moral forces. It

superadds to them all, without exception, the obligation of one supreme personal relation. Sufficient attention, perhaps, has not yet been paid to that view of morality which treats it primarily as a matter of personal relations. The Aristotelian Ethics reflected too strongly the individualism of the Greek mind, and treated virtue mainly as the perfection of the individual nature. The Roman mind, in accordance with the whole bent of the Roman character, regarded it rather from the point of view of mutual duties, as is indicated in the title of Cicero's treatise *De Officiis*; but the Jewish, and above all, the Christian mind, rose to a still higher point of view, when it resolved all moral and religious excellence into love—into the true relation of persons to persons. The late Mr. Maurice, when he held the Chair of Moral Philosophy at Cambridge, treated the subject under the same point of view in his lectures on Social Morality. Ordinary virtues are best defined, indeed they can only be satisfactorily defined, in terms of the relation which one person holds to others. The self-respecting virtues, as they have been termed, have sometimes been excepted from this rule; but under Christian Philosophy they fall within it, as resulting from the relation of a man or woman to their Divine Lord; and it is upon this basis that St. Paul treats, for example, the virtue of purity.

It would take us far beyond the limits of a paper to develop this view in detail. But for our present purpose it may be sufficient to point out how every moral excellence becomes, under this view, animated and illuminated by the spirit of personal loyalty and devotion. I venture to think it is a high point of excellence in this consideration that it enables the idea of self to be everywhere suppressed or superseded. If virtues are self-regarding, that chord of self, of which Tennyson speaks, is still heard vibrating, and there is no little danger in this survival of self, even in our best achievements. But when every virtue becomes an act of homage and of love to another, all thought of self is absorbed in an unselfish devotion. It will be universally acknowledged that moral excellence consists in the due realization of our personal relations as children, as parents, as citizens, as friends. Is it not a still higher, and the highest privilege, to add to all these one further stage of personal relation—the eternal relation of the heart to a perfect Being, towards whom every emotion of love and of gratitude can be indulged to the highest degree. Of course, the possi-

bility of such a transformation and elevation of morality is dependent on the question of the truth of the Christian revelation; and that, as is often urged by the school of writers to whom I am referring is not evident to everyone. It is quite true, as has been said more than once, that it would be at once incorrect and unjust to treat all morality as depending on such a belief. But the highest morality may be dependent on it; and those who disbelieve it may consequently shut themselves out from the highest form of moral development. That belief, moreover, may itself, in some respects, be the highest moral test to which human nature can be put, and its acceptance may be a primary moral act of the most vital significance. The only point it is requisite for the present purpose to urge is that if the belief be true, and if the moral relation it declares to a divine and human Lord be duly recognized, it adds to morality a supreme grace and power. The due recognition of our relation to such a Being, and the due fulfilment of that relation in love to Him, must, in fact, by its very nature, become the first of moral duties, in which all others find their support and their glory.

We may, perhaps, in conclusion, take an illustration from natural science of the influence upon morality of these Christian truths. The greatest, probably, of all discoveries in the realm of natural science was that which established the law of gravitation as the governing force of the whole universe; so that, in the most distant stars and suns, we behold vast worlds held in mutual relations by mutual attractions, and those attractions precisely the same in character as that by which the smallest elements of the physical life around us are controlled. We look into the distant heavens at night, and are overpowered by the thought that one and the same law of mutual attraction, according to a fixed proportion, maintains those orbs in their order; and then our eyes and thoughts are recalled to the little forces and atoms of our daily experience, and we are the more sensible of the supremacy and universality of the laws by which the circumstances of our daily life are regulated. So it was with the Apostle of Love as his eye ranged from those depths of divine life, which it had been his privilege to witness, to the daily and ordinary relations of men and women. One and the same law, the law of love, controls alike the most divine and the most human relations, keeping them in harmony, peace and beauty, if it be obeyed,

and avenging itself in terrible convulsions and wrecks if it be neglected. The law of love is the law of gravitation of the moral world; with this only difference, that it is in the power of human beings to violate it, and thus to bring on their nature that destruction, that moral, and ultimately physical, disorder which is its curse.

Such is the intimate connection between Ethics and Theology, and it has been conspicuously illustrated in history. Whenever, and in whatever religion or civilization, the personal life and love within the Godhead has been obscured, there you find the principle of love similarly obscured. When, as in Mohammedanism, God is regarded, so to say, as a solitary despot, simply as the absolute Lord of all His creatures, human beings apprehend their relation to each other in a similar manner. There you have government assuming the form of a pure despotism, and the relations of men to one another, and of men to women, become relations of power and possession, and not of mutual love and devotion. Slavery, the absolute possession of one human being by another, is a natural institution under such a religion, for it is but the reproduction of the relations which God is regarded as holding to men. The woman is similarly regarded as the mere possession of the man, and the son is under the absolute power of the father. The ultimate connection between Ethics and Theology, in short, lies in the fact that the highest ideal of men is always represented by their conception of God, and where the idea of God is that of power and dominion, there the highest developments of human relations take a similar character. But the Christian conception, of a personal life of love within the Godhead, has established among Christian nations the idea of mutual love, and consequently of mutual rights and mutual devotion, as the highest form of the relation between human beings. If that theology could not be maintained, it would, indeed, be unworthy of human nature to say that all morality must go with it. But it would be true that the highest glory of morality, and its profoundest source, would be removed.

DISCUSSION.

The PRESIDENT.—I will allow anyone who is present to make remarks on this subject.

Dr. WALTER KIDD, M.D., F.L.S.—It is very important at the present time that attention should be called as in Dr. Wace's valuable paper, to the proposed divorce of Religion and Ethics. There is one point in this matter to which I should like to draw special attention. It is that the proposed secularization of ethics, if it takes place at all, must be dealt with by science and its methods. Mr. Spencer has announced that the old sanctions of religion are passing away and a fitter regulative system, to use his own words, is the great need of the time. In passing, one may remark that this system of Philosophy and Ethics is stated by Mr. Spencer to be valid only for optimists. Whether or not the present state of the World even in Western and progressive nations justifies this optimism, is not very clear. Indeed Prince Hohenlohe in a very serious public pronouncement lately spoke in a solemnly different tone. But it would seem that science is to regulate conduct. Sir Michael Foster hinted the same in his presidential address last year at Dover. But what says one of the most prominent scientific men of the day? "*All our knowledge is, and remains throughout provisional.*" Weismann contrasts with this changing body of theory and progressive investigation which belongs to Science, and which is her glory, with the more glorious *semper eadem* of Christian Ethics, which has survived eighteen centuries of often poor performance on the part of its exponents. Here, at any rate, we know where we stand. The minor differences of Christian sects, the divergence in doctrines of secondary or tertiary importance, "the minute anise and cummin" which so many mistake for the weightier matters of the law, these may vary; but the essential and fundamental ethics for Christianity to-day, as *e.g.*, in the second table of the moral law, are the same as for the primitive Christians—no more, no less.

Are we then to assume that serious danger to national morals will come from studying ethics apart from religion? Dr. Wace has well shown us how much there may be in the proposed new system which agrees with the old, but that the highest forms of morality must be in extreme danger from such treatment. Optimism would say "no," the general spread of education, the average good sense of

mankind, will never depart seriously from the old highways. But this movement, if anything, must be according to evolutionary doctrines, and what do these tell us? Among others this, that the fittest survive. That sounds very plain, and so far Christianity *does* survive and *does* flourish. But the other side of this is equally important. *Whatever survives is fittest.* A most serious and alarming corollary, I maintain. The French are a nation of people who are nothing if not intellectual and logical. With them every theory is as soon as possible put to the test of practice. The result of Darwinian doctrines applied to morals, as in the writings of Zola, are so alarming to a nation of clear-headed people, that a man like M. Brunetiere, the mouthpiece of the University of Paris, can speak of *the bankruptcy of science*, on account of its failure in the sphere of morals.

Are we alarming ourselves for nothing? I think not. The alarming consequences we allude to are with us, and we have but to look to the writings on social subjects of an eminent man like Professor Karl Pearson, the Huxley of to-day, in another sphere of science, in his ethics of free thought as to marriage, and we find "a new sex-relationship will replace the old. The Socialistic movement with its new morality, and the movement for sex equality, must surely and rapidly undermine our current marriage customs and marriage laws," and much more to this effect.

It is only too easily conceived and to be apprehended that, if the sanctions of religion be removed from the sphere of conduct, if the antiseptic of Christianity be operative no longer in civilized nations, our children's children might live to see a reversal of the 5th, 6th, 7th, 8th and 10th Commandments, such as it makes one shudder to contemplate. If "whatever survives be fittest," it is thereby right to do or forbid now things very different from what were done and forbidden of old, and what will be done and forbidden a generation or two hence. *Morality thus is relative to the times and to the nations concerned.* It is however through the direct reversal of this system of relative ethics that the Christian Gospel with its pure morality has spread from pole to pole till a third of the human race is under nominal Christian government. The unvarying unyielding character of the Christian code in spite of much inconsistency of its followers in all ages, has been at once the keynote of its success and its glory.

The moral ideas of Greece and Rome as expounded by Plato,

Socrates, and Cicero, have a noble and true ring about them till we come to the actual state of conduct as it existed in those days, and as Aristophanes, Juvenal and Tacitus depict it. As a matter of fact a degradation of conduct was reached in the glorious periods of Greece and Rome which no one could imagine from the high tone of the philosophers mentioned.

I venture to say it is not the pure morals and high teachings of Sir J. Seeley, Mr. Leslie Stephen and Professor Sidgwick which will prevail if the old moorings be unloosed, but a greatly lowered general tone in that day when "the laws of comfort" shall be "the laws of conduct."

Mr. DAVID HOWARD, D.L., F.C.S.—I think we must all feel that we owe very hearty thanks to Dr. Wace for bringing before us, in such clear and eloquent language, thoughts which many of us have been striving to express, but have failed to measure so clearly or so well as he has done.

It is a vital point nowadays to make up our mind on what basis ethics are to exist, and directly you get from the religious basis (I do not say the merely Christian basis) we find that there is a hopeless lack of foundation. As far as experience goes the conceptions of morality are so linked with religious conceptions from the very earliest times that it may be a very grave question how far they exist without them. The conceptions of the Greek philosophers are derived from their religious conceptions. They rose above the religious conceptions of their time, but at any rate, they were derived from them, and the religious conceptions, such as they are, of the wild savage are derived from his religion, and so mixed with it that it is impossible, always, to distinguish cause and effect. A merely scientific basis for ethics is incompatible with the belief that right is grounded in the will of God, and misconception on this point is a common cause of delusion. Take the lowest conception such as telling the truth. Why do we tell the truth? I believe Professor Moseley is right in saying that the conception of telling the truth all round is not natural to us, especially outside our own family. Then comes the Christian conception of one God and Father for all. That truth affords a higher conception, and you cannot disentangle the idea of religion from morality, and, after all, is not it scientific to connect them together? The one aim of science is to find some underlying

cause, which will express the great and ever-perplexing phenomenon of humanity. The more we study it the more we are convinced that the conception of human nature is incomprehensible without a first cause, and therefore it is only scientific to believe that ethics are unthinkable without a first cause too.

The Rev. F. A. WALKER, D.D.—My remarks in reference to Dr. Wace's admirable paper will only be confined, so to speak, to a side issue.

On page 13 Prebendary Wace has made a quotation from the Book of Job: "Where shall wisdom be found and where is the place of understanding?" He goes on to say "and when his eye has ranged nature in vain for an answer, he falls back upon the old solution, 'God understandeth the way thereof, and He knoweth the place thereof; for He looketh to the ends of the earth and seeth under the whole heaven.'"

I would, with due deference, supply one word, "hidden"; "and when his eye has ranged [*hidden*] nature in vain for an answer"—otherwise the common interpretation of that would be looking round at the tall trees, especially the ocean and crag. That, evidently, is not what Job had in mind; because in the same 28th chapter the keynote is *hidden nature* and not external nature. "There is a path which no fowl knoweth, and which the vulture's eye hath not seen. The lion's whelps have not trodden it, nor the fierce lion passed by it." It seems, therefore, that Job is referring to hidden nature, in which case his observations are in correspondence with his reference to wisdom. "It cannot be valued with the gold of Ophir, with the precious onyx, or the sapphire."

The Rev. JOHN TUCKWELL.—I think we all concur in thanking Dr. Wace for the admirable paper we have listened to and for his courage to put into print such an emphatic declaration that morality can only be efficiently enforced on the ground of religion, and indeed the Christian religion. But, at the same time, I think we ought to be quite clear about it and not allow ourselves to think that Christianity has invented the moral law, or given the moral law for the first time. That would be to lose sight of a great and important truth in connection with our own being and our relationship to our Creator. If the Divine Creator makes any being, apparently by that act He establishes some relation between that being and Himself. There are

obligations towards that being which He undertakes. There are obligations which that being owes to the Divine Creator.

I think, therefore, the sense in which the whole moral law and the Ten Commandments may be regarded is embodied in every nature—either in the nature of relationship to our Creator, or in the nature of our relationship to each other. When the Creator creates more than one being He establishes certain relationships between those two or more beings as the case may be, and therefore there are reciprocal duties and obligations resting on them. I should like also to recall the fact that it is impossible for us to go back to any period in human history where the moral law has not been sustained by religion and religious beliefs. Thousands of years before the giving of the moral law on Sinai all the principles of those Ten Commandments were known. It is very important, therefore, to bear in mind that there is no way of discovering a period in human history when morality and religion were absolutely separated. I understand that one of the objects of the Ethical Society is to discover some separation. It behoves all who are concerned in the future of our own country, as well as religious beliefs, to insist, with all the power we possess, on the absolute futility of maintaining anything like an efficient system of morals divorced from religion, and especially the highest religion known to man—the religion of our Lord Jesus Christ.

Mr. MARTIN L. ROUSE.—I was much struck with the closing illustration given by Dr. Wace in his paper that slavery as well as polygamy and the ill-treatment of women flourished so under Mahomedanism and does not under Christianity.

I don't know whether it has ever struck you that it is only in Christian states that practically free governments have existed and Christianity, though after many years of struggle (perhaps not working up to its light), finally abolished slavery.

In regard to polygamy, though it was common in the days of old, yet the teaching of even the Old Testament is against it, as shown by the sad example of the ruin of Solomon.

Again, where is it, outside Christianity, that we get the condemnation of suicide? We have certainly the most enlightened people on this side of the world, who show a tremendous aptitude for [adopting all forms of Western civilization, and until lately it was a most common practice amongst them for a man, who had

in any way incurred dishonour, to commit the "happy despatch," as it was called, and it never occurred to their mind that it was wrong. I know Socrates speaks against it, for one of his pupils said, "If the after life is so happy why not commit suicide?" and Socrates said it was the greatest sin; because God, having placed us in this life, knows best what is for our good, and it would be the most daring presumption for us to presume to know better and to toss ourselves out of this life.

The Rev. Prebendary WACE.—I have only to thank the audience for the kind way in which they have received my paper, and those gentlemen who have spoken on it.

The PRESIDENT.—I think I need hardly propose a vote of thanks to Dr. Wace after the way in which his paper has been spoken of. I am sure we are all deeply indebted to him for bringing this paper before us. [Applause.]

The meeting then closed.

COMMUNICATIONS RECEIVED.

Lieut.-Colonel M. A. ALVES, R.E., writes:—

In offering a few observations on the subject introduced by Dr. Wace, I should like, first, to join in the vote of thanks which will, I feel sure, be unanimously voted to him for his paper.

In dealing with those who repudiate the Bible as the revelation, both of God's Ethical Standard, and of Christ as the Power of God to approach that standard in its completeness—I do not say to attain to its perfection during this lifetime—it is not of much use to quote Scripture to them. We must show to them some evidence that they cannot deny, in proof of ethics combined with, and as the result of, the Christian religion as revealed in the Word of God; and challenge them in their turn to show to us that complete ethics can be practised apart from that or any other religion. The proof must not be sought for amongst those who, by reason of gifts, possessions, surroundings, or well-balanced heads, etc., are raised above many of the common temptations of life, but amongst the unveneered mass of struggling humanity living amongst evil surroundings and temptations, morally weak

and phrenologically vicious by nature. Moreover, neither side must call in the assistance of the other to its aid.

The vast majority of "the classes" are bound to be more or less moral; otherwise they would very soon lose their social position amongst "the masses." They have more inward strength than "the masses," or they could not—as a body—either rise to, or long remain in, a higher position than that of these "masses."

Whilst I think that we have woefully departed from the teaching of John xvii, which, notably verse 21, seems to me to teach that the example of the elect, sanctified in the truth (verse 17), and united, was intended to be the great gospel sermon to the world, there can, I think, be no doubt that where the Christian religion has laid hold of anyone, some ethical improvement has been the result. Our many philanthropic agencies can bear witness to this amongst the naturally weak and immoral; and that, too, in the direction aimed at by Sir John Seeley, Professor Sidgwick, and Mr. Leslie Stephen.

We should, I think, work this for all that it is worth, and insist on all missionaries inculcating steady ethical improvement on every convert, especially on his weak side.

Better a few edified and ethically improved elect, than a vast mass of disorderly converts.

It is for the Ethical Society to show us that—apart from religion—they have either induced a number of people to sacrifice themselves for the improvement of the depraved, and with successful results, or that, solely by their writings and speeches, they have produced these results. Ask them for their first-ripe figs, and tell them that we do not want the fine fig leaves of their beautiful theories.*

21st May, 1900.

The Rev. R. C. OULTON, B.D., writes:—

In the first place I would premise that this is a most valuable paper, fair and convincing as regards doubters, as well as helpful to believers in supernatural religion. But Dr. Wace

* I have used the word "complete" in the sense of the development of every ethical quality in its proper relative proportion; and "perfect" in that of the full acquirement of all these qualities, rightly balanced.—M.A.

appears to me to make an over-statement in the following passage :
 "Some of the most vital principles of the moral law—such as the golden rule of doing as you would be done by—are so deeply embedded in human nature as to be *universally* acknowledged as a *general* rule of action."

Is this principle acknowledged by savage nations in warfare, which forms so large an element in their national or tribal life? Or was it generally acted upon in ancient warfare even among so-called civilized nations? In fact, morality seems to me very much a matter of education. While I fully and freely admit that all mankind has a conscience, I must at the same time hold that this conscience requires to be enlightened, among heathens and non-Christians by reason, and among Christians by the teachings of revelation. No doubt heathens and others have arrived in many respects at a knowledge of "the absolutely right." But this result is the product of reason acting on knowledge and experience. Granted that every man has a conscience or standard to which he submits actions for approval or disapproval, will he everywhere pass the same judgment on those actions? Surely not. It therefore appears to me that moral ideas cannot be regarded as innate.

ORDINARY GENERAL MEETING.*

PROFESSOR E. HULL, LL.D., F.R.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following elections were announced :—

MEMBER :—Professor Lionel S. Beale, F.R.C.P., F.R.S.

ASSOCIATES :—Joseph Brown, Esq., C.B., Q.C. ; John G. Cribb, Esq., Brisbane ; Rev. President J. A. Peters, D.D., U.S.A. ; F. A. Bruton, Esq., M.A.

The following paper was then read by the Author :—

METHODS OF PROTECTION AMONG ANIMALS.

By W. A. KIDD, Esq., M.D., B.S., M.R.C.S., F.Z.S.

PROFESSOR WEISMANN well says, "Everything is adapted in Animate Nature, and has been from the beginning."† This statement will commend itself to any person who makes acquaintance with the organic world, as much among plants as among animals. I propose to consider one phase of this universal adaptedness of Nature, viz., the various methods of protection among the groups of the animal kingdom. The conditions under which the great animal world is found existing are so diverse that abundant opportunity is offered for such a study. It is indeed so abundant that one can but glance shortly at a few notable members of the different classes as we ascend the scale from Protozoa to Man.

Animals occupy the water, the air, the surface of the earth, and even to some extent its interior. They are found in water at the depth of 3,000 fathoms, at the bottoms of the deepest oceans, and at all levels of the sea. They flourish in all regions of the teeming waters, warm and cold, in branches of trees, in the air, and on mountain tops, in

* Monday, 6th February, 1899.

† *Germinal Selection.*

torrid, temperate, and frigid zones, in rivers, lakes, and ponds, on the earth and in its crust, and in the bodies of other animals. Here, then, in so motley an assemblage of environments, is a great field in which may be displayed those multiform methods of protection which I, for one, cannot dissociate from the action of mind and will.

In considering this subject of protection one must somewhat enlarge the ordinary meaning of the word, in accordance with the common maxim in the affairs of nations that the surest way to peace and protection is to be prepared for war, "*Si vis pacem bellum para.*" This is denied by certain prominent thinkers of philanthropic bent, but it obtains much support among the higher members of the animal kingdom. We shall see many of these, in which the methods of protection are almost altogether active rather than passive in character, and in which formidable weapons of offence supply adequate protection to their possessors, otherwise feebly provided with passive methods of protection.

The varying modes in which the need for protection among animals has been met afford contrivances so diverse from one another as the outer thickened and hardened layer of an amœba, protecting the softer internal parts, the skull of man protecting his delicate brain, or the oil with which an aquatic bird preens its feathers for protection against moisture and cold.

The two most important divisions of the animal kingdom are the invertebrates or non-chordate animals and vertebrates or chordate animals. Of the former the Protozoa form the lowest group. This great group of small creatures comprises those which have no specialization of functions for the different cells of their bodies. They may be called one-celled by reason of the fact that the protoplasm of which they consist discharges indifferently the functions of *nutrition*, *reproduction*, and *relation*. The rest of the animal kingdom is marked off from the Protozoa as Metazoa, and includes creatures which range from a sea anemone to a man.

Among the Protozoa the need for protection is slight, as they are aquatic and mostly microscopic in size. But in the amœbæ, almost the lowest Protozoa, there is a provision by which the outer layer of protoplasm, or *ectosarc*, becomes relatively hardened, and serves to protect the inner portions. In somewhat higher Protozoa a substance called "chitin" is produced on the surface. It is a hard, horny, organic tissue,

and enters considerably into the protecting structure of lower animals. In the tiny foraminifera, which show an advance upon amœbæ, there is, as a rule, a shell or "test" perforated by minute protusions of the body-substance, whence their name. These "tests" are of great variety and beauty, as, for example, in the nautiloid foraminifera, with their microscopic shell fashioned like that of the higher pearly nautilus. Among this order are found the beautiful and ancient nummulites, honoured of old by entering into the "nummulite" limestone of the Egyptian Pyramids, with their small coin-shaped shells. We must not forget to notice the minute Globigerina, which go to make up with their myriad skeletons the Chalk formations of the world. The Radiolaria are another great division of the Protozoa, full of forms of beauty with varied contrivances for the protection of their bodies. Professor Haeckel was occupied for ten years in the study of the Radiolaria, brought to light by the *Challenger* Expedition, and has identified 3,500 species. The Polycystinæ also, which have contributed to form the flint all the world over, have "skeletons" of extreme beauty and variety, though microscopic in size. For example, one Radiolarian called *Ziphacantha Murrayana* (after Dr. Murray of the *Challenger* Expedition) possesses a more elaborate skeleton, passing through the body of the animal, consisting of delicate spicules arranged in a radiate form, with secondary connections, in most exact geometrical order.

The next division in the scale of animal life among the Zoophytes or Coelenterates is that of the sponges. At this stage the one-celled animals are passed by, and *tissues* and *organs* begin to be seen. The soft body-substance of the sponges is supported and protected by a framework of flinty, horny material. Some sponges exist in fresh water, but most of them in sea-water; some are calcareous in their skeletons, others siliceous. We should not forget how valuable a *secondary* purpose for the comfort of us human beings are the skeletons of the horny sponges found in the Mediterranean and West Indian Islands, and their beautiful elasticity and firmness. It is not necessary, because the primary purpose of these skeletons of sponges is the protection of the individual, to forget the secondary uses and purposes to which they are applicable.

Of all the sponges the famous Venus's Flower Basket, or *Euplectella*, is the most beautiful, and serves as a model of

lightness, strength, and beauty. The skeletons of the great group of corals may also illustrate these primary and secondary purposes in the building up of great islands and continents. Sea anemones have no hardened exoskeleton, but they possess an external layer of hardened tissue containing the substance "chitin" just mentioned.

The Echinodermata, or sea-urchins, starfishes, and sea-lilies, present a very hard and varied coat fashioned by the animal from the ingredients of the sea-water in which the animal lives. It is enough to mention these familiar forms of protective structure without further description, except to refer to the movable spines often found on the plates of the shell or coat, some of which are capable of bestowing painful wounds on enemies by means of a stinging apparatus. Altogether this group of sea-urchins, starfishes, and the like are well able to take care of themselves, which fact may account for their great antiquity as a family, dating from Palæozoic times.

The great group of Annulosa comprises *worms*, of various forms, *spiders*, *crabs*, *lobsters*, *shrimps*, and *insects* of all kinds.

In worms there are no such spicules forming a skeleton as in the sponges, nor any complete endoskeleton. But protection is given by an outer tough coating in some; in others the same with muscles attached to it. In sedentary annelids inhabiting the sea there is a protecting tube, sometimes further hardened by the deposition of calcareous salts, sand, mud, or other foreign substances. In some a lid is provided at the entrance to this tube, capable of closing the aperture. In certain chætopod worms some gland-cells of the outer skin secrete hard bristles, serviceable for protection. The earth-worm has also an abundant slimy secretion on the surface, serving efficiently to protect it.

The great group of insects consists of animals with the body divided into head, thorax, and abdomen, each of these parts being protected by contrivances of various kinds. The antennæ and jaws borne by the head contribute to the protection of the possessor, and the simplest well-known example of protection in the case of the jaws is that of the mandibles of the stag-bettle, resembling horns in shape. The head is also strongly protected by a chitinous covering, as is also the thorax, that of the abdomen being of a softer and more mobile character.

In addition to the dense tough covering of an insect such

as the stag-bettle, or the equally tough covering of *Pulex irritans* (or the flea), there are numerous species with delicate protecting hairs, or with appendages on the terminal portion of the abdominal segment, such as the pincers of an earwig, or the sting of a bee or wasp. Then there are *protective resemblances* in this order, marvellous cases of *mimicry*, *warning colours*, and *recognition markings*—all eminently protective to their possessors. Further details of this great group cannot be considered here. Lord Walsingham considers that only about 10 per cent. of all existing species have been described, and these are calculated to number 250,000. We may simply enumerate the better known forms—ants, wasps, bees, saw-flies, flies and fleas, butterflies and moths, beetles, dragon-flies, may-flies, white ants, crickets, grasshoppers, cockroaches, earwigs. The simple mention of the more or less familiar forms of insect life bring up before the mind a perfect wealth of contrivances for the protection of the bodies of their possessors.

In the Arthropoda (Crustacea, spiders), so called because of their pointed limbs, there is, instead of the calcareous skeleton of sea-urchins and the like, a chitinous external skeleton of the organic horny chitin, secreted by the integument. The immense variety of forms which this great family of animals exhibits will excite our admiration as showing the beautiful adaptation of their protecting structures for diverse environments—the hard carapace and armour of the limbs in crabs, lobsters, crayfish, to say nothing of acorn-shells, king crabs, hermit crabs, barnacles, shrimps, sandhoppers, water fleas among the smaller forms. The power possessed by the young among these Arthropoda of shedding their protective covering during growth is Nature's method of dealing with these young and stirring lower animals. The "jointed" young ones have a simple method of adapting their coats to their growing bodies and just shed their protecting "chiton" when it is too tight, remain quiet and in a temporarily timid state for a few days, no longer indulging in their favourite battles, and devote a little time to the secreting of a new "chiton" from their soft integument. They are then ready once more for the struggle of their life, offensive and defensive.

The Arachnida or spider family, in which hundreds of British forms alone of spiders are known, includes spiders, scorpions, mites, "harvestmen" and certain parasites.

In many the integument is not hardened for protection,

but most spiders have soft, flexible surfaces on the under and a harder chitinous covering on the upper part. Scorpions have a chitinous shell all over the body. In spiders the segments which represent the antennæ of insects are very efficient pincers, used for prehension. Scorpions have still more formidable nipping-claws, and have the power of stinging their prey by means of the tail, which is hooked and has two poison-glands with minute canals opening into the tips. The spider's web must ever be borne in mind as a wonderful and beautiful method of protection devised for the double purpose of protection and supply of the animal's needs. Its formation and origin need not be here described.

Centipedes and millipedes also possess a chitinous covering and glands in the integuments which secrete an acrid fluid for protection.

The remaining group of Invertebrates or non-chordate animals is the large sub-kingdom of Mollusca or soft-bodied animals. For us the interest centres on the shells, which almost all possess. They are aquatic, inhabiting sea and fresh water, and terrestrial. It is computed that 50,000 species of the former and less than half that number of the latter have been identified. The vast majority of Mollusca have shells consisting either of one piece shaped after diverse patterns, or of two valves, thus constituting the two main divisions of Mollusca, univalve or gastropod molluscs, and bivalve or lamellibranch molluscs—*e.g.*, snails on the one hand and oysters on the other. The shell is in nearly all composed of calcareous matter mixed with a small amount of animal matter, and is formed by the outer layer of the "mantle," so called. This shell is essential to the life of the animal, and it cannot, in the convenient manner mentioned among Crustacea, shed its coat and form a fresh one. Injuries to the shell can be repaired, but no new one has ever been known to be produced. Shells are described as *porcellanous* from their dense white structure, *horny*, *fibrous*, or *nacreous*, such as those of the mother-of-pearl. In addition to the ordinary protection of the hard shell, there is in many a further protection of the shell itself. This "overcoat" of the molluscan shell is called the "periostracum," and is a tough, smooth coating laid over the calcareous surface, efficiently protecting fresh water shells, in particular, from the eroding chemical action of the water, in which carbonic acid gas is dissolved. A past generation of men thought the discovery of copper coatings for the bottoms of ships a great

advance, which it truly was, on the old style of ships' bottoms, when the great seamen of old days would be obliged after a long voyage to spend weeks in "careening" the bottoms of their stout, rough little vessels that the surface might be freed from myriads of barnacles, seaweed, and such like. So the growth of knowledge produced copper bottoms, and in course of time this process was improved upon by the discovery of compositions to preserve the copper bottoms themselves. But here in a molluscan shell is this late discovery of man anticipated in an organic composition, formed from the shell itself, and reformed as required.

It only remains to remark upon the exceeding beauty of the colouring of many shells, connected with the presence of certain glands in the "mantle" of the mollusc. The colours may be white, red, green, yellow, olive, purple, slate blue, black, and marked with a marvellous symmetry. As to the forms of shells, there are those of cephalopods, such as cuttle-fishes, argonauts, pearly nautilus, octopus, and a few more. Ammonites and Belemnites, among extinct forms, come under this division. Of these, all the pearly nautilus and *Argonauta argo*, with its shell used as a boat in which the mollusc swims near the surface, are the most beautiful and familiar forms. But the protection conferred on cuttlefish is very interesting, with the dorsal plate or cuttle-bone placed under the skin of the back so as to protect the animal against collisions as it swims backwards, as also the remarkable ink-bag which can be discharged by way of self-defence against pursuers at the pleasure of the animal.

Next to Cephalopods come the bivalves, *oysters*, *scallops*, *cockles*, *mussels*, and *razor-shells*, too familiar to need description.

The largest division is that of Gastropods, such as *snails*, *whelks*, *periwinkles*, *limpets* and *cowries*, which inhabit fresh water lakes, rivers, salt water at all levels and in all regions, and the land.

Some of these have an internal skeleton, but the majority have an external skeleton, and some, such as slugs, none at all. They have spirally-coiled shells and are univalve as a rule, and nearly always they are coiled from right to left. To take one familiar example out of many as to efficient protection, we may remember the numerous and fruitless efforts made by us in the days of our youth to dislodge a well-grown limpet from its rocky home, and may thus gain an idea of the power of the muscle which retains it in

contact with the rock, and the efficient covering given by the strong little shell to the soft-bodied animal within.

The next class of animals is that of the fishes, lowest among chordate animals, for we need hardly in this short sketch consider the so-called semivertebrates, *lancelets*, *sea-squirts*, and *sea-worms*.

Below the true fishes is a class called Cyclostomata (lampreys or hag fishes), called also Marsipobranchii from their pouched gills, the hag fishes being not a little interesting as regards a singular form of protection they possess, viz., that of secreting enormous quantities of slimy mucus, which may even be so great as to interfere with fishing in their immediate neighbourhood.

We have now to consider the various methods of protection among vertebrates, such as *scales*, *spines*, *fur*, *hair*, *feathers*, *horns*, *poison-glands*, possessed by all below man, according to their individual needs. There are five orders of fishes described, and a few only of these can be touched upon by way of illustration. The means of protection among fishes, generally speaking, consist of *scales*, *teeth*, and *fins* and *fin-rays*. Of scales there are three kinds, "*ctenoid*" or comblike (as to their hinder edge), "*cycloid*" or circular, and "*placoid*" or plate-like, these last being often composed of structures similar to those of the teeth, viz., *dentine* and *enamel*. The fin-rays are delicate bony rods supporting the fins. There is also as a rule in fishes a gill-cover or "*operculum*" covering the gill-slits and gill-rays efficiently. The brains of fishes require protection to a great degree, and they obtain it in the delicately shaped and carefully welded bones of the skull (*e.g.*, in the skull of a perch there are thirty-seven pairs of bones enumerated), which as a rule has a pointed, tapering shape, with obvious advantage conferred thereby in the rapid passage of the fish through the water—a shape advantageously imitated by man in the construction of his ships. The same advantage in its rapid movement is obtained by the beautiful imbricated or overlapping arrangement of its scales with which we are familiar, and further assisted by the slimy abundant secretion of mucus. *Fins* are among the earliest of organs among Vertebrates, in which the beautiful double purpose of protection (offensive and defensive) and direction by one organ is supplied. Not only does the fish progress by means largely of its fins, but it at the same time steers and maintains its balanced position in the water with them, as is shown by the

experiment of cutting off the fins of one side, or of the two pectoral fins. The tail fin has this double purpose in a special manner, as if a steamer were propelled and steered at the same time by screw or rudder. The teeth of fishes are of great variety as to number, size, and arrangement, and contribute of course very largely to the protection and supply of food to the animal, especially the latter, and can be renewed indefinitely as a rule. We may notice the terrible armature of the sharks with their interlocking formation, and numerous rows of reserve-teeth which lie folded back behind those in use, also the great basking shark, sometimes 28 feet long (*e.g.*, one caught at Shanklin), shows a remarkable development of *denticles* on the surface of its body, constituting very efficient mail armour, and otherwise rather devoid of protective structures.

Other more rare methods of protection among fishes can only be enumerated, *e.g.*, the electric organs near the tail of the electric eel, found in the river sand lagoons of Brazil; the series of galvanic plates along the back of the torpedo, or electric ray; the strange modification into spines of the skin of the globe-fishes, capable of immense distension by means of air taken in through the gullet. When well filled with air it becomes nearly circular, the spines stick out at right angles to the surface, and the inflated globular creature floats along the surface of the water, and can afford to laugh at almost any hungry enemy; it is appropriately called the sea-hedgehog.

Again, some small fishes frequenting the coral reefs of the Pacific, called *Scorpanoids*, possess appendages of the skin causing them to resemble seaweeds, so that they are easily hidden. Some of these are justly feared because of their poisonous dorsal spines. The class of swordfishes forms a remarkable group of specialized animals, the well-known offensive weapon being a prolongation of the upper jaw. *This well-armed warrior of the deep not being otherwise well protected, and having neither scales nor teeth*—its active structures of offence or defence are sufficient to allow it to dispense with passive ones. Its great weapon can transfix a codfish or tunny, and even, by repeated stabs, a whale, and will even penetrate the strong timber of a ship. At the College of Surgeons Museum one may see a portion of the bow of a South Sea whaler with the end of a sword from one of these fishes embedded in it. At one blow the fish had lunged his sword through and transfixed $13\frac{1}{2}$ inches of solid timber. Another

highly specialized family of fishes are the pristidæ or saw-fishes, belonging to sharks and rays. Their terrible saw-like weapon is developed from the cartilage of the mouth, and consists of five portions strongly welded together, furnished with lateral rows of teeth in sockets. The fish itself may be 20 feet long and the saw 6 feet. They have their mouth on the under surface like sharks and have no *needlessly strong* teeth. They strike their prey sideways, thus tearing the flesh to pieces, and devour it at leisure. One of the ugliest and most singular of fishes is the British angler-fish or sea-devil, with its marvellous fishing tackle, living at small depths on the coasts. Lying at the bottom, it can move on its surface, as if walking, with its pectoral and ventral fins used as limbs, and generally hidden in seaweed. It is also protectively coloured, and all round the great head are fringes. This is not all—the angler-fish lies with its great mouth wide open and is furnished with three long filaments inserted along the middle of the head. The longest of these, the first, is able to move in all directions by way of attracting prey into its capacious maw. Flying-fish need to be remembered, and are too familiar to need description, except to state that their flight resembles that of a parachute in principle and may extend to 500 feet.

Amphibia.—This class of animals is not of sufficient importance from our present point of view to detain us long, and it will only be necessary to mention a few characteristics of the group, of which frogs, toads, or the tailless amphibians, and newts, salamanders, or tailed amphibians, are the chief. They would appear in general to be very little protected against the various dangers of animal life, with their soft, naked skin. But in them a considerable element of protection is bestowed by their coloration, which strikingly resembles the colours and appearance of their surroundings, and which is able in a wonderful manner to change according to those surroundings. Their skin is moist and flexible and can be shed and renewed frequently. It serves the very important function of absorbing moisture from their damp, marshy homes or from the water in which they may live. This is their method of drinking. Their skin is also endowed with numerous glands secreting a milky, poisonous fluid, partly of a protective character.

Reptiles constitute a larger and more important group than *Amphibia* and include *snakes, lizards, tortoises, turtles, and crocodiles*.

They resemble birds and lower mammals in the manner of reproduction, the young being produced from eggs, but are strongly marked off from these two higher classes by the absence of hairy appendages to the skin or feathers, though certain extinct reptilian forms are believed to have possessed feathers. This point touches the much-discussed subject of the development of birds from reptiles, which is too large for present consideration. *Crocodiles* show the familiar hard, horny appendages to the skin in the form of plates arranged close to one another in rows resembling ancient armour, which are shown in all the regions most liable to injury, such as the back and tail. They are adapted both for life on land and in the water; but are unable to remain long under water. In accordance with their frequent habit of lying near the surface of water they possess a remarkable arrangement of the posterior openings of the nasal passages. These open as far back as possible in the cavity of the mouth just within a short distance of the upper opening of the windpipe, and this arrangement allows of the unusual power of taking air into the lungs when the anterior portion of the cavity of the great mouth is full of water, the external opening of the nostrils being placed at the very end of the snout and remaining barely visible above water. This constitutes a very efficient method of protection from foes and concealment from prey. The great rows of teeth and deeply-set eyes and small external ears, with their covering for protection, need only to be mentioned in the list of the armour, offensive and defensive, of the various crocodiles and alligators found in the subtropical and tropical regions of the world.

Tortoises and Turtles possess the well known exoskeleton or shell, and this constitutes their first line of defence. Their second is that of the horny, toothless beak. Their protective structures are almost entirely passive, and the form, texture, and arrangement of their carapace or shell is so familiar as not to need description here. Suffice it to say that the strong, hard substance of the plates, their firm articulation, the carefully convex shape of the whole, and the power possessed by many of the tortoises of withdrawing their head and limbs within the shelter of their movable castle, convey a high degree of protection against other than human foes. Indeed, one is not surprised at those practical old soldiers of Rome having invented or imitated the moving fort or *testudo*, on the lines of this arrangement of the protective structure of these reptiles.

Snakes present three main structures of a protective kind—*scales* developed on the integument, with which one must remember their remarkable power of frequently changing their skin, *protective coloration*, and among venomous snakes the *poison-fang* and *gland* with the muscular apparatus for ejecting a stream of the venom along the grooved fang placed in the front of the upper jaw. Time will not allow of any details being given. With these protective arrangements and their power of rapid sinuous movement snakes are not less equipped for the struggle of their life than other animals. The reserve fully developed poison-fang behind the one in use needs to be remembered. Indeed, it has been noticed that, considering the fact that non-venomous and venomous snakes get on equally well in life, the latter may be called over-equipped animals. The eyes of the snakes are provided with a thin transparent layer of skin for protection of these delicate organs, and this layer is shed with the rest of the skin and renewed.

Lizards, inhabiting mainly the land, some the trees, and some the water, are a large group of animals protected mainly by their colouring, active movements, and scaly skin. A few have a poisonous bite, but most of them are harmless. The most interesting from the present point of view are the chameleons, very sluggish, harmless creatures, mostly arboreal, but remarkably protected by their power of changing colour, not only according to their surroundings, but from yellow at night to dark green at dawn, and brighter in colour as the daylight increases. They have a singular thin tongue, several inches long, which can be protruded with lightning-like speed to any small prey, which the sticky bulbous end captures with unerring skill, while the creature itself may be solemnly seated on a bough apparently as motionless as the bough itself, with only its globular eye revolving in a weird manner. Lyddeker points out how utterly defenceless are these creatures apart from these characters mentioned.

Among birds the structures concerned in their protection are very remarkable and differ much from those of any other class of animals. The most characteristic are feathers; epidermal structures analogous to the scales of fishes and reptiles, or to the hair of mammalia. It is clear that there are two important purposes in clothing a bird with feathers. On the one hand, feathers are valuable non-conductors with the important effect of maintaining the temperature of the bird's blood in its rapid flight through cold air.

The feathers being set closely together and in different layers, one can see how a considerable bulk of warm air is retained round the main organs of the body. On the other hand, feathers, being very light themselves, assist materially in lessening the specific gravity of the body; and in addition to this they further diminish the specific gravity by retaining a certain amount of warm air, serving a purpose, in a more delicate manner, which the "swim bladder" of a fish does in its element. The construction of a feather is elaborate and marvellously complete for the purpose. It cannot be better studied from the present point of view than in the pages of Paley. One only need refer to the names of the various parts of a feather. The shaft is divided into quill and rachis, the latter giving off numerous processes called barbs. These are interlocked with one another by the delicate contrivance of barbules held together by fine hooklets. These together constitute the vane of the feather. One small point in the quill may be noticed, viz., that this tough, light structure is filled with air, and a small opening at the distal end called the "superior umbilicus" is furnished so that the air inside the quill communicates with the outer air, thus preserving the due degree of air-pressure in the cavity of the quill. All this mechanism testifies strongly, I think, to intelligence in operation, whence alone structures so light, so strong, so firm to resist pressure, so protective against heat, cold, and moisture as the commonest wing-feathers of a common bird could have proceeded. It may be added that the *distribution* of feathers is admirably adapted to a maximum of *protection, warmth, lightness, and smoothness of contour*, and a minimum of waste of tissue or size. In this connection one must mention shortly the remarkable oil-gland found in most aquatic birds. Anything more significant of design in the efficient protection of the feathers and body of an aquatic bird than this receptacle, placed in a convenient situation for the bird to reach it with its beak, it is hard to imagine. The small sac referred to lies in a sheltered, convenient position on either side near the tail of the bird within easy reach of its beak. It is well protected from pressure, and yields when squeezed a thick oily secretion, wherewith the bird "preens" its feathers, conferring upon them the necessary amount of "waterproofing," renewable as required when the bird's sensations inform it of its needs. Here is a case in which the protective structure is itself protected, reminding us

of the "periostracum" or "overcoat" of certain mollusca, to which reference has been made. Though not strictly protective structures, the air-sacs found in the bones of a great many birds may be looked upon as indirectly protective by reason of the warming effect upon the air of respiration, acting as a reserve warm-air chamber, which is of value to the bird in its rapid inspiration of cold air.

The *beaks of birds* confer necessarily protection upon them, as teeth do in other animals. The *skull* is welded together into one solid, light, strong bone in adult birds, and lightened by air spaces.

The *nasal passages* are protected by the position of the apertures, placed far back on the skull. The *external ears* are carefully protected by a tuft of hair.

The *eyes of birds* are specially protected by the "third eyelid," or "membrana nictitans," also highly developed in fishes, and much less in some mammalia. In birds and fishes this movable mucous membrane is of obvious advantage in protecting the eyeballs against the impact of foreign bodies in the air and water. It is capable of being rapidly moved across the eyeball, serving in the most beautiful manner to protect, lubricate, and cleanse the surface.

It remains only to mention the names of the leading members of this great class of highly specialized animals, and such of them as are familiar will at once suggest to our minds modifications of the protective structures given above. Lyddeker enumerates them as follows:—

Perching Birds, Woodpeckers, Cuckoos, Hornbills, Parrots, Owls, Ospreys, Eagles, Falcons, Vultures, Pelicans, Cormorants, Gannets, Storks, Herons, Flamingoes, Ducks, Geese, Swans, Screamers, Pigeons, Dodos, Sand-grouse, Fowls and Game Birds, Rails and Coots, Cranes and Bustards, Plovers, Curlews, Snipe, Gulls, Terns, Albatrosses, Petrels, Divers, Auks, Penguins, Tinamus, Ostrich, Emu, Cassowaris.

Among the great class of mammalia those characters conferred upon them for protection present to us a broad fact strikingly illustrative of design. This class includes animals of a higher organization in almost all respects than those that have preceded. Of these the most important is *higher cephalization* or increasing proportion of the size and complexity of the brain. In lower levels of life there are some remarkable exceptions to this broad rule, *e.g.*, among insects the brains of an ant so impressed Darwin

as to cause him to say, "Thus the wonderfully diversified instincts, mental powers, and affections of ants are notorious, yet their cerebral ganglia are not so large as the quarter of a pin's head. Under this point of view, the brain of an ant is one of the most marvellous atoms in the world, perhaps more so than the brain of a man."* But, broadly speaking, ascending brain-power, shown not only by proportional weight and size of brain, but by complexity as well, marks all the vertebrate or chordate classes, especially mammalia.

The striking fact in regard to characters for protection is the diminishing power and complexity of "passive" structures, correlated with the increasing power, through higher intelligences, of employing the "active" characters subserving protection.

The means subservient to the active protection of the body are such as the organs of movement, of sight, hearing, smell, taste and touch—claws, teeth, and horns. The various powers of burrowing, climbing, swimming, diving, walking, running, hibernating, exhibit some of the different methods adapted to the differing organizations of mammalia, and serving to protect them against a thousand and one dangers.

In regard to *passive* structures concerned in protection we find many still among mammalia, but in a markedly lower proportion to their multiplying needs than all that have gone before. The enumeration of the most common passive structures among mammalia, viz., *hairy coverings* of all degrees of thickness, *spines*, *coloration*, and *markings for protection*, and a few specialized forms, will show their comparative insignificance in this the highest class of animals. In truth a survey of this subject forces one to the conclusion that as animals ascend the zoological ladder they have increasingly to learn the art of living by their wits; an art which naked-skinned, unprotected man has been compelled to study to perfection, in the course of many bitter lessons.

We will here only mention the successive orders of mammalia, as given by Lyddeker, alluding briefly to the protective character of each.

1. *Monotremata* possess fur, strong claws, and certain of them prickly spines. *Marsupialia*, or pouched animals

* *Descent of Man*, i, p. 54.

such as kangaroos, wallabies, and opossums, have the characteristic pouch for the young, hairy coverings, strongly made, powerful tail, and configuration adapted to rapid leaping.

2. *Edentata* comprise sloths, ant-eaters, armadilloes, and pangolias, and some have a remarkable extraneous greenish growth of fungus on their thick, coarse coat, protectively coloured—*anteaters* a peculiarly tough, dense coat and hard skull, *armadilloes* a powerful cuirass of bony plates and the power of curling up into a ball and of burrowing rapidly. The South American *apar* can protect itself thus about as rapidly and efficiently on land as the “sea-hedgehog” was shown to do on the water.

3. *Sirenia* or sea-cows, with tough smooth skin, slow in movement, frequent shallow seas, rivers, and bays.

4. *Cetacea*, as whales, dolphins, porpoises, possess tough, smooth skin, “blubber” for protection against cold among whales, and large, active, quickly moving bodies.

5. *Rodentia* or gnawing animals—mice, rats, squirrels, rabbits, hares, beavers, porcupines—are mostly terrestrial, burrowing and nocturnal in habits, a few aquatic and a few arboreal. They have as defensive armour only fur as a rule, a few have spines, especially “the fretful porcupine” of Shakespeare, and as indirect means of protection strong gnawing teeth, with strong chisel-like cutting edge, and no canine teeth, as the latter would, if present, be useless to them.

6. *Ungulata* or hoofed animals, such as horses, asses, zebras, rhinoceros, tapirs, pigs, sheep, oxen, goats, deer, antelopes, giraffes, elephants, camels, possess a few passive characters, such as hairy coverings of various kinds, thickened integument, and certain special instances of protection by diverse means; and as active characters *horns, tusks, antlers* on the one hand and fleetness of pace and agility (*e.g.*, horse and goat) on the other.

7. *Carnivora*, such as *cats, hyenas, dogs, wolves, foxes, bears, weasels, racoons*, all possess hairy coverings of great value to themselves and for protection against adverse influences, also many protective markings. “*Vibrissæ*” or “whiskers” in all the cat tribe, a valuable tactile organ, each long hair being furnished at its base by a special sensory nerve; the singular papillæ on the tongue of cats, *curved backwards*, for the purpose of cleaning their fur, and licking clean the bones of their prey (in which character they differ from the dog tribe, which crush the bones with their teeth); the retractile

claws found in many Carnivora, whose beautiful mechanism and economy of force compels our admiration—these are but a few general and special contrivances for protection among this important order of mammalia.

8. *Insectivora*, such as hedgehogs, moles, and shrews, are inoffensive, burrowing, hibernating, and mostly nocturnal animals, and these show some important protective characters such as dull, *uniform colouring*, strong, coarse coats, and formidable erectile spines among hedgehogs; a delicate, velvety, strong coat among moles, which lies smooth when rubbed forwards or backwards; very strong claws, spade-like fore-feet, and elongated snout. Shrews show fur much like that of mice.

9. *Cheiroptera* or *bats* show modifications of the digits of the fore-limbs into a long framework on which is stretched the wing-membrane, enabling them to fly; the thumb being furnished with a claw, the hind-limb with hook-like claws by which the creature can suspend itself when asleep. They also have a beautifully sensitive sense of touch in the wing-membrane, nose, and external ears.

10. The remaining order of mammalia, *the Primates*, contains lemurs, monkeys, apes, and man, the least protected of all animals, except for such help as he obtains from his elevated intelligence. The armour, offensive and defensive, of the primates below man consists of hairy coverings, some protectively coloured, strong teeth, especially tusk-teeth, prehensile tails, powerful fore-limbs, generally extreme agility of movement, all of which conduce to a considerable power of taking care of themselves.

I think this rapid survey of leading forms of animal life with the methods of protection adapted to each will tend to bear out as far as it goes the statement of Weismann that “everything is adapted in animate nature.” It is a catalogue of contrivances for the important purpose of protection of individual animals, hardly less eloquent of design than such a record as the Patent Office, for instance, affords of the multi-form inventions of the human intellect. “Means adapted to calculable ends” may well describe this varied series of protective characters. And I venture to affirm that the conception of an intellect and will and power, not human and yet in measure interpretable by the human mind, concerned in the production of these characters, cannot be avoided.

This small contribution to teleology is offered to those who, in the words of Professor Campbell Fraser, “are trying,

as many now are, to realize intellectually, whether or not we are living and moving and having our being in an essentially divine universe—that is to say, in a universe that in its final principle is morally trustworthy, and that is more or less interpretable by man, in an exertion of theistic or religious faith, as well as of physical faith.”*

DISCUSSION.

The CHAIRMAN.—Is it your pleasure, ladies and gentlemen, to return thanks to Dr. Kidd for his communication? (Applause.)

I think we have listened to an exceedingly interesting and graphic account of the modes of protection, which are often the same as those used for supplying the needs of animals from the lowest to the highest order. We might often wish that some of those forms were not so well furnished with means of protection—for instance, when Dr. Kidd came to the question of the insect tribe, bugs, fleas, mosquitoes, cockroaches, and other forms which infest hot countries, and which require curtains to keep them from persecuting unhappy individuals sleeping under them, we might wish that Nature had not been so very adaptive to their wants for the purpose of perpetuating those noxious pests. But I suppose we must feel that every animal has its use. We cannot always see what their use is. We could very well, for instance, do without some of those I have mentioned, and such forms as scorpions, or flocks of those destructive insects, the locusts; and I hope as civilization extends over the regions where those animals seem to multiply, and to develop to an extraordinary extent, that man will be able, if not to exterminate them, at any rate certainly to reduce their number for the benefit of mankind generally. In the vast majority of cases that Dr. Kidd has enumerated this evening I think we must admit that we see most clear evidence of design, both for protection and for the supply and support of the animal life.

* *Giffard Lectures for 1895-6, Series 2, p. 2.*

Professor ORCHARD, D.Sc., in response to the Chairman, said : In response to your invitation, Mr. Chairman, I am very glad to express our sense of debt which we owe to Dr. Kidd for his thoughtful and suggestive paper this evening.

The subject of the protection of animals is, of course, a subsidiary branch of the great argument of design. It is a branch, however, which has generally been very much neglected. Dr. Kidd has done good service in the cause of truth in calling attention to it this evening.

The AUTHOR, in reply, said : I am much obliged to you for your very kind reception of this paper, which I am afraid was rather hurriedly written and is imperfect in parts.

I did not refer to anything in regard to the protection of man because that to deal with this subject would require a paper itself. It is well worthy of study—the subject of the protection that is given to almost every part and organ of the human body, the veins and arteries and those structures, apart from his own powers of taking care of himself. I often think that one of the most wonderful things is the little tube called the thoracic duct, conveying the lymph from the abdominal regions to the venous organs. It is in a most elaborately and carefully arranged position, so that it is never pressed upon by any large organ, and a wound in that tube or a stoppage is quite a rare case in medicine; illustrating the way in which this means of communication from one portion of circulation to the other has been thought out and protected. I can see no other view than that it is a matter of infinite and perfect knowledge and design. The substance is softer than a vein and far more important than a main vein, simply because there are no other means of communicating this immense supply of lymph to the body than by this little channel provided with valves.

The CHAIRMAN.—Perhaps Dr. Kidd may be induced some day, either this session or next, to give us a paper on this particular subject. (Applause.) He referred to Mr. Lyddeker's work. I suppose that is the *Royal Natural History*?

Dr. KIDD.—Yes, and Dr. Sclater?

The CHAIRMAN.—Yes, and Dr. Sclater's. I have been recently turning over its pages with the greatest admiration. I think it is one of the most beautiful works on Natural History that was ever

published, and I am very glad that Dr. Kidd has referred to it this evening.

Dr. KIDD.—I ought to say, perhaps, that I obtained a good deal of my information from that book that I have brought forward this evening.

The meeting then closed.

ORDINARY MEETING.*

WALTER KIDD, ESQ., M.D., F.L.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following paper was read by the Author :—

QUESTIONS INVOLVED IN EVOLUTION FROM A GEOLOGICAL POINT OF VIEW. By Rev. G. F. WHIDBORNE, M.A., F.G.S.

CONTENTS.

1. Evolution (as referring to life) not yet beyond discussion.
2. The evolution of artificial varieties does not entail that of the whole of life.
3. Meanings of the term: (1) an abstract idea; (2) the life-history of portions ("partial"); or (3) of the whole ("extreme") of animated nature.
4. Extreme Evolution, perplexing on the scientific rather than the religious side.
5. Difficulties to its action (considered apart from its cause).
 - (1) Any reasoning on it which assumes the present state of nature inconclusive.
 - (2) The existence of set species—
 - (a) in present nature.
 - (β) in geologic ages.
 - (3) The stability of certain forms.
 - (4) The increasing size of the faunas discovered in the older rocks.
 - (5) The age (*ab initio*) of these faunas being measurable by their most aberrant forms.
 - (6) The diffusion in time of related forms.
 - (7) The high relative position of many of the earliest appearances.

* January 21st, 1901.

- (8) The occurrence of characteristic fossils.
 - (9) The rareness of evidence of centripetal action.
 - (10) The "unknown quantity" of growth in embryology.
 - (11) The complexity of the embryonic cell.
 - (12) The presence of parents in embryology.
6. Extreme Evolution impossible as the unaided cause of the present cosmos.
- (1) It cannot explain the origin of primæval protoplasm.
 - (2) It cannot explain its potency to evolve.
 - (3) It cannot explain the influence of environment.
 - (4) It is mathematically incompetent to explain the present cosmos.
7. Therefore it must be governed by an outside Creative and Directing Power, and thus would actually be an argument for Theism.
8. Theism being therefore regarded as its basis, the question becomes one of pure scientific research ; the weight and scope of evidence to it.
9. The bearing on it of the tendency in the human mind to seek after unity in the essence of things.
10. The risk of mistaking mere similitude for relationship.
11. The question of the evolution of the material organism may after all be dominated by higher attributes of life which it cannot itself reach.
1. **I**N the present state of scientific thought it may be deemed heretical to raise any demur to Evolution. The great theorem is now so generally regarded as a proved fact, so widely assumed to be incontrovertible, that even to discuss its validity sounds almost like rebellion against the scientific dogmatism of the twentieth century. If this be so, I am content to be ranked as unscientific. For, admitting to the full the true force of the crowding arguments and innumerable facts adduced in its favour, I cannot shut my eyes to difficulties not yet, I think, explained away, and liable, I fancy, to gather strength as days go by, and scientific knowledge is still more increased.
2. The doctrine of Evolution (considered only as applied to life) can be held in many various degrees of strength. The full and extreme view would trace all living things, including man, to some simple cell-mass or protoplasm,* some primordial vitality, of which little can be predicated, except (1) that it was living matter, (2) that it had somehow the potentiality

* The term *Protoplasm* is only used in this paper in the general sense, and not in rivalry or contradistinction to *Bioplasm*.

of almost limitless development, and (3) that its origin has hitherto been utterly unexplained. But short of this it is possible to hold the doctrine in many less degrees, until we come down to that which at all events is a fact of common knowledge—the production under human agency of quasi-permanent varieties within a species. If this last be called evolution, we must all perforce be evolutionists! But the climbing of a molehill does not guarantee the ascent of Mount Blanc. There is no slight difference between this minimum and the maximum of the theory; and the question is how far from the minimum to the maximum we are led by Nature. Whether the chain of life is one and unbroken throughout, or is composed after all of various series which though corresponding in character are distinct from each other;—whether in short the fragmentary groups of links which scientific research has joined together betoken one single gigantic chain, or only a greater or less number of short independent chains, is a problem which requires not hypotheses, but actual facts, for its satisfactory solution.

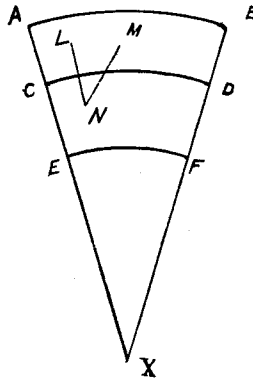
3. Now, it is hard to know what is really to be understood by the word “Evolution.” There is a danger that its acceptance as a term for a principle *de minimis* unconsciously entails its acceptance as the assertion of a fact *de maximis*. It is a convenient word, a clear expression—so convenient and so clear that it fits on at once, and accurately, to several deep and different ideas, and is in fact commonly and logically used for most of them; and it is by no means certain whether thereby much is not frequently taken for granted, which, if each separate idea could be expressed by a separate word, would be found to require elaborate proof. Perhaps in this paper it may be permitted to use the word “Evolution” for the process in the abstract; to call the extreme historical form of the theory “extreme evolution”; and to call its less extreme forms “partial evolution.” This may I fear be clumsy, and perhaps ineffective; but I do not myself happen to know terms which distinguish these distinct and different meanings of the word, the confusion of which can only be confusing.

4. To my own mind Extreme Evolution is not a question affecting religious faith; and that for this following reason—that it is so utterly impossible that it could have been the life-history of existing nature, except it was altogether under the guidance of a governing power outside itself, that it

almost more forcibly predicates Theism, than does any other method by which it is conceivable that the present state of nature could have been effected. This point I propose to consider more at large further on. At present I only premise that from a Christian standpoint I am prepared, freely and fearlessly, to accept extreme evolution as a probability, if its probability be proved, or as an established fact if it can be established as a fact. My only practical difficulties are upon the scientific side.

5. I will begin by stating some of these difficulties to extreme evolution in itself (as apart from the postponed question whether it be automatic or controlled). I know that Embryology brings many and great arguments to bear upon it which I am not at all competent to weigh in detail. With the exception therefore of some general remarks upon them, I will treat the matter only from the sides of practical geology and elementary mathematics.

5 (1). The first difficulty may be simply illustrated by a diagram. Existing life consists of a number of animal and vegetable species, vastly numerous but not infinite. It is possible to imagine a far vaster number of other possible forms; and as a matter of fact, even now, unknown existing species are being constantly discovered, yet without appreciably increasing the ratio of existent to non-existent but possible species. Let, therefore, existing nature be represented by



the arc of a circle, AB, whose centre, X, shall, on the assumption of extreme evolution, represent primordial protoplasm. It is the method of the extreme evolutionist to trace back the various forms of life from the circumference to the

centre, helped on by data from intervening arcs, CD, EF, etc., representing various geological ages; and certainly very often surprising and fascinating results are thus obtained. Certain chains, for instance, LN, MN, appearing to result in common ancestry, are brought to light, and these are regarded, therefore, as proofs of extreme evolution.

But the difficulty lies in the fact, that this process of investigation is backward. It does not take into account that in the action of evolution during any one geologic age the limitations now seen in the subsequent ages were non-existent. It is one thing to draw lines backward from a definite arc and thereby to find the centre; it is a totally different thing to start from the centre and by the sole action of evolution to produce lines which shall happen to impinge upon this definite arc. The first process is limited by the existing arc; the other process is entirely independent of it. What has really happened in nature according to the theory of extreme evolution is not that a given assemblage of forms have worked backwards to an original unity, but that primæval protoplasm has started from the beginning, and through the ages has gone on developing, until from its free action has resulted existing nature and nothing else. Of course it may be said that the evolutionist *does* trace development forward as well as backward; but the crux is that in the argument the present age is accepted as definite, and thus practically becomes the basis on which that argument is built. The real question to be solved is not "Can existing nature be traced back to one protoplasm?" but "Could primæval protoplasm by its free development produce existing nature; and, if so, why did it produce that and nothing else?" Looked at thus, such theories as "natural selection" and "survival of the fittest" do not seem to lead us very far towards a solution; because the proofs of them adduced either more or less assume the goal to which the starting-point is directed, or else imply, but do not acknowledge, some independent force working from without, and thereby modifying the action of evolution by an ungauged element not of its nature.

5 (2). Another and somewhat kindred difficulty arises from the fact of the existence of Species at all. Whatever value we may attach to species, whether we estimate them as persistent or mutable, the fact of their existence is one of the most notable and widespread phenomena of nature, and one which has to be reckoned with by evolutionists. What

are species—not as regards their outside limits, but as regards their essence? They are assemblages of vast multitudes of similar beings, lasting certainly for very many generations, sometimes even for geological periods, which, though constantly, it may be, subject to small individual variations, yet remain so essentially alike, that they must be regarded throughout the term of their existence as one and the same kind of animal—such that the action of evolution must on the whole be said to be either arrested or imperceptible within them. Granted that evolution may be traceable in their varieties or in their connections with kindred species, yet, to say the least, their existence at all means nothing else than the constant retardation of evolutionary action. It asserts that evolution at most can only act by steps and not continuously. But this cannot be the ideal of evolution! If that were the sole agent in the advance of nature, it seems only conceivable that it should act so equably and uniformly, that the whole advance should be by infinitesimal variation all through; that in the present nature there should exist no specific persistence of forms and no specific limits except those caused by accidental breaks or failures, which, in their turn, should always tend to eradicate themselves again; that within any one species development should be so constantly and uniformly going on, as, normally and continuously, to expand its amount of variation without splitting it up by new specific limits. In fact evolution ought *a priori* to be supposed to produce the obliteration, not the multiplication, of species.

5 (2 β). Further the existence of set species is a phenomenon not only of the recent period, but of all known geological ages. We acknowledge fully the imperfection of the Geological Record, but at least it is congruous with the better known Recent Period in the nature of its specific limitations. No doubt fossil species are occasionally found in a state of disintegration: occasionally too this state tends to their splitting into sections which may in cases be traceable as the ancestry of distinct species in a subsequent age. Thus far, it may be granted, there is some amount of evidence for evolutionary change. But all this is a very small exception (as far as is hitherto known) compared with the stability of the species at any known geological level. The general rule is to find kindred species, rich in individuals, contemporary in one age or consecutive in more than one,

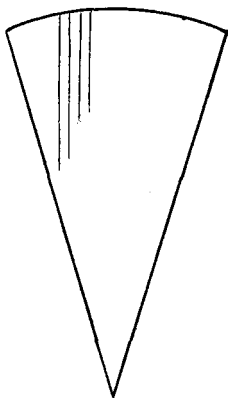
which, in spite of their resemblance, are so distinct that their individuals can rarely be confused. It has to be remembered too that fine specific distinctions scientifically drawn have often in nature no more than varietal force, and that if by the conjunction of such forms the number of acknowledged species were reduced, the ratio of known instances of transgression of specific limits would be very much more than proportionally lessened. It has to be remembered too that the actual tracing of a being from one species to another is a very different thing to the tracing of it from one genus to another, and that extreme evolution no less demands the latter (and much more) than it does the former. On the other hand, one has only to collect a few ordinary species *en masse* to realize how strong, in spite of individual variability, specific unity generally is. When, for instance, *Atrypa reticularis* may be collected in vast multitudes from England, Germany, America, China, Australia and the Arctic regions, and from the Silurian and Devonian; when it varies so greatly within itself that two specimens are rarely facsimiles, and yet has so strong an individuality that there is as a rule little difficulty in recognizing it; and when there appears to be absolutely no trace of anything like it in the Carboniferous age*; it can only be said that specific stability is sometimes a very formidable opponent to the play of evolution.

It may be remarked, by the way, that the force of one of the supposed motors of evolution—viz., Sexual Selection—must evidently be in the main against, and not for, variation, being of necessity an antidote to individual variability.

5 (3). A kindred difficulty arises, when we attempt to trace the genealogy of species through successive ages. Here too we find much evidence in favour of evolutionary action. We find sometimes two species in consecutive ages, distinctly different, and yet so similar that it is natural to suppose that the one has descended from the other, although the actual linking may be rarely observed. But we may often go very much further; we often trace such nearly similar forms on through many ages, and then their very connection becomes as much an argument for the limitation, as for the existence, of variation. From first to last their variation hardly exceeds generic

* Unless shells described by Professor Herrick from a "Devonian facies of the Waverley or earliest Carboniferous fauna of Ohio" be an exception.

bounds:—for instance, *Lingula* of the Recent compares with *Lingulella* of the Cambrian, *Rhynchonella* of the Recent with *Rhynchonella* of the Ordovician, *Heliopora* of the Recent with *Heliolites* of the Ordovician, *Nautilus* of the Recent with *Nautilus* of the Silurian.* Thus some animals have traversed almost the whole of known fossiliferous time with barely generic variation. Hence, returning to our diagram, we have to draw to the circumference of the Recent Period these radii almost parallel throughout the known life-ages before producing them backwards to find the centre of original protoplasm. It may be questioned indeed whether there is in them any divergence at all; whether for instance *Heliopora* is more differentiated than *Heliolites*; but even granting this, it is, on the basis of extreme evolution, pure assumption to assert, that in the pre-fossiliferous ages they had diverged more rapidly than they afterwards did in the



fossiliferous ages. No sufficient reason for such a cessation of advance has been given; if anything it would be more reasonable to suppose that the potency of evolution increased rather than diminished with the progress of time and the advance of organic grade. But this is to make the pre-fossiliferous ages hugely vaster than the fossiliferous ages. Yet already we know how difficult it is becoming, even on a very much modified uniformitarian basis, to account for the accumulation of sediment shown by the fossiliferous ages in the time (the lessening time) allowed by physicists for the age

* Ehlert in Fischer's *Manuel de Conch.*, 1887, placing it as a sub-genus of *Lingula*, remarks, "it is the most ancient form of Brachiopod actually known."

of the earth. That dilemma, therefore, becomes greatly intensified by the vast period which has thus to be predicated for the existence of life before the earliest of the known geological systems.

5 (4). And further the constant discoveries of new forms of life in the older formations are yearly increasing this dilemma. We are continually finding that various genera, families, and even orders, reach a little further back in time than we knew before. We are gradually learning that the older formations contained a very much larger and more varied fauna than has been hitherto supposed. Thus the imperfection of the Geological Record becomes constantly more evident. For the discovery of new forms only renders the existence of many others, yet undiscovered, more probable. And the larger these old faunas are found to be, the larger is the field for which extreme evolution has to account in pre-fossiliferous ages; and therefore the longer is the time required to be allowed to those ages for their development.

5 (5). Further the discovery at the same time of linking species or of generalized forms does not lessen this difficulty where aberrant or specialized forms exist alongside them; for it is the most aberrant and specialized form of any one period that has to be traced back to primordial protoplasm if the theory of extreme evolution be valid.

5 (6). Another sphere of probable difficulties lies in the general temporal arrangement of related forms. While the different formations have each distinctive facies of their own and their faunas grade upwards in a most notable manner, we not only find the above-mentioned persistently stationary forms all through, but also a distinct scattering of related forms with very little apparent connection to epoch. Thus if a systematic list of the genera of almost any class of animals be examined, it is remarkable how completely commingled the ages of its adjoining genera appear; old and new formations occur side by side on many of its pages; and it cannot in itself be made the basis of a chronological classification. Even where, as in the corals and crinoids supposed time-groups have been made the groundwork of a physiological classification, that classification has been proved by further research to break down. It may of course be argued that this only indicates the greatness of the number of the "missing links" in it; but, if so, it at least emphasizes the greater magnitude of the original chain.

5 (7). Akin to this perplexity is that of the high relative

position in their groups of many of the earliest known species of those groups. Certainly we have nothing in any fauna that indicates it to be an early stage of development from primæval protoplasm. Even the earlier palæozoics, though in parts restricted, have all the characters of fairly grown up faunas. Put aside vertebrates, and the amount of variety in the Silurian and Devonian faunas does not (allowing for the imperfection of the Geological Record) present any very striking contrast to the amount of variety in the present age. That is to say, if the progress of evolution be taken as a measure of geologic time, the Devonian and Silurian systems would find places in the scale which would be approximately near to the Recent compared with the Age of primordial protoplasm. If, in still older formations, simple forms are found which are supposed to be archetypal, there is nothing to show that they are not themselves stationary or even degenerate forms, as indeed the nearly synchronous existence of other higher and varied forms almost presupposes.

5 (8). Again the frequency of "Characteristic Fossils" brings into view a broad range of difficulties. By their characteristic fossils the same strata may be recognized in different localities, often at great distances apart. Their constant occurrence points to the great geographical extension of species in synchronous or homotaxial minor epochs, and also suggests the question how far Evolution can account, not only for change, but for identical change over wide areas. To take but one instance, *Rhynchonella procuboides* of the Eifelian is replaced both in England and Germany by *Rhynchonella cuboides* in the Cuboides Beds. Thus we have an apparently very sedentary species similarly replaced in distant countries. This can hardly be supposed to have been effected by a single operation, but seems to imply a wholesale modification producing in distant regions the same result.

5 (9). Yet another difficulty lies in the fact that the action of free evolution ought to be as much centripetal as centrifugal. There is no intrinsic reason why variation from type should be stronger than reversion to type. When a species has varied under the control of man and thereby produced definite varieties, the first thing which happens when that control is removed is that the varieties merge and the old conformity is re-established. But such reversion is hardly to be noted in geological ages. We rarely, if ever, find a species, once modified by descent into another species, reverting in a subsequent age back to the original species

again. Even the colonies of Barrande have been proved to be fictitious. It may, in fact, be said to be a law of palæontology that a species once extinct never revives. Species do not repeat themselves in diverse ages; evolution, having climbed on from a level it had before achieved, appears never to sink back to *exactly* the same level again.

5 (10). We may now venture to turn, though in a very brief and general way, to embryology. The notable correspondences between the growth of the embryo on the one hand, and the graduations in biology and palæontology on the other, are regarded by some (perhaps rather hastily) as authoritative demonstrations of extreme evolution. It may be open to question how far they really bear upon it at all.* For embryology traces the progress from the simple germ to the elaborate mature animal, but does not explain the motive forces of that progress. Its answer to "Why does it?" cannot get beyond "It always does." It asserts its laws as customs, not as ordinances. It reveals the executive, not the legislative, powers which govern nature. One thing it does. It reveals the orderliness of the progress, both in the sequence of growth in the individual, and in the correspondences of growth in the mass of individuals. In fact, it emphasizes the order of the cosmos, though the secret of the reason of that order lies just beyond its sphere. Another thing it does. It reveals the inadequacy of the embryo, regarded as an intrinsic material cause, to produce the mature animal solely as its effect. It thus shows that there is an unknown quantity running all through the problem, and that not as a mere subsidiary, but as a dominant factor to which the solution is due. It is no elucidation of this factor in itself to prove that the results of its working may be measured and defined.

In fact, when embryology has told us everything it has to tell, it leaves the question of the motive power which causes growth, not only unsolved, but more abstruse than ever, inasmuch as the wonders of the processes increase the evidence to the wonder of the power. Indeed in this line scientific discovery is grandly building up the altar to its unknown God. The correspondence of embryonic development to evolution is like a photograph; it is the reproduction

* Dr. Walter Kidd in his paper, "Creation or Evolution" (*Journ. Vict. Inst.*, vol. xxxii, p. 191), deals very exhaustively with this subject and shows that embryology does not go towards sustaining evolution.

of a material view, but one which needs the sun's rays to produce it.

5 (11). It may also be observed that a flaw in its evidence to extreme evolution lies in the fact that the structure of the embryonic cell is very far removed from that uniform simplicity, which used to be (if it is not still) logically assumed for the starting-point of life. Without pursuing this point further it may be enough to note how the process of *Karyokinesis*, as described in this year's Presidential Address of the British Association, presents not only specialized energy but elaborate machinery in the fundamental structures on which the science of embryology is built. Either the most primitive embryo does in no way correspond to primal life, or primal life must in specialization have been very far removed from the simplicity of that chaotic organism which some have almost seemed to hope might be deduced from the inorganic by little more than accident.

5 (12). A difficulty is also developed by a difference between the arguments for evolution from embryology and from palæontology, which must be regarded as *fundamentally important*. In both we trace from the embryo to the mature, from protoplasm to perfection, but in embryology we have something behind the protoplasm, viz., the perfect parent, which, if it does not explain the cause of the growth, at least gives an antecedent reason for expecting its result. But extreme evolution as exemplified by palæontology knows of no parent. To imagine some highly organized being as the parent of primæval protoplasm would be at once to upset the whole theory of the evolution of nature. In that no one would suggest a recurring series, but only a simple advance. If then embryology be called to evidence, arguments from a recurring series have to be applied to explain a simple advance. It remains therefore that to the "unknown quantity" of growth in embryology we have to add the "unknown quantity" of *origin in palæontology* before the facts of the former can be logically brought into line for application to prove extreme evolution.

6. With such difficulties to its action in view, we turn now to the question whether extreme evolution can be of itself conceivable as the "ratio" of the present cosmos.

Here we are met at once by four considerations.

(1) *No rational explanation of the origin of primæval protoplasm itself has ever been given except the creative action of an outside Power.* Nothing can be predicated to it which could

in any way account for its origin *per se*, nor is there anything provable about abiogenesis which can in any way support it by analogy. To produce an *amœba* from warm oil is jugglery not science. Let the oil-amœba reproduce itself, and go on reproducing itself, and we will believe it. Otherwise it is no more an animal than an automaton is a man. Even the cell in embryology implies its parent. "Ex nihilo, nihil fit" remains a principle. "There can be no effect without a cause." But to primæval protoplasm no ancestry is conceivable, and for its origin no cause whatever can be assigned, excepting one—and that is all-sufficient—the action of an outside creative Power. It knows no parentage but the power of God.

(2) *Still less is any rational explanation of the endowment of primæval protoplasm with evolutionary potency conceivable except by the action of an outside Power.* Evolution implies not only variation but advance. Whatever advance has come *ab intus* must be measured by the original potency of the protoplasm; and therefore its assumed simplicity can be no more real simplicity than is the elaborateness of the highest resultant organism. The infinitesimal calculus of evolution gives only an explanation of the method of advance; it no more explains the cause of the power to advance, than if the whole advance had been effected by a single instantaneous operation. Either the force producing the advance must come actively and independently from outside, in which case it is not evolution; or it must be constantly immanent in the advancing organism, and therefore originally to its full extent potentially immanent in the primordial protoplasm. It is therefore no easier to explain the origination of that protoplasm, than to explain (without taking count of its ancestry) the origination of the highest organism that has resulted from it. That is to say, the outside power that produced the protoplasm with such a potency, must have been at the very least as mighty as if it had directly produced the highest organism that has resulted therefrom.

(3) *The introduction of the consideration of circumstance, or correspondence to environment, does not account for the cause of the action of evolution.*—Correspondence to environment must result, as to any particular organism, either from animate or from inanimate circumstances. If the former, it is only due (on the theory of extreme evolution) to the development elsewhere of the same original protoplasm that gave rise to that organism itself. Its action, therefore, is covered by the

remarks in our last paragraph, and need not here be considered further. If on the other hand it results from inanimate circumstance it must be accounted for through the forces of inanimate nature. It really is part of the question involved in the nature and history of the earth and sun and air. Whether the natural forces inherent in these are sufficient to explain much of the advance which the theory of extreme evolution requires, we need not now discuss. So far their outside influence may be allowed for the sake of argument ; but we are thereby simply carried back to the greater question, "*What brought about inanimate nature itself?*" It contains in itself no reason for its own history, no explanation of its own origin. If it be sufficient to account for sun and air and earth, for chemical elements and physical agencies, by adopting Topsy's science and saying "they growed," the question may be left unsolved. But if inanimate effects, no less than animate, must have a cause, if it is unimaginable that the existing Universe arose without an Author, then too these outside correspondences are only the methods of His work, they are the channels, not the causes, of the incentives to evolution, which thus must find their only starting-point from Him.

(4) *Extreme evolution, acting through any measurable time, is inadequate to explain the production of the present state of animated nature from primordial protoplasm, except under the definite outside control of a Power, acting incessantly to direct and hasten its action, so that such results should be produced.*— For the doctrine of chances, applied to the unaided advance from protoplasm by evolution, at once shows how improbable it is, that, even in an illimitable time, the present "cosmos," with its intricate variety elaborately in order, could be achieved by it alone; and the acknowledged time-limit turns this improbability into a mathematical impossibility. Such difficulties to the working of extreme evolution, as we have already reviewed, would, if it were supposed unaided, become at once insuperable. In face of these drawbacks no possibility of such a result to its action would be conceivable at all, unless an outside Power turned its weakness into strength.

7. But if these things are so, we arrive at this ; that Nature, in its origin, progress, and present state, is the workmanship of an outside originating and controlling Power ; and therefore we may, and have a right to, use for it the word "Creation"; and extreme evolution, if it could be asserted as an established fact, would be the strongest argument for Theism.

8. Next, therefore, taking Theism definitely as our basis, and acknowledging to the full all that the existence of the Almighty Creating and Controlling Power means, we may proceed to inquire how far evolution, either extreme or partial, may be taken as an established fact, or be regarded as a probable or possible explanation of the method of Creation.

We certainly have now an adequate reason for its possibility; but we have in the same factor equal reason for the possibility of other methods of Creation. There are multitudinous data proving correspondence and similarity and relationship between different kinds of beings, but it can no longer be argued that these of necessity point to community of origin, but only to the unity of that Intelligence by which they were arranged. For we have found that we are dealing with "workmanship"; and the investigation therefore is no longer limited to the mere mechanical tracing out of consecutive changes in advancing organization, but enters the higher sphere of the consideration of the *plan and purpose of the great Worker*—the Worker whose power, once discerned, must be acknowledged to be only describable as infinite. In His working, order and connection and similitude and correspondence appear on every hand; but these are not necessarily proof of unity of origin in the works themselves, but only of a comprehensive plan of the Author. Hence to gauge their true bearing on the former question, they must first be weighed in detail in the light of the latter. Is it not possible that the shutting off of this latter consideration, now scientifically fashionable, is really the great weakness of evolutionary doctrines? For instance, the first difficulty, noticed above, is at once swept away by a recognition of the Divine plan of creation. The present cosmos thus becomes the foreseen goal towards which the action of evolution may have been directed throughout preceding ages: and so the present state of animate nature becomes a definite basis for the inquiry upon evolution. It is, however, *a priori*, equally easy to imagine that its Author willed to bring it about from a single primordial origin or protoplasm, or that He willed its various elements to come into existence as separate creations at different times. It lies with us, therefore, to examine all obtainable evidence and seek therefrom to ascertain, more or less clearly, His methods and His plan of work. The question thus becomes one of pure scientific research, unbound by the

limits of any preconceived human axioms. We simply have to weigh every fact of paleontology and of embryology, and to inquire in what direction its evidence goes. That evidence has now become weaker on its mechanical, but stronger on its philosophic side.

This change in the weight of the evidence may be illustrated by a trivial allegory. Suppose we were entirely ignorant of the art of pottery, and that for the first time we came across some ordinary set of china ware. Suppose too either that our knowledge were so bounded that we did not recognize their purely mineral character, or that we had some scientific reason to regard them as in the nature of fossils or remains of something having a history akin to life (assuming the possibility of a character ranking with, but distinct from, those which we know as animal and vegetable life). Upon examination of the set we should at once be struck with the various similarities existing in its diverse articles, which would clearly prove to us some definite relationship between them all. Next suppose that in our investigations we discovered, besides the finished set, a workshop containing the unfinished articles in various stages of incompleteness down to that point where they were all in their most immature condition. It would be only natural to apply to them the doctrine of evolution, and doubtless the result would be to trace the whole varied set back to a common source, and to find for them all a common origin. But, leaving supposition, let us now face fact. The fact is that on the one hand the set owes its cosmos not to unity in its own origin, but to the mind of the Potter; but that on the other hand the immature examples do truly point to actual descent through the working of the Potter's hands. We need not pursue the illustration further. The correspondences of animated nature reveal the unity of the Creative Mind, whether or not they prove universal community of descent in things created. For the latter problem scientific research does not yet seem sufficiently advanced to give a final solution; but its progress may tend to do so at some future time. What seems essential is that it should never be assumed to prove more than in any particular it actually does prove; that no missing links in any chain of facts be allowed to be filled in by theories however specious or ingenious; and that every discovered scientific fact be given its true weight without bias, and be never fitted by force into a preconceived hypothesis.

9. There seems a natural tendency in men's minds to seek after unity in the essence of things. The "unities" of the poets no less than the uniformitarian and evolutionary theories of scientists are phases thereof. The importance of this tendency is not to be minimized: it may be the instinctive groping after truths whose real roots and meanings have not yet been scientifically fathomed and comprehended. But on the other hand it is possible that an interim result of this tendency may be the narrowing and restriction of the greater truth from the failure of present discovery to reach its centre. We learn by mathematics that all parallel straight lines meet at infinity; to the unassisted human eye they would appear to meet very much sooner. It must be said that the arguments of evolution do make for this underlying unity in creation. But it may be that the extreme evolutionist is seeking its origin too near; that he is prematurely uniting chains of life whose roots start really far beyond his ken; that the telescope of his research gathers up unity too quickly from the inadequacy of its focal length to penetrate to its true source; and that improved telescopes may hereafter dissolve the nebula now seen and reveal unfathomed distances in the cosmical mystery of life. For from the point of view of the Christian thinker the unison of nature must have a far wider range, a much deeper seat, than has yet been dreamed of in the naturalist's philosophy.* He finds its source and final explanation at no point short of the Unity of God.

10. In the evidence of any detailed facts to evolution one very "slim" danger cannot be too carefully observed. Similitudes, however striking, do not of necessity point to a common original. The ancestry of the horse, for instance, has been a favourite subject with evolutionists. It is well known to be an awkward fact that lines of descent have been worked out deducing it from two distinct sets of ancestors. Again, having had to study carefully the critical marks upon the cephalothorax of *Bronteus*, I was amused at noting their exact agreement with the lines on a baby's face. No one, I imagine, would argue that this quaint similitude indicated relationship. But, were such a striking resemblance observed in nearly

* "Πίστει νοοῦμεν κατηγορίσθαι τοὺς αἰῶνας ῥήματι Θεοῦ, εἰς τὸ μὴ ἐκ φαινομένων τὰ βλεπόμενα γεγονέναι."—Heb. xi, 3. By faith (the evidence of the unseen) we realize that the ages have been builded up by the voice of God, so that not from phenomena have the things we see been made.

allied organisms, it would (and possibly quite as fallaciously) be regarded as a certain proof of common origin. Again, I have known Brachiopods externally so similar as actually to be placed in one species, until their internal arrangements were discovered, and found to be fundamentally different. The fact is that the relationships relied on by evolutionists must in general be described as distal, not proximal, to the motive centre of being. There is, therefore, the more danger that supposed relationships may sometimes prove to be mere accidents unconnected by anything but coincidence of appearance. But even where the relationships are true, they cannot be wholly accounted for as simple and direct modifications of the resembling parts themselves. The reasons for their production must be sought not merely from the particular local circumstances of the organs in which they occur, but from the innate being of the animal itself producing local changes in its parts consequent on tendencies that may have been produced upon itself by the local causes.

11. This brings me to my last remark—that the material organism is after all not the whole animal. The organs are not the senses which they habituate, and by which they are worked. And the organs are for the senses, not the senses for the organs. The brain does not evolve talent, but talent evolves the brain. The instincts, the mind, the soul are attributes of animal life unreached by embryology or palæontology; and to its material outcome they may hold a superior, not inferior, place. They may be lieges, not feudatories, to its form. The life-essence of the gorilla and man may, for instance, be dissevered by differences as fundamental and far-reaching as are the marks on the cephalic shield of *Bronteus* and the lines on a baby's face.

DISCUSSION.

The CHAIRMAN.—We have a most valuable paper this evening—one which contains a large amount of material for discussion.

I will only just point out that besides the technical part, occupying no less than eight pages, there are important groups of subjects, so well arranged, that they offer opportunities to many of us to discuss, without that technical knowledge necessary to express our views upon them.

I also observe that the author of the paper refers to *evidence*. In these matters we can never go beyond evidence. We can never have a completed induction—there must be limitations; and

we cannot arrive at definite conclusions as in the case of the laws of gravitation for instance. Therefore it can never be more than a more or less good induction.

I should, perhaps, refer to one point that I like very much in the paper, where the author speaks of evolution on these lines in the sixth section, p. 14. I will read the passage, as I think it very important. "For the doctrine of chances, applied to the unaided advance from protoplasm by evolution, at once shows how improbable it is that even in an illimitable time the present 'cosmos,' with its intricate variety elaborately in order, could be achieved by it (*i.e.*, chance) alone; and the acknowledged time-limit turns this improbability into a mathematical impossibility."

I think we ought to be thankful that mathematics can be brought into the question.

Mr. SCHINZEL observed that it was well known that Darwin's bold hypothesis "has gained much popular credence with the general public so that evolution and its accessories—'natural selection,' 'struggle for existence,' and 'survival of the fittest'—have become popular catchwords supposed to be sufficient to explain all the mysteries of nature, while the unthinking multitude are using the theory of evolution in many ways not contemplated by its authors." Those are words quoted from Sir J. W. Dawson's article in the "Expositor," and no one ventures to range Sir J. W. Dawson among the "unscientific."

The author refers to the varieties produced by human agency. This is the special work of the fancier, an individual unfortunately not represented in nature. But all the dog varieties are dogs differing only in outward form, and they breed together, which would not be the case if they were of different species—and the same holds good of fancy pigeons. Nobody has ever succeeded in producing a lion, or even a rabbit from a dog, or a vulture or partridge from a pigeon. The able lecturer again alludes to the same subject further on (p. 16). Allow me to give an illustration.

It is a fact that when fancy pigeons are turned out into a state of nature they soon revert to the rock pigeon, their ancestor. "Natural Selection," says Mr. Duncan Graham, in his book, *Is Natural Selection the Creator of Species?* p. 75—"here makes the awkward mistake of exterminating the improved breeds and preserving the parent forms." The same, by Mr. Wallace's own admission, is the case with fancy rabbits.

I can only conclude that natural selection must be untenable.

The SECRETARY (Professor EDWARD HULL, LL.D.).—I think it is the duty of a Secretary to hold his peace except when he is called upon to speak in his own province as Secretary, but I suppose as a brother geologist to the author of this paper it would be looked upon as an act of disrespect on my part if I did not make some observations upon it.

In the first place allow me to say, as I think you will have all gathered from the paper itself, that Mr. Whidborne is admirably furnished with the necessary knowledge and experience to deal with this problem on geological lines. He is a good geologist himself—a worker in the field—a Fellow of the Geological and of the Palæontographical Societies, in which he has taken an important part, and I am happy to say he has taken an equal interest and important part in the work of the Victoria Institute.

Some of the points to which I intended to refer have really been anticipated by the author.

It has always appeared to me that there are some tremendous difficulties, which geology presents to us, in accepting any theory of evolution. In the first place what the last speaker referred to is very strong when we look at the remarkably sudden and early appearance of very high types of life amongst the strata of the globe. That remarkable and widespread zone known as “the primordial zone” of Barrande, contains Trilobites, crustacea furnished with limbs, and with beautifully constructed eyes, like those of the dragon-fly; and they are very highly organized marine animals indeed. Where does the group of Trilobites come in the geological record? Does it come with the Devonian or the Upper Silurian, or even the Lower Silurian; the Lower Silurian being the direct successor of the primordial zone and amongst the oldest fossiliferous strata we know of? Not at all. It comes in with the primordial zone itself in Britain, Sweden, Bohemia and other parts representing the earliest fossiliferous strata. And along with this type of crustacea we have the Cephalopods—not altogether dissimilar from the Nautilus of the present day. Thus we have the highest type of the mollusca coming in at this early stage of biological history.

Then as to the appearance of plant life on the globe. Through the long ages down to the upper Cretaceous, the flora of the world was represented by lowly organized types such as algæ, lichens,

ferns, palms, cycads and conifers. But with the upper Cretaceous stage of geological history there appears, "with startling suddenness," a whole array of more highly organized forms, namely, dicotyledons representing the forest flora of the present day in sub-arctic and temperate regions. Professor Oswald Heer, in describing this fossil flora as it occurs in Switzerland, says truly that it is "the introduction of a new fundamental conception into the vegetable kingdom." Here we have for the first time oaks, poplars, plane-trees, walnuts, figs, willows, tulip-trees (*Lyrio-dendra*), hornbeams and myrtles, representing the temperate flora of the present day, and developed on a new organic principle as compared with that of preceding geological periods. The change from the monocotyledenous to the dicotyledenous type in the prevalent flora of these regions is remarkable for its completeness and rapidity, and is analogous to that which, as we have seen, has taken place in the animal kingdom in past times.

Now, how are we to account for these phenomena? I do not believe, given all the license that you may demand for the incompleteness of the geological record; of the occurrence of great gaps in the succession of strata which we have not been able to fill up; these, I confess, do not satisfy my mind as a sufficient reason for the appearance of these types. But we have other types. We have the first appearance of the vertebrata and mammalia, all coming in, in great numbers, at certain geological periods. Do not these indicate special epochs in the Divine plan?

As for the theory of the origin of species by natural selection, I have acknowledged to a certain extent its force, as I suppose every geologist has; but the types of life in the animal and plant world form a problem that we have to deal with and solve, and it seems to me that unless we accept the view that the Creator had in His mind, from all eternity, the introduction of these fresh types of life, giving them certain powers of development, by natural selection and descent and so on, I do not hesitate to say (and I say it most humbly) that I believe the Creator was pleased to intervene, at special periods of the world's history, in order to introduce fresh types of life more and more representative of the fauna and flora of the present day; and thus preparing this globe from the past ages by this wonderful process of evolution and introduction of fresh types for the future habitation of His intelligent creatures.

Professor ORCHARD.—With your permission I would make three or four rather brief observations upon this paper, with the value of which and its logical character I think none of us have failed to be impressed.

That the case for “extreme evolution” is absolutely disproved no one can doubt; but I think the paper goes rather further than that. If we look at page 8, and read of these parallel lines which meet at infinity, and do not meet in time—when we go back as far as evidence warrants our going back; and if, as we extend them through the supposed millions of years, they still do not meet; the fact that they do not meet appears to me to be conclusive that evolution does not exist.

There is another important argument, and that is the argument of reversion. If you endeavour to overstep, by artificial means—by constraint which nature does not herself employ—the boundaries of species, directly you leave the creatures to themselves they revert to their original types, as we know. Now this shows a force opposed to evolution. Why this reversion back to original form, if the great force or power in nature is always toward alteration?

It appears to me to be altogether inconsistent with any form whatever of the doctrine of evolution. I might follow the lecturer on the fact that evolutionists can show no connecting links; with regard to which you may remember the words of the great American (Dana) that if those links ever existed their disappearance without trace is altogether inexplicable. That is a strong argument; but I think the argument as to reversion is even stronger still.

With regard to extreme evolution, some might think that Herbert Spencer’s evolution was more extreme than that of Haeckel. Herbert Spencer, as we are aware, does not stop at living forms, but goes back to inanimate matter, which he imagines to have been homogenesis, and acted upon by a force of some mechanical nature—this theory is more extreme and absurd than even Haeckel’s, but perhaps they are first cousins to each other.

I am glad that the lecturer had the courage to speak of divine power and design. If the Creator, as we believe, of various forms of life, made them with certain similar functions to fulfil and with certain environments, more or less similar, is it any wonder that there should be a remarkable structural resemblance?

I thank the lecturer much for his important contribution to our study and investigation of the subject.

Mr. MARTIN ROUSE.—I am much struck with the various arguments that have been advanced on this subject. I never heard before that if extreme evolution were true, we should just as much expect to see in the different epochs of geological development, species all reverting into one form as that one form should come in many species. Why should not we find in successive ages, here and there, a number of species converging into one form just as much as we should expect them to be diverging—if evolution were true?

Again, the speaker said that sexual selection was a change—an individual variation.

I do not know exactly who it was who said that whereas, as one speaker just stated, fanciers make various breeds of animals, as for instance, dogs, these dogs do not select one another according to their finer qualities. A large dog does not necessarily interbreed with a large dog, or a long-legged one with a long-legged one, or a dog with a fine sense of smell and long nose with a similarly created one; but they all interbreed promiscuously, which is downright contrary to the idea of sexual selection such as Darwin sets forth. As Lord Salisbury put it at Oxford, when presiding over the British Association, can you conceive that two rabbits, say one at one extremity of a forest, and the other at the other, should pass over all the intermediate individuals in order that they might meet and preserve the finest specimens of their race?

The CHAIRMAN.—I must now ask Mr. Whidborne to reply.

Rev. G. F. WHIDBORNE.—I cordially thank you for the hearty and, indeed, for the most kind way in which you have received my paper, and especially the Chairman, Professor Hull, Mr. Rouse, and Professor Orchard, for their very kind remarks. Having said that I really think I have nothing left to say, because I have not had any scoldings or adverse criticism. I thoroughly agree with Professor Hull's remarks.

Mr. ROUSE.—Excuse me; but there is one thing I meant to have said and which I should like to mention now.

I know it is a scientific fact discovered by some eminent naturalist, that in the primrose, to turn to botany, there are in some specimens long stamens with shorter pistils, and in others

long pistils with shorter stamens. Now, if natural selection be a true doctrine, we should expect to change the plants of the forest by taking the pollen from a long stamen and putting it into a long pistil; whereas you do not produce a change by taking the pollen from a long stamen and putting it into a short pistil or, again, from a short pistil and putting it into a long stamen.

REV. JOHN TUCKWELL.—I should like to know if there is any well authenticated case of the appearance of new forms of life within the human period, and also whether there is anything like evolution that may be going on at the present time?

If there is no satisfactory evidence of evolution taking place at the present time, such as we are asked to believe took place in past ages, then it seems to me to lead to this thought that if there has been a force at work in the production of new forms of life in the pre-human period, which is not in operation now, we are not in a position to judge, and that any argument based on what is going on now is only misleading and fallacious.

THE AUTHOR.—I am afraid I am not in a position to say what is going on at the present time. I have been dealing with the Devonian period all my life; but as far as we know from natural history I do not think there is any such case.

PROFESSOR HULL.—There is no such case known.

THE AUTHOR.—My simple point is that we need stronger evidence to prove evolution. There are so many difficulties against it, that I cannot see how it is possible unless it was by God's creating and God's guiding all through. I am looking at it now not from a Christian, but a scientific point of view; therefore I cannot point you to a satisfactory scientific solution of the question until we take into account not only the works, but the plan and purpose of the Worker.

[The vote of thanks having been duly put and carried the proceedings terminated.]

COMMUNICATION RECEIVED.

The Institute is to be congratulated on a paper dealing with evolution conceived in a thoroughly scientific and open-minded spirit.

The difficulties presented by what the author terms "extreme

evolution" are doubtless many and formidable, and some of those now adduced were submitted by myself in a paper to the Geologists' Association fourteen years ago.

As the genus *Nautilus* has been mentioned I may draw attention to the remarkable fact that although *Ammonites* and *Nautilus*, both tetrabranchiate cephalopods, flourished under the same conditions and side by side in secondary times, *Ammonites* were absent at both earlier and later periods, although *Nautilus* flourished and still flourishes.

Although the author brings forward difficulties in the way of the acceptance of extreme evolution, I gather that he admits the general doctrine of evolution. And indeed it is difficult to understand how any one scientifically minded can refuse to accept what is alone consonant with the great teaching of all science. For this is that the phenomena of nature are sequential. There is no one in the scientific world that doubts that the phenomena of the inorganic world are sequential, or that every observed phenomenon has had a natural cause, and that cause and effect form an unbroken chain.

The only reasonable conclusion from this is that phenomena in the organic world also, however difficult it may be to understand the process or to observe all the links of the chain of causation, are sequential also.

I am especially glad to find that in Mr. Whidborne's opinion evolution, even "extreme evolution," is not a question affecting religious faith, and that if it could be asserted as an established fact it would be "the strongest argument for Theism."

This is a great change of mental attitude from that which but a few years ago denounced evolution as hostile to and even as destructive of religion.

Scientific questions can alone be solved by scientific facts and arguments, and Mr. Whidborne, it seems to me, merits the best thanks of the Institute for giving to its Members an excellent example of how the great question of evolution should be discussed.

January 21st, 1901.

J. LOGAN LOBLEY.

ORDINARY GENERAL MEETING.*

REV. DR. WALKER, F.L.S., IN THE CHAIR.

The Minutes of the last Meeting were read by Professor E. Hull in the absence of the Hon. Secretary.

The following paper was read by the Author :—

EOLITHIC IMPLEMENTS. By the Rev. R. ASHINGTON BULLEN, B.A., F.L.S., F.G.S. (With seven Plates.)

CONTENTS.

- § I. Eoliths distinct from Palæoliths and Neoliths.
 - § II. Eoliths : their Name and Authenticity.
 - § III. Eoliths : determined by Prestwich.
 - § IV. The Action of Frost and Cold (Dawson and Jones).
 - § V. Torrential or River-Action.
 - § VI. Eoliths : their Ochreous Stain.
 - § VII. The Red-Clay-with-Flints.
 - § VIII. The Ferruginous Gravel.
 - § IX. Eoliths : their Possible Uses.
 - § X. The Uses of some Old Implements Obscure.
 - § XI. Eoliths : their Shapes and Probable Uses.
 - § XII. Eoliths : their Geological Age and their History.
 - § XIII. Other observers :—S. J. B. Skertchley, O. Fisher, H. Hicks, O. A. Shrubsole, W. L. Abbott, C. Reid, J. Lomas, R. A. Bullen, Allen Brown, H. P. Blackmore, H. B. Woodward, G. A. J. Cole.
- Appendix.
Explanation of Plates.

§ I. *Eoliths distinct from Palæoliths and Neoliths.*—The now generally accepted types of the best known stone implements made by man have been divided into two groups, representative of two great periods, the “Palæolithic” (those of the *old* stone age) and the “Neolithic”

* Monday, 18th June, 1900.

(those of the *new* stone age). Other terms have been suggested recently. The late Sir J. W. Dawson, F.R.S., has adopted "palanthropic" and "neanthropic" as expressive of the same series of facts. But the terms palæolithic and neolithic, for which we are indebted to Sir John Lubbock (Lord Avebury), are not likely now to be displaced from the position they have held so long.

The geological distinction between these two types of implements is that the Palæolithic implements* are of forms which were used by men contemporary with the now extinct mammalia—the cave-lion, cave-bear, mammoth, cave-hyæna, species of rhinoceros and hippopotamus, the Irish deer, etc.; while the Neolithic implements (though some of them nearly resemble the Palæolithic) are either found scattered on the surface and generally unstained, or are unearthed from burial mounds, where they have constituted part of the interment.

But, although the terms "palæolithic" and "neolithic" are used in the above senses, the forms of tools and weapons included under these terms have lingered in one district or another down to recent or comparatively recent times:—the Palæolithic in Tasmania,† Egypt,‡ and North America;§ the Neolithic in Egypt, North America,|| New Guinea and other islands of Melanesia, South America, and numerous other places. Their occurrence in North America¶ is a testimony to the late retreat of the ice-sheet there at the close of the glacial epoch.

§ II. *Eoliths: their name and authenticity.*—We turn now, however, to a third class of stone tools which, unlike the palæolithic and neolithic, has not yet passed beyond the stage of criticism into that of general acceptance.

* H. B. Woodward, *Geology of England and Wales*, 2nd Ed., p. 479. Evans, *Ancient Stone Implements*, p. 472.

† Prestwich, *Controverted Questions in Geology*, p. 72. Dr. E. Tylor, *Journ. Anthropol. Institute*, November, 1893, p. 141.

‡ Forbes, *Bulletin Liverpool Museum II*, Nos. 3 and 4, p. 115.

§ Mercer, *Antiquity of Man in the Delaware Valley*, p. 6, says:—"Beyond doubt it has been demonstrated in the last five years that North-American Indians continually manufactured chipped stones more or less resembling the Drift types, and in fact scattered the whole surface of the United States with them." Evans, *Ancient Stone Implements*, 2nd Ed., *passim*.

|| Boyle, *Archæological Report*, Toronto, 1896-97, p. 49, Figs. 6-10.

¶ Dr. E. W. Claypole, *American Geologist*, November, 1896, p. 306.

Nor can we blame the doubters; for in such a case as this the believers must justify the claims of these very old implements to acceptance on reasonable grounds.

At the same time we must remind the critics that—

“The novel doctrine may be right
In spite of cries of danger;
The best yard-dog will bark and bite
Alike at every stranger.”

It has been proposed to call these particular stone tools “eoliths,” or “tools of the *early* stone age,” and on the analogy of palæolith and neolith.

As will be seen later on, they are of far earlier date than the accepted palæoliths, and we must use a scientific term compounded of two Greek words if we are to keep to a scientific nomenclature, agreeable to the established usage among naturalists. The ugly expression “plateaulith” has been proposed; but it is as hybrid a word as “bicycle” (Latin and Greek), and “cablegram” (English and Greek), for plateaulith is French and Greek. Purity of terminology pleads for “Eolith,” which will be the term adopted in this paper.

Sometimes the Eolithic Men are wrongly referred to as “Plateau Men.” This is incorrect, because those men of the earliest Stone Age did not live on the Plateau, nor even see it. As explained later on they must have lived on the heights afterwards reduced by natural causes to the Wealden Island and to the present Wealden Hills.

The so-called Palæolithic Men subsequently lived on the Plateau and left their tools and implements there.

§ III. *Eoliths determined by Prestwich.*—Sir (then Mr.) Joseph Prestwich, in 1859, in working out the Quaternary gravels of the Somme Valley, especially with reference to the tools of palæolithic man, became interested in the occurrence of many roughly chipped flints, such as those with which M. Boucher de Perthes, after twenty-seven years’ enthusiastic labours, had acquainted the scientific world.

Many years afterwards Prestwich’s attention was attracted to the remarkable series of peculiarly worked flints, of several distinct types, that Mr. Benjamin Harrison, of Ightham, had amassed from the Kent plateau, near Ash, at heights of 500 to 700 feet and over, O.D.*

* See A. M. Bell, “The Tale of the Flint,” *Longman’s Magazine*, January, 1898, pp. 214–225, for an account of Mr. Harrison’s work.

In 1890 Dr. Prestwich laid before the scientific world his views as to these rude stone tools being of human origin.

His reasons for accepting these dressed stones as having been worked into shape were briefly :—

1. They arrange themselves into definite groups according to their forms.
2. The parallelism of the flakes struck off the surfaces is not due to natural or accidental causes.
3. Possible uses can be suggested for some of them as tools and implements.
4. The style of work is the same for those of which the uses are obscure.*

The other causes suggested as capable of producing the same rudely chipped edges of these plateau flints are the action of frost, of river floods, or of waves on a sea-beach.

§ IV. *The action of Frost and Cold.* Dawson and Jones.— Sir J. W. Dawson, F.R.S.,† in writing of the broken flints on natural desert surfaces, and on the sites of old towns and similar places, says, “one error in regard to this natural breakage deserves notice. It is said it has been caused by the alternate expansion and contraction of the flint from changes of temperature. But flint is not easily broken in this way. I have exposed piles of chalk flints for years to the frosts of a Canadian winter, alternating with rain and mild weather; and though a few very good flakes and piercers were produced, this was only from the surfaces already broken; and the number of specimens was very small. The actual cause is the pounding of heavy stones borne along by torrents, or driven by surf; and the fragments produced in this way are often very similar to those produced by hammering.”

It will be seen that Dawson here is speaking only of the general form of flakes produced, and not of hammered edges. The work on the plateau flints is very often on the blunt and not the sharp edges of the flint.

Professor Rupert Jones has been collecting for years specimens of flint accidentally and naturally fractured, having any resemblance to man's stone tools; but these are mostly of small size and have not the general facies of the flints of the plateau.

* *Controverted Questions*, p. 62.

† *Leisure Hour*, 1884, p. 490, “Rough Notes of a Naturalist's Visit to Egypt.”

His words are :—"That there are, even in gravel-walks, small flints of analogous shapes, but by no means identical with those of the plateau-gravel, is quite true, and some approach to their peculiar shapes may occasionally be seen elsewhere, but the 'Eoliths' are distinct. Doubtless frost in splitting stones can form more or less parallel-sided flakes, often concave and thin on one edge, and convex and thick on the other, and that the thin edge may be readily modified by natural and accidental causes; but the hooked and hollow-curved plateau implements have the concave edge thick, and intentionally chipped and hammered."*

§ V. *Torrent- or river-action.*—Many of the eoliths show contusions caused by rapidly moving water, but the contusion is on the chipped surfaces by which man had previously converted them into implements. It has blunted and obliterated the originally sharp margins of the parallel depressions, which have truncated one another by a series of intentional blows round a roughly regular edge; but such contusion was not the cause of chipping and is (in all cases which I have examined) demonstrably posterior to it in point of time.

It must be remembered that water resists compression (that is the principle of the Bramah press, hydraulic jack, etc.), and in the collision of flint stones one on another by water in violent motion, the water becomes at the same time an elastic cushion between them as they are jostled together; for the greater the aqueous force that flings them together the greater the compression of the water between them, and *pro ratâ* the weaker the resultant collision.

However strongly the suggestion has been made, that aqueous agencies have produced the chipped or hacked edges of these plateau flints, it is a mere assertion; no one has yet produced a series of examples, due to known aqueous agency, whether fluvial or marine, actually resembling eoliths.

So far then Sir Joseph Prestwich's theory of their human origin holds the field.

§ VI. *Eoliths: their ochreous stain or colour.*—The stain on

* *Journ. Anthropol. Inst.*, 1898, p. 53. Mr. W. Cunnington, F.G.S., boldly referred the production of the various apparent flakes and chippings on the Kentish Eoliths to the influence of successive glacial periods in his paper on the "Non-authenticity of Plateau Implements" (*Natural Science*, vol. xi, No. 69, p. 332).

the flints of the Plateau drift is not always of the same tint. In some cases the colour is a deep dull brown,* in others there is more polish and a consequently brighter and richer colour, and in some few the tint is of a warm red. This latter tint also occurs, I know, in flints from the glacial gravels of Wells, Norfolk.

§ VII. *The Red-Clay-with-Flints*.—This brown or red stain is not derived from the colouring matter of the “red-clay-with-flints.”

Mr. W. Whitaker, F.R.S.,† considers “that the clay-with-flints may be of many ages, and may be forming even at the present day, and that it is owing in great part to the slow decomposition of the chalk under atmospheric action.” To the residual flints and earthy matter “would be added the clayey and loamy wash from the Tertiary lands, and the remains of beds of that age left in pipes and hollows in the chalk.”

In 1891, I made several excavations in the red-clay-with-flints, varying from three to eight feet deep, in the “Great North Field” and “Paradise” above Dunstall Priory, Shoreham, Kent, in search for eolithic implements, in each case down to the undisturbed chalk. Among the objects in this red clay was an abundance of green-coated flints from the Thanet Sand, pebbles of the Woolwich-and-Reading beds, and Tertiary ferruginous Sandstone (Diestian), with angular fragments of flint as well as whole flints.

In Otford Lane, near Halstead, on the other side of the Darent Valley, in the strawberry lands near Stockham Wood, a bed of entire or complete, dissolved-out, that is residual flints, occurs beneath the “red-clay-with-flints” with the thickness of three or four feet.

At Goodberry Farm, near Woodlands, there is no “red-clay-with-flints,” but undisturbed Woolwich-and-Reading red and buff clays, overspread with plateau drift flints.

But whatever the nature of the clay upon the chalk, the ochreous plateau drift always occurs above the clay and never in it.

In this red clay natural flint flakes appear quite white and soft. The reason given for this is that the alumina of the clay has such power to extract the water of crystallization

* Hence the Eoliths are sometimes alluded to as “Old Brownies.”

† *Geol. of London*, vol. i, pp. 282–285 (*Geol. Survey Memoir*).

from the flint that the natural flint flakes in the clay are not stained but bleached, and are soft and light. They are also so completely desiccated by the clay that when placed in water they absorb it, and the air escaping through the water makes an effervescing sound.

The soft white flints in the red clay are quite different from the hard compact ochreous flints of the plateau gravels; and hence the red clay cannot have been the cause of the brown stain.

§ VIII. *The ferruginous gravel.*—Specimens of plateau gravel from Madam's Court Hill and Shepherd's Barn, Shoreham, Kent, and from Blean near Canterbury, have on them evidences of having lain in a ferruginous matrix. Dr. Prestwich was much interested in these specimens. Mr. B. Harrison has also several, showing the same ferruginous incrustation upon them from the following localities in Kent, Parsonage Farm near Ash, Chimhams, between Kingsdown and Farningham, Terry's Lodge above Wrotham.

The distance from Blean to Madam's Court Hill is not less than forty miles.

It is evident, from the wide extent of the localities from which eoliths so encrusted have been obtained, that the ferruginous bed or probably iron pan, from which these eoliths and plateau gravels were derived, must have been of correspondingly wide extent on that now vanished Wealden range from which they have been carried by aqueous action in parallel directions.

It is remarkable that the gravel at Parsonage Farm, from which many eoliths have been obtained, and where special excavations were made at the suggestion of the British Association in 1894, is also of the same character above mentioned, viz., an iron pan so hard that it had to be broken with the pick-axe.

When we call to mind the very large number of fragments of ferruginous sandstone of Tertiary age which occur on and in the red-clay-with-flints, when we remember the ferruginous Diestian Sands at Lenham, Paddlesworth, and Les Noires Mottes, near Calais, we are strongly tempted to consider that these early Pliocene Crag beds, so widely extended in Pliocene times, must have been the source of the iron matrix in and from which, by percolation of water, these eoliths and gravels received their ochreous stain of various tints.

The staining of flint is a somewhat obscure subject; but

its physical and chemical structure* may account for the varying tints assumed in the same staining medium.

It has been suggested by some that the Eoliths owe their colour to the local gravel in which some of them are found, but the conditions of the superficial deposits do not admit of this solution of the question.

§ IX. *Eoliths: their possible uses.*—Eoliths group themselves into certain well-defined classes or types. These types, in some instances at least, bear rude resemblances to tools or weapons of which the use is known; but in others, beyond the chipped and battered edges, eolithic man has left little trace of his agency upon them. However, this uncertainty as to the intention of the makers and users of these implements need not trouble us, as there are many stone implements the applications of which are unknown.

§ X. *The uses of some old Implements obscure.*—Mr. W. J. Lewis Abbott has pointed out that the use of the small exquisitely worked trapezoidal Neoliths, from the Hastings Kitchen-Middens, the Valley of the Meuse, etc., has not been explained.

In Dr. Grierson's Museum, Thornhill, N.B., there are some long heavy stones, of modern date, bearing very little trace of man's handiwork, and yet they are known to have been used in the Orkneys in modern times as weights for tethering cows, a use no stranger would attribute to them from their shape.

The small stone balls with beautifully worked surfaces, from various parts of Scotland and Ireland, are of uncertain use.† Even their age is doubtful.

* *Report of U.S. National Museum, 1897, Plates XVI–XIX.*

The great variation in the intimate structure of flint is well illustrated by Mr. Thomas Wilson, Curator of the Division of Prehistoric Archaeology, Smithsonian Institution, U.S.A. The mineralogical descriptions are by Dr. G. P. Merrill.

The English flints illustrated from the microscope in Plate XVI are from Brandon, Grimes Graves, and Dorchester (Dorset).

The specimen from Brandon, while generally chalcedonic in character, "shows minute amorphous yellowish and black particles, which are presumably ferruginous and carbonaceous matter." In other instances (not English) he mentions chalcedonic silica with interstitial calcite. It is certain that flint, while mainly consisting of silica, is not homogeneous in structure, and therefore flints will lend themselves to the reception of ferruginous and other stain according to their varying composition and porosity.

† Evans, *Stone Implements*, pp. 420–421. See also Anderson, *Scotland in Pagan Times* (ed. 1883), pp. 122, 220, 232, 249, for implements of stone, bone, and bronze, of which the uses are unknown.

Recently, Mr. T. Wilson* has drawn attention to some very remarkable prehistoric implements, "principally from the Ohio and Mississippi valleys, all of flint in curious and rare forms, believed to be entirely without utility, and solely to gratify an artistic desire. None of them are spear or arrow-heads, and none of them appear to have been made for any service," unless indeed they were for personal wear as *totems*.

It certainly is remarkable that so comparatively civilized a person as neolithic man, who in some localities was acquainted with agriculture, weaving, fishing, and such arts, should leave behind him any implements for which no use can now be suggested with any degree of certainty, although his arts in an improved manner are still those of civilization.

It is not to be wondered so much that Eolithic man, whose very home has disappeared from the face of the earth, should have left behind him tools for which, not being savages, we find it very difficult to suggest uses.

But it is not improbable that, his wants being reduced to their lowest terms, he clad himself in skins, used fire,† made use of wood and the sinews of animals for various primitive appliances; and in hunting, poison and pitfalls may have been the means of obtaining his ends rather than direct attack.

§ XI. *Eoliths: their shapes and probable uses.*—We have evidence of the use by modern North American Indians of flint implements of the most primitive type. Prestwich‡ figures one such which shows very little sign of work, but is of undoubted authenticity, as the following extract from his life§ shows. It occurs in a letter from Dr. Blackmore. "When I say 'implements,' the word would perhaps give a wrong impression, as the specimens found are rather natural or accidental forms of flint that have been taken up, used a few times and then thrown away, but the evidence of use to any one accustomed to the usual forms of flints is unmistakable. As far as I can judge, the early

* *Report U.S. National Museum*, 1897, p. 943, Plate XI.

† Dr. H. P. Blackmore (Prestwich, *Life*, p. 376), has found evidence of fire in the gravels at Alderbury near Salisbury, from which eoliths (but not paleoliths) have been obtained.

‡ *Controverted Questions*, p. 69.

§ *Ibid.*, p. 363.

savage had two ideas in the selection and use of these conveniently shaped stones, viz., hammering and scraping—and this is just what one would have expected. Some years since the late Professor Leidy gave me a stone scraper which was used by a tribe of North American Indians for dressing buffalo skins: it was an ordinary smooth quartzite pebble, split in half with the thin sharp edge carefully removed, exactly like the plateau Eocene pebbles described in your paper.”

Our authority, Dr. Prestwich,* divides the eoliths into the eighteen types according to their shapes.

The edges in Prestwich's Group I. are blunt; and in this Mr. Montgomerie Bell, although accepting them as of human workmanship, finds a difficulty.

But is there really a difficulty? The tools called “sleekers” used in the early part of the century by tanners for removing fat from skins before tanning, were of wood, flat, blunt, and of square form. At present a *blunt* steel blade is used with a wooden back, as I have satisfied myself at Barrow's Tannery, Redhill, and at the Shalford Tannery, both in Surrey. Carpenters also used a blunt steel scraper about 40 years ago. Moreover, some undoubted neoliths are trimmed to a blunt edge: I have one such from Pakefield and others from Newnham near Cambridge, and Clapham Hill near Whitstable.

Among the implements from the plateau are several squarish eoliths with flaked and chipped edges (Plate IV, Figs. 1, 2)† analogues of the above mentioned sleekers. Probably the round scrapers also were used in dressing skins.

Another set of tools characteristic of the plateau drift is the double-shoulder scraper (Plate IV, Fig. 5).‡ Some of these have the chips struck off at the same general angle and on the same side of each shoulder. These are probably scrapers.

There are others, however, in which the chips were struck off at the same general angle, but the resultant surfaces are on opposite sides of the two curves respectively. They thus form a boring tool; for, if the point were worked into

* *Controverted Questions*, pp. 69, 70, and 71. The type collection is now in the British Museum (Natural History), Cromwell Road.

† Prestwich, *Controverted Questions*, Plate I, Fig. 1, p. 80.

‡ Prestwich, *Ibid.*, Plate VII, Figs. 20-25; Plate XII, Fig. 40.

any material, such as a sapling or some soft wood, for instance, these chipped surfaces would always present cutting edges to the material operated on as the tool was rotated. They are analogous to the "engineer's bit." These drills occur in the plateau gravels in a series from the bluntest point up to a fine boring tool.

They resemble in their general idea the beautifully worked points of the bone-needle-borers described and figured in the *Reliquiæ Aquitanicæ*, pp. 134, 141. Of course I do not suggest that the larger and coarser borers were used for making needles, only that the general idea of the piercer is the same.

Mr. B. Harrison, from evidence of travellers who have seen his collection,* is of opinion that Eolithic man used some of the scraper-stones for rubbing the hard skin of the foot to prevent painful cracks and corns which cause lameness. For the same reason he believes that some of the larger curved stones were used for scraping the limbs and body to soften and supple the skin. At any rate it is certain that the luxurious Romans used the strigil or scraper made of horn or metal,† to add to the comfort of the baths (*thermæ*), and kept slaves for the purpose of scraping them with that instrument. This practice of scraping the body after the bath was seemingly derived from the Greeks, among whom it may have survived from early times. An instrument (*στλεγγίς*)‡ (at Sparta made of reeds, elsewhere of metal) was used to scrape the limbs and body after the bath, and the exertions of the palæstra, in the latter case in order to remove the oil and sand from the body after a wrestling match. Its form *στρεγγίς* is akin to the Latin strigil. The anointing was probably post-Homeric, but that is no evidence that the scraping was not a more ancient practice. At any rate the possibility of the scraping of the body with hollow scrapers to conduce to its comfort is not to be dismissed with a gibe.§

* *Transactions of S.E. Union of Scientific Societies*, 1899, pp. 15, 16.

† Lewis and Short's Latin Dictionary, sub "strigil."

‡ Guhl and Koner, *Life of the Greeks and Romans*, p. 220.

§ Consult Becker, Gallus, *Excursus I*, p. 394 (Longman's "Silver Library"). Ramsay, *Manual of Roman Antiquities*, 10th Ed., 1876, p. 434. See also Professor T. Rupert Jones, *Nat. Science*, October, 1894, para. 5, p. 272, for the probable wants of Eolithic man and consequent implements.

Cf. Martial, XIV, 51.—

“Pergamus has misit, curvo destringere ferro.”

§ XII. *Eoliths: their Geological Age and their History.*—Our interest in the rude ochreous implements of the Kentish plateau centres in their unique position, at a higher level than the Pleistocene High-level Gravels, and in their consequently greater age, ante-dating the Glacial Epoch. When Sir Joseph Prestwich, having finished his monumental work on geology and resigned his Oxford Professorship, was able to devote himself to local geology, his prescience at once discerned this fact, and his writings are storehouses of information on this subject.

These eoliths have been found at levels from 400 to 700 feet O.D.* by their discoverer, Mr. B. Harrison†, by Mr. de Barri Crawshay,‡ Mr. Montgomerie Bell,‡ Mr. W. J. Lewis Abbott,§ Mr. Santer Kennard,|| Mr. O. A. Shrubsole,¶ Mr. H. Stopes, Mr. A. E. Salter, Mr. Lasham, by myself,** and others.

In 1894 the British Association made a grant for excavating on the crest of the North Downs in a carefully selected spot, under a Committee consisting of Sir John Evans, F.R.S., Professor H. G. Seeley, F.R.S., and the late Sir Joseph Prestwich, F.R.S., under which committee Mr. B. Harrison worked, carefully recording the progress of the excavation of the various pits sunk under their direction.

In a pit sunk on Parsonage Farm, Ash (Pit No. II), the following section was clearly made out to my own knowledge:—

* Ordnance datum or mean high-water mark of H.M. Ordnance Survey used in estimating contours of hills, etc.

† Prestwich, “Drift Stages of the Darent Valley,” *Quart. Journ. Geol. Soc.*, vol. xlvii. “Occurrence of Palæolithic Flint implements—Ightham,” *Quart. Journ. Geol. Soc.*, vol. xlv. “Primitive character of Flint Implements, etc.,” Kent, *Journ. Anthropol. Inst.*, 1892.

‡ Bell, *Journ. Anthropol. Instit.*, 1894, pp. 263-284, *obiter*.

§ Abbott, *Nat. Science*, April, 1894, “Plateau Man in Kent.”

|| Kennard, *Nat. Science*, January, 1898, p. 31.

¶ *Journ. Anthropol. Inst.*, 1894, p. 44, etc.

** Bullen, *Nat. Science*, February, 1898, pp. 108, 110, 111.

		<i>Approximate depths.</i>	
		ft.	in.
Dark sandy soil	.. .. .	1	6
Grey and yellow sandy loam	.. .. .	4	6
Iron sand, pebbles, and large rough flints and worked stones	.. .. .	1	0
Grey loam and yellow sandy gravel and worked stones	.. .. .	1	0
Stiff black soil and worked stones	.. .. .	1	0
Orange, red, brown or grey loam, and few pebbles	.. .. .	18	0

Below which depth the section was not continued.

(See also *Report of British Association for 1895*, p. 349.)

I visited this section with Mr. B. Harrison on December 24th, 1894, and saw this old pre-glacial gravel, and below the 6-foot level took out a well-defined squarish "sleeker" and other rudely flaked flints.

In writing of these pits and others opened by Mr. B. Harrison near the same spot Mr. A. Santer Kennard says: "In all these pits, at a depth of 8 feet from the surface, a bed of gravel, varying from 6 to 12 inches in thickness, was found. The gravel was cemented by iron and was so hard that a pick was needed to break it up. The underlying sandy loam, which was pierced for a further depth of 19 feet, is probably of early Tertiary age."

The position of these excavations near the face of the chalk escarpment, at a height of over 700 feet O.D., shows that they were anterior to the Glacial Epoch. They are not gravels of that age, being gravels in a ferruginous cement, whereas the glacial gravel deposits lie at a far lower level, in the bottoms of the chalk valleys, below the 250 feet contour line, and sometimes attain a thickness of 30 feet. Bones of musk-ox, mammoth, horse, etc., as well as land shells, occur in the latter gravels.*

The manner of the deposition of these plateau gravels has been ably stated by Sir Joseph Prestwich, F.R.S.,† and Professor T. Rupert Jones, F.R.S.‡

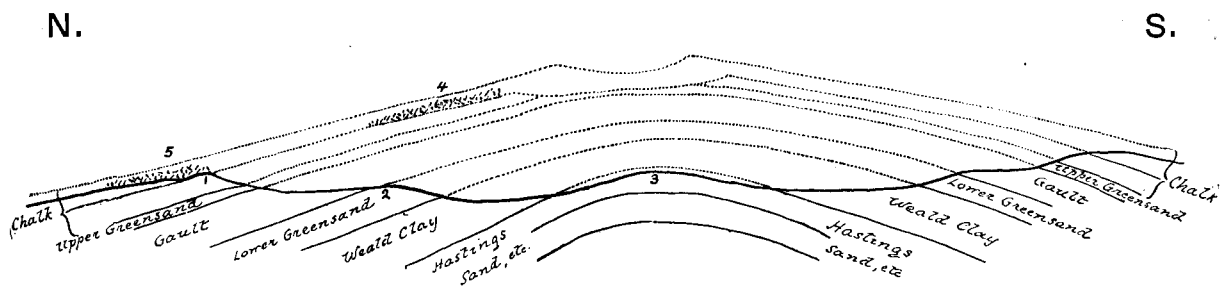
As the latter wrote at a later date, in consultation with

* See also Kennard, *Nat. Science*, January, 1898, p. 33.

† *Quart. Journ. Geol. Soc.*, vol. xlv, May, 1890, p. 179, sections 7 to 13, and elsewhere.

‡ *Nat. Science*, October, 1894, p. 269, etc.

FIG. 1.—SECTION IN OUTLINE OF THE STRATA FORMING THE OLD WEALDEN RANGE, AND THE CRETACEOUS BEDS OF THE NORTH AND SOUTH DOWNS.



1. Limpsfield (Botley Hill). 2. Oldbury Hill, 3. Crowborough.

his old friend, it will be well to quote his conclusions *in extenso*.*

“The great changes of land surface in this part of the European area were referred—firstly, to the movements accompanying the elevation of the Pyrenees, when the chalk became dry land, with its uplands, valleys, and estuaries; at that time the Wealden area formed an island in the Thanet-Sands sea.

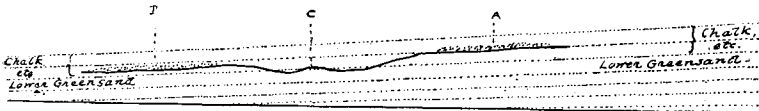
“Some rivers afterwards brought down the clays and sands which now constitute the ‘Woolwich-and-Reading’ beds. With some submergence other Tertiary beds were formed, probably extending over a part of what is now the Wealden Area.

“Secondly, this area with its stratified coatings was raised up (after the formation of the London Clay) by movements accompanying the elevation of the Alps, by the lateral pressure caused by the earth’s contraction. The other Tertiary beds (of Paris, Bracklesham, etc.) had helped to shallow the sea surrounding the island of the Weald, which was ultimately to be an elevated, elliptical, weather-worn, and sea-eaten dome of great height.

“Fig. 1. Diagram showing roughly the relative position of the formations constituting the Wealden Anticlinal between the North and South Downs (1. Limpsfield (Botley Hill), 877 feet; 2. Oldbury, 620 feet; 3. Crowborough, 803 feet); also their successive denudations, and the original place of the Old Gravel (4), some of which was brought down by natural agencies to the Chalk Plateau (5) now existing.

“Fig. 2. Diagram showing the possible position of the

FIG. 2.—SECTION OF THE STRATA FORMING THE NORTHERN SLOPE OF THE OLD WEALDEN RANGE, WHEN THE BROWN GRAVELS CAME TO A LOWER LEVEL.



- A. Old Gravel at higher level.
- B. Old Gravel at lower level.

* *Op. cit.*, pp. 270-3.

Lower Greensand outcrop (C) when the Old Gravel (A) was being transferred from the higher (A) to the lower (B) level of the chalk by natural agencies along a continuous surface. The strata are set at too high an angle in Fig. 1 to show what is required here.

“(A) Old Gravel in place. (B) Plateau Gravel derived from the Old Gravel. (C) Outcrop of the Lower Greensand.

“The successive stages were:—

“1. When the elevation of the Wealden area attained its maximum, there was certainly a considerable thickness of chalk on the surface, and this was necessarily exposed to marine and atmospheric denudation.

“2. The immediate result of this was the wearing away of the chalk and the trituration of the washed-out flints; and thus the formation of a great bed of shingle—that of the Thanet Sands.

“3. With continued wave-action, these shingle-banks were washed away and distributed at a lower level, to be the Pebble-beds of the ‘Woolwich-and-Reading’ series, which had been formed in the meantime by rivers from the hill-ranges. The pebble-beds can now be seen at Addington, Blackheath, etc., extending to the very edge of the present chalk escarpment.

“4. The deposits of this stage were next removed in part; and in course of time the Diestian beds were laid against the flanks of the lowered and perhaps sinking range. Of these strata some limited patches, such as the Lenham beds, remain here and there on what are now the Chalk Downs.

“5. One or more accumulations of chalk-flint debris were formed at or about this stage of the history of the old Wealden Range or Island, and were probably characterized by the presence of iron-oxide in greater quantity than in the common ferruginous gravels of the south-east of England at present.

“Man, being present, used such pieces of the flint as suited his requirements. Probably, at first, with little or no alteration of form; but afterwards he applied them with definite modification of their shapes to meet his wants in killing, skinning, cutting, fire-making, rubbing, pounding, scraping, drilling, knocking, breaking, chopping, digging, etc., that is in tooling and other processes.

“Such implements he made and left there, on that old, very old, probably pre-glacial ground (see Fig. 1).

“6. This gravel extended down the side of the ‘dome’

perhaps tailing down the slopes of uplands by slips, slides, and slushings, probably by more than one stage, after its formation; or, during a succeeding age, the sea cutting away the lessening dome, or torrents scoring the hill-sides, removed the more or less extensive deposits of ferruginous gravel, with the rude implements left upon it, and spread out the much worn relics on the slopes of the chalk below. Here they are now found on the isolated plateau; and they lie on the 'red-clay-with-flints,' that had been in process of formation previously, for ages, by the gradual solution of the chalk below, and the settlement of argillaceous and sandy matter from the overlying and gradually disappearing Tertiaries. This was coextensive with the chalk-surface, and on it lies some of the transported ochreous gravel, together with Tertiary pebbles, less worn flint stones, and some *débris* of the Lower Greensand, which the wave-line had then reached. The presence of chert fragments from the Lower Greensand proves that the current of driftage (or the tailing of the gravel) must have passed over the outcrop of the Lower Greensand, and therefore here from south to north, on a continuous surface (see Fig. 2).

"7. Subsequently the outlying chalk (now the plateau above referred to, sloping from an elevation of about 800 feet on the south to 400 feet and less on the north) was cut off by denudation in the Glacial period from the remaining uplands of the once lofty range, the Weald-clay Valley lying below the escarpment of the L.G.S. at the foot of the diminished dome, and the Holmesdale of Gault Valley at the foot of the chalk escarpment (see Fig. 1).

"The Diestian or Lenham beds were formed in the early Pliocene period, and the denudation probably began directly afterwards, at about the time of the Red or the Chillesford Crag, in late Pliocene or Post-Pliocene times; and as the old ferruginous gravel had not only been formed but had been brought to a lower level before that time, it must be regarded as of pre-Glacial age.

"A similar series of occurrences and geological results evidently took place on the south side of the old Wealden uplands, giving origin to the brown-coated rude implements at Friston, near Eastbourne, in Sussex."

As the Kentish chalk plateau is the classic ground whence the first specimens of eoliths were obtained, it has been necessary to give the geological evidence for their antiquity *in extenso*.

Furthermore, in the sculpturing of the Wealden hill-ranges glacial agency must have had a large share, as we learn from Prestwich's memoirs above referred to and insisted on in the extract from Professor Rupert Jones's paper at p. 17, and that from Mr. A. Santer Kennard, p. 13. In my old parish in Kent (Shoreham), in the churchyard, at a depth of about 3 feet, an indurated chalk-rubble (locally called "chart") occurs, which was so hard that it blunted the best pick-axes, and its rocky character caused my sexton much trouble. It was from this stratum, but on the other side of the river, at Mill Hill, Shoreham, at about 240 feet O.D., that the tusk of *Elephas primigenius* was obtained, which passed into the possession of Sir Joseph Prestwich.

§ XIII. *Other Observers: S. J. B. Skertchley, O. Fisher, H. Hicks, O. A. Shrubsole, W. J. L. Abbott, C. Reid, J. Iomas, R. A. Bullen, H. P. Blackmore, H. B. Woodward, G. A. J. Cole.*—Since 1890 various workers have been elucidating the epoch of man's appearance, and their labours with singular unanimity have all pointed to the pre-glacial advent of man in Britain.

Omitting the finding of a well-marked flake of human workmanship by Skertchley in 1879, which has the support* of Rev. Osmond Fisher, M.A., F.G.S., who visited the spot, and is a first-class authority, and omitting also the equally important testimony of Dr. Henry Hicks, F.R.S.† (late President of the Geological Society), we will pass to other records of pre-glacial man.

In 1894, and previously, Mr. O. A. Shrubsole, F.G.S., found in deposits of Southern Drift at a general level of 400 feet above O.D., on an elongated plateau between Easthampstead, Berks, and Ash Common, near Aldershot, several implements of a rude and primitive character. He did not come across the common types of highly finished palæolithic implement, such as those of the Somme, Thames, and other valleys.‡

* *Cambridge Philosoph. Soc.*, vol. iii, pt. vii, p. 288.

† *Quart. Journ. Geol. Soc.*, vol. liv (1898), p. ci.

‡ *Journ. Anthropol. Inst.*, "On Flint Implements of a Primitive Type from Old (Pre-Glacial) Hill-gravels in Berkshire," August, 1894, pp. 44-49. See Dr. Blackmore's remarks farther on concerning Alderbury.

These implements from Berkshire may be referred to three general types:—

1. "Large implements with rounded butt.
2. "Grooved or hollowed scrapers.
3. "Fragments of flint worked at the point only."

These implements are of the general character of plateau-type implements, being slightly but distinctly worked, and rude in form. The gravels from which they were obtained are of the same age as the plateau gravels of Kent. They are, moreover, at a much higher level than the pleistocene gravels of the Thames Basin. They are accepted as pre-glacial (Southern Drift).

In 1897 Mr. W. J. Lewis Abbott, F.G.S.,* an acute observer of the younger school of British geologists, found four implements near Sherringham, Norfolk (one of which bears an *éraillure* or secondary small flake-mark on the bulb of percussion, a hall-mark of man's handiwork).†

Of these four implements, one was found embedded in the iron-pan of the "Elephant Bed," and the others on it, but having the purple black stain characteristic of the flints found in that deposit. Mr. Clement Reid, F.G.S. (as quoted by Mr. Abbott), says, "I have always considered that, if implements were found in the Forest-Bed, it would be at Runton (on the Norfolk coast near Sherringham), although up to the present I have been unable to find any."‡

This discovery by Mr. Abbott puts man in the pre-glacial epoch to which the Cromer Forest-Bed belongs.

Again, in 1898 Mr. Joseph Lomas, F.G.S., of the University College, Liverpool, found in the shell-bearing sands and gravel on Moel Tryfaen two implements which Mr. Abbott gives weighty reasons for accepting as of human workmanship, but his argument is too lengthy to be reproduced here.

Mr. Lomas§ says, "The boulders associated with the flints without exception came from the north. The probability, then, is strong that the flints came from the north. Unless some concealed outcrop of chalk occurs somewhere in the

* *Nat. Science*, vol. x, No. 60, pp. 89-90.

† *Op. cit.*, p. 95. "I found one well-bulbed flake, partly of the same stain, but partly of a rich brown, on the beach at Bawdsey in Suffolk in 1896, but from the locality it may belong to the Red Crag."

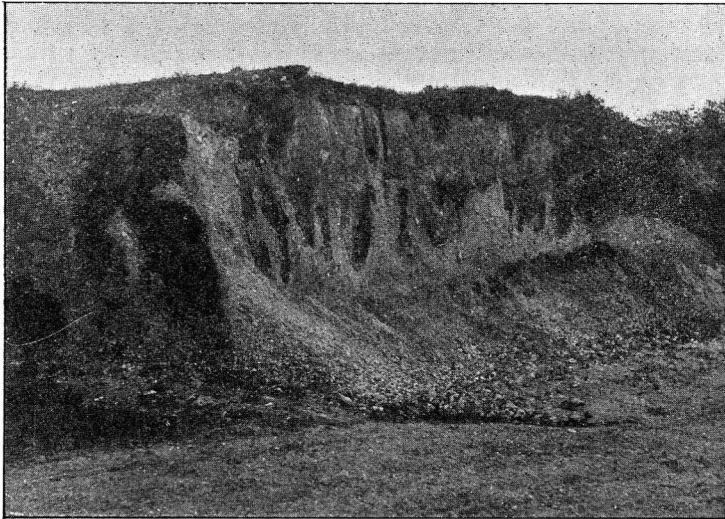
‡ *Ibid.*

§ Lomas, "On some Flint Implements found in the Glacial Deposits of Cheshire and N. Wales," Liverpool, *Arkell*, p. 12.

Irish sea, the only source of the flints is Antrim. They, as a rule, possess the physical character peculiar to Antrim flints."

In 1893 and 1898 I obtained from gravels of glacial age* west of Wells, Norfolk, implements of a rude type, one of them *in situ* at 4 feet down in the sand and gravel. This gravel pit is known now as Morter's, formerly Cadamy's, and is about 300 yards south of the Wells to Holkham Railway. The railway is metalled from the gravel of the cuttings between Wells and Holkham, and between Wells and Fakenham, in which these gravels cap the disturbed chalk.

FIG. 3.—MORTER'S GRAVEL PIT, WEST SIDE.



The following is Rev. O. Fisher's description of the railway-cutting west of Wells:—

"The deep channels cut out of the chalk surface by these (ice) bergs are to be found farther to the west (of Kelland and Weybourn). There is a splendid section of such a one in the railway-cutting between Holkham and Wells. The width of it is 120 yards. It is filled with coarse bouldered gravel and fine calcareous sand, containing abundantly frag-

* Rev. O. Fisher, M.A., F.G.S., "On the Denudations of Norfolk," *Geol. Mag.*, 1868, p. 551. See also Drift Map 68 N.W. of Geol. Survey.

ments of chalk foraminifera and occasionally a fragment of *Cardium edule*. Here we have the coarser materials from which the finer particles have been carried off to form loam elsewhere."

These gravels being thus demonstrably glacial, the contained implements are pre-Glacial, transported probably across the sea from the Lincoln or Yorkshire coast. Although these gravels were deposited in Glacial times, all the flints need not have been striated. From the undoubted Chalky-Boulder-Clay of Little Stukeley very few of the chalk flints are ice-scratched: from an undisturbed deposit dug out in making a rain-water reservoir 12 feet deep and 10 feet in diameter I only found two flints with striæ—they are now in the possession of Dr. G. J. Hinde, F.R.S.

In his paper in the *Anthropological Journal*, Mr. J. Allen Brown points out how nearly the eoliths and the palæoliths are associated. From his long study of stone implements he satisfies himself that the eoliths, palæoliths, and neoliths are closely related without any great lapses of time.

But fortunately we have still further direct evidence of the age of pre-glacial man in the researches of Dr. H. P. Blackmore, of Salisbury. He had previously worked successfully in the gravels of Alderbury Hill, near Salisbury, which according to Prestwich belong to the southern drift,* and are therefore of the same age as the plateau gravels of Kent. His magnificent series of eoliths from these gravels have convinced so cautious a geologist as Mr. H. B. Woodward, F.R.S., who said† he had recently seen, in Dr. Blackmore's museum at Salisbury, a series of the eolithic implements; and he was much impressed by the apparent evidences of design which they afforded. He has also, under the guidance of Dr. Blackmore, examined the plateau gravel at Alderbury whence many of the flints have been obtained; and these were considered to have been hacked rather than chipped into their present forms. It was noteworthy that Dr. Blackmore had never obtained a single palæolithic implement from this plateau gravel, whereas in lower-level gravels near Salisbury such implements do occur, and among them

* *Quart. Journ. Geol. Soc.*, 1890, vol. xlvii, p. 181. "Alderbury Hill, three miles from Salisbury, was capped by gravel full of chert and rag-stone, like the southern drift of the Thames Basin."

† *Quart. Journ. Geol. Soc.*, 1898, p. 297. Discussion on Mr. W. Cunningham's paper on "Palæolithic Implements from Plateau Gravels."

were specimens which have been fashioned after the same type as some "eoliths" but more highly finished.

Since 1898 Dr. Blackmore has been anxious to get a more definite geological date for the eoliths, and has had the good fortune to find eoliths in the *Elephas meridionalis* gravels of Dewlish, in Dorset. He has generously placed the announcement of these discoveries at my disposal; and the Victoria Institute has the honour of the first statement of these important facts.

Dr. Blackmore's statement to me by letter is as follows:—

"The Alderbury gravels were looked upon by Prestwich as a good example of Southern Drift. Before he had definitely arranged the various beds of gravel, they were looked upon as Pliocene, but the absence of fossils, shells, or mammals always left the question of age somewhat doubtful. They certainly rest upon the Bagshot Sands, are at a much higher level than the river drift, which furnishes both flint palæolithic implements and a very good list of Pleistocene mammals and shells.

"There is one point worth noting: the Alderbury gravels are largely dug for road-metalling, and for the last twenty years search has been made for the ordinary palæolithic type of implements both by myself, the workmen who dig the gravel, and other good field-geologists, but in vain. Nothing of this kind has turned up, although they are found in fair abundance in the lower-river-drift gravels of the neighbourhood.

"But since one's eyes have learned to recognize eolithic forms and workmanship, plenty have been found in the Alderbury gravels at all levels, some 14 feet deep, which I have taken out of the gravel with my own hands.

"Being very anxious to fix the Pliocene age of these eoliths, rather more than a year ago I went down to Dewlish, in Dorset, with the express purpose of carefully examining the gravel which had furnished the remains of *Elephas meridionalis*, as this was the one spot in the South of England which was regarded as a patch of Pliocene gravel.

"The farmer, Mr. Kent, on whose land the elephant remains were found was fortunately known to me, and he furnished me with two or three labourers. A trench was opened through the deposit of gravel, and there was no difficulty in finding eoliths, stained like the gravel, at the same level and associated with the elephant bones. This was to me most satisfactory and conclusive.

"I may add that my grandfather, Mr. Shorto, first obtained a molar of *Elephas meridionalis* from this locality in 1813; and I was present when Mr. Mansel Pleydell and Rev. Osmond Fisher in 1887 (but then one's eyes had not recognized eoliths) found the remains now in the Dorchester Museum.

"I have not yet published this fact, but you can make use of it, as it is, I believe, the best evidence of undoubted age yet known. The age of the plateau gravels is very difficult to fix; but I believe the presence of eoliths coupled with the absence of the usual river-drift type of palæolithic implement to be a fact quite as eloquent as a Pliocene bone or shell.

"The character of the work on the flints is important. Eoliths are *hacked*,* palæoliths are *chipped*, and neoliths are *flaked*. Hacking, chipping, and flaking are the characteristics of the three stone periods.

"The colour of the flints varies. The dark and deeply stained yellow ones have clearly been derived from an older gravel; on the other hand, those unstained or but little stained, and having the edges of the fractures but little water-worn, could not have travelled far, and are probably nearly, if not quite, contemporaneous with the deposit of the gravel."

Here, then, we have a series of workers in different parts of England whose labours, whether in Kent, Wales, Norfolk, or Dorset, all lead to one and the same result. They all point to the Pre-Glacial age of man, and the labours of Mr. Abbott and Dr. Blackmore both place his remains distinctly in the epoch of *Elephas meridionalis*.

The question then remains what that epoch is to be called.

Mr. H. B. Woodward's summary of the Pliocene strata is as follows†:—

The Pliocene deposits of this country occur chiefly in Norfolk and Suffolk, and they consist of shelly sand, gravel, and laminated clay.

* This is *generally* true, but deeply ochreous plateau implements with small chippings do occur from the Kent Plateau 450 to 500 feet O.D., and many neoliths are rudely chipped.

† *Geology of England and Wales*, 2nd Ed., p. 455

The beds are subdivided as follows:—

Newer Pliocene.	{ Cromer Forest-Bed Series. Norwich Crag Series. Red Crag.
Older Pliocene.	

I do not propose to discuss the Crag Series here, but simply to point out that the Cromer Forest-Bed Series occurs immediately above the Weybourne beds* of the Norwich Crag, and below the Glacial beds.

However, Prestwich points out† that the base-line between the Pliocene period and the Quaternary or Pleistocene period is somewhat arbitrary. He places this base line at the top of that very variable deposit the Chillesford Clay and consequently includes the Forest-Bed with remains of *E. meridionalis*, in the Pleistocene period, as the lower member of the Westleton Series.‡

A list of the Forest-Bed flora and fauna is contained in Mr. C. Reid's memoir on *The Geology of the Country round Cromer*, pp. 62–80, and in Mr. E. T. Newton's memoir on *The Vertebrata of the Forest-Bed*. (*Geol. Survey Memoirs*, 1882.) The absence of *E. primigenius* (mammoth) should be noted.

If, then, we follow Prestwich, we shall class eolithic man as belonging to the early Pleistocene; if, on the other hand, we follow Lyell, we shall regard him as of late Pliocene time. The geological facts of the case, however, are the really important points; the nomenclature, however useful as a framework for the scientific appreciation of those facts, is in this instance a secondary consideration.

As Dr. Hicks pointed out in his last Presidential Address at the Annual Meeting of the Geological Society in 1898, "all the evidence tends to show that the so-called Tertiary and Quaternary periods merged gradually one into the other, and were not separated by any great break in Britain. The higher mountains, before the close of the Tertiary period, must have been covered in part by ice and snow, and the so-called "Glacial period" can only have a chronological importance as indicating the increased intensity and climax

* C. Reid, *Geology of the Country round Cromer*, 1882, descriptions of sections, pp. 25–33; also Fig. 4, p. 33.

† *Geology*, vol. ii, 1888, p. 441.

‡ *Ibid.*, pp. 422–445.

of that cold condition gradually ushered in at the earlier time. For the same reason there is no marked and definite line separating the fauna of the Pliocene from that of the Pleistocene, for we find remains of the animals of the warmer period closely associated with those of the colder in the same deposits, and under conditions which show clearly that they lived in those areas at the same time.*

I cannot do better than conclude this paper with the word of Professor Grenville A. J. Colet:—

“Surely the existence in the Pliocene period of a man-like animal capable of making implements is to many of us one of the highest probabilities. The close of the Pliocene period has nothing mystic or magical about it, nor is it likely that man sprang fully armed from glacial furrows. Let us ask ourselves candidly on which side of the question does probability lie.”

In conclusion I have to thank Professor Rupert Jones, F.R.S., for loan of books and pamphlets, and also for critical help; and Mr. Benjamin Harrison for access to and loan of his specimens.

* *Quart. Journ. Geol. Soc.*, vol. liv, 1898, p. lxxix.

† *Nat. Science*, October, 1895, p. 295.

Geological Period.		Geographical Conditions and Climate.	Fauna.
Holocene.	Modern.	Present day.	Present.
	Neolithic Age.	(3) Present day with addition of submarine forests round coast.	<i>Bos longifrons</i> , Owen.
Pleistocene.	Post-Glacial.	Palaeolithic.	Wet epoch. Cold and dry with glaciers. Warm and moist.
	Glacial.		Increasing cold. Submergence. Marine boulder clay.
Newer Pliocene (1) (Lyell). Early (Older) (2). Pleistocene (Prestwich).		Eolithic.	Gradually growing colder. Mild at first (4). (7) <i>Elephas meridionalis</i> , Nesti. <i>Rhinoceros leptorhinus</i> , Cuvier.

NOTE.—*Elephas meridionalis* overlaps *Elephas antiquus*, as *E. antiquus* overlaps *Elephas primigenius*, but *E. meridionalis* and *E. primigenius* did not co-exist.

- (1) Judd's *Student's Lyell*, pp. 182, 3.
- (2) Prestwich, *Geology*, vol. ii, p. 442.
- (3) Boyd Dawkins, *Early Man in Britain*, p. 254. Map.
- (4) Judd's *Student's Lyell*, p. 170.
- (5) Probably an immigrant from India. Scharff, *Hist. of the European Fauna*, p. 253.

NDIX.

Flora.	Synchronism with other regions.	
<p>Present.</p> <p>Wheat, barley, etc.</p>	<p>1. Iron Age. } 2. Bronze Age. }</p> <p>3. Polished Stone Epoch. 4. Chipped Stone Epoch.</p>	<p>{ North American Stone Age. South " " " Melanesian " " Australian " " Egyptian (partly) " "</p>
<p>Partly Arctic.</p>	<p>Raised beaches and head. Low- and high-level gravels.</p> <p>Brixham Cave. Kent's Hole Cave. Cresswell Caves. Hoxne Gravel. Selsey Bill.</p>	<p>(8) Loess of the Continent. (9) Belgian Caves. French Caves. German Caves, etc.</p>
<p>Arctic.</p>	<p>Moel-Tryfaen Clyde Drift.</p>	<p>(10) Scandinavia. North Germany. France. Italy. Spain. Switzerland. North America. Nicaragua. North Africa.</p>
<p>Gradually changing with increase of cold. Temperature at first.</p>	<p>Plateau-gravels. Dewlish. Cromer Forest-Bed.</p>	<p>(11) Pliocene of the Val d'Arno, Italy, and St. Prest, France.</p>

- (6) Probably identical with *Elephas Armeniacus*. Scharff, *op. cit.*, p. 252.
- (7) Agrees in all essential characters with *Elephas hysudricus*. Scharff, *op. cit.*, p. 253.
- (8) Prestwich, *Geology*, vol. ii, p. 483 and p. 6. Table of Sedimentary Strata.
- (9) *Ibid.*, pp. 498 and 504, "Cave Chronology."
- (10) *Ibid.*, chap. xxix.
- (11) Prestwich, *Quart. Journ. Geol. Soc.*, vol. xlv, 1890; Westleton Shingle paper, part ii, p. 174.

EXPLANATION OF THE PLATES.

- Plate I. FLINTS FLAKED BY FROST.
- Fig. 1. Waterloo Pit, Great Stukeley, Hunts.
 Figs. 2, 3, 4. Morter's Pit, Wells, Norfolk.
- Plate II. IMPLEMENTS FROM SOUTHERN DRIFT, ALDERBURY, WILTS.
- | | | |
|---------|-----------------------------------|-----------------|
| Fig. 1. | <i>In situ</i> , at depth 14 feet | } 325 feet O.D. |
| " 2. | " " 6 " | |
| " 3. | " " 11 " | |
- Plate III. IMPLEMENTS FROM DEWLISH, DORSET, 350 feet O.D.
- Figs. 1, 2, 3. From gravel with remains of *E. MERIDIONALIS*, NESTI.
- Plate IV. SOME SUGGESTED USES OF PLATEAU TOOLS.
- Fig. 1. Square "sleeker," Parsonage Farm, Ash, British Association, Pit II, *in situ*, below 6 feet in the gravel bed; 700 feet O.D.
- " 2. Square "sleeker," Shepherd's Barn, Shoreham-in-Kent, 500 feet O.D.
- " 3. Round "sleeker," Stockham Wood, Shoreham-in-Kent, 600 feet O.D.
- " 4. Round "sleeker," Shepherd's Barn, Shoreham-in-Kent, 500 feet O.D.
- " 5. Double-shoulder scraper, small variety, Preston Hill, Shoreham, Kent, 500 feet O.D.
- Plate V. BORER, SCRAPER, HAMMER.
- Fig. 1. Borer, Great Northfield, Shoreham, Kent, 500 feet O.D.
- | | | |
|------|---|----------|
| " 2. | " " " " | Obverse. |
| " 3. | Scraper or rude "spear-head." | Reverse. |
| " 4. | Hand hammer, glacial gravels, Morter's pit, Wells, Norfolk. | |
- Plate VI. (A.) MASSIVE PLATEAU IMPLEMENTS.
- Fig. 1. Bower Lane, Eynsford, Kent (bone crusher, etc.), 500 feet O.D.
- " 2. Parsonage Farm, Ash, Pit III, *in situ* at 8 feet (pointed tool), 700 feet O.D.
- " 3. Well Hill, Shoreham, Kent, 600 feet O.D.
- (B.) SMALL PLATEAU IMPLEMENTS WITH FINE CHIPPING.
- " 4. Sepham Heath, Shoreham, Kent (hollow scraper), 600 feet O.D.
- " 5. Sepham Heath (pointed tool), 600 feet O.D.

Plate VII. OCHREOUS PLATEAU FLINTS MOSTLY FROM THE SURFACE
WITH LIMONITE INCRUSTATIONS RESEMBLING THOSE FOUND
in situ IN BRITISH ASSOCIATION PITS AT PARSONAGE
FARM, SOUTH ASH.

- Fig. 1. South Ash, 500 feet O.D.
,, 2. Shepherd's Barn, 500 feet O.D.
,, 3. Ash, 700 feet O.D.
,, 4. Terry's Lodge (from a shallow excavation), 770 feet O.D.
,, 5. Blean, 200 feet O.D.

NOTE.—Plates II and III are figured from specimens in Dr. H. P. Blackmore's collection.

Plate VI, Fig. 2, and Plate VII, Figs. 1, 3, and 4, are from Mr. Benjamin Harrison's collection.

The rest are from my collection: those implements figured, except Plate V, Fig. 4 (found in 1898) were examined and approved by the late Sir Joseph Prestwich.

DISCUSSION.

The CHAIRMAN.—Before inviting the Members present to commence the discussion, I may say that I think you have already by your applause anticipated me in proposing a vote of thanks, which we all owe to the lecturer.

It is a subject that I am not qualified to discuss—or hardly at all—but he has shown himself to be a perfect master of knowledge respecting it, and he has given us a most valuable lesson in geology, as to the various formations in which these flint implements of different form and appearance are found.

I will now ask Professor Rupert Jones to address the meeting.

Professor RUPERT JONES.—I really cannot tell you anything more than Mr. Bullen himself has so clearly and definitely put before you.

There are one or two little points on which I would say something.

As a geologist, I should have liked the author to have given more importance, in a popular kind of way, to the height of the Wealden dome that did exist. It is not so easy for people to fancy, or imagine, the real condition of things, as shown on the diagram; but although it was some 2,000 or 3,000 feet in elevation, I believe, you must remember that the same movement, the same crush, the same lateral pressure that brought that up, as a mere crumple of a carpet, raised the Ardennes Mountains ten times as high. So that there is nothing so very wonderful in it to a geologist.

Eoliths and palæoliths sometimes seem to be almost muddled up together—not by our friend the author, but by people in general. As a matter of fact they are found together in some cases, though not quite undistinguished; but they may be found in one place together, and people say they are all of one form; but eoliths are the very earliest condition in which a man can use a clean flint stone, or pebble, with slight degrees of modification which are necessary to make it useful. The palæoliths have been still more mixed up, and possibly people who made the palæoliths were making eoliths originally in the same way, and therefore you find the two together.

Again, neoliths are only a complete and finished form of palæoliths with their smoothly polished surfaces and edges. Still, they are practically distinguishable; but sometimes they are found together, and then people are led to confuse them. But really I think we ought to realize that these stone implements, whatever they are (and the older the better), are really historical evidence, that they are the best historical evidence, when you can define their places of deposit that is, which gives their age, and that they are better than papyrus, better than papers or parchments of history. Why? Because history has been re-written, altered, and amended, altogether losing its character of exact truth. Whereas these, wherever they are found, tell us at once what they are, and where they come from, and how they were made. (Applause.)

Mr. STOPES, in response to the Chairman, said: I am much indebted to you for having the privilege of joining in the discussion of this exceedingly interesting and most able paper. I have only one fault to find with it, and that is that it is altogether too much to be discussed in the limited time at our disposal. As a consequence, without going over the whole ground, which I would like to do, in the few remarks I offer, I will confine myself to two or three points.

I much regret that the author has not emphasized the point that is so rarely realized by people now, viz., that they are living in "the stone age." So much time is expended needlessly, and somewhat fruitlessly, in attempting to define a former age in which men have lived and have worked. A very great deal of effort is made to define, if possible, the limits within which men have lived, and everyone seems to ignore the fact that we still live in "the stone age," that we have people living with us who know little of the use of metals, and who until recently were as ignorant of the earth as the people we are discussing when we speak of the stone age now. I think we should remember that many have come to the conclusion that man lived long ago, and it would be better to attempt to define more truthfully the conditions under which he did live.

I am glad that this discussion carries us back to the early pleistocene. I think it is a pity that all collectors are not geologists, and I will go a step farther and say that it is a still greater pity that all geologists are not collectors. They have

often had the opportunity of collecting information, and if they had written out a list and had kept it, we should have been saved much that is now extremely doubtful and upon which there is conflict of opinion.

I have no hesitation in expressing the belief that pleistocene man did exist, for the reason that will eventually be found—that some of these stones on the table were made by pleistocene man in pleistocene times. I think there is not a stone here that was not made by man, for though they bear signs of natural agency there is much that shows man's handiwork—that they were finished and used by man for a variety of purposes, and the evidence of use is evidenced by the signs of wear on them.

I have brought with me some stones, not being certain whether Mr. Bullen would have some. *Here* is one, which is still more interesting than those other two on the table. It is the same shape and form, but this was originally made by plateau man: It has a ferruginous coating.

[The speaker here exhibited and explained the features of his specimens, including neolithic, palæolithic, and eolithic samples.]

Professor LANGHORNE ORCHARD.—We shall all agree in thanking Mr. Bullen for his interesting paper.

I was very much struck, as he went along, with what may be called hasty generalizations. Some stones are supposed to be the work of man, and it is inferred that if others are like them they too must be the work of man. Some stones which appear to be human implements are found in the early pleistocene, and it is at once conceived that man must have lived in the early pleistocene. That is a style of argument which enthusiasts are very apt to adopt; but I think we ought to be very greatly on our guard in that kind of thing. Perhaps nothing has more hindered the progress of science in the past than hasty generalizations. Professor Huxley well remarked that a scientific man is very careful in saying that he knows a thing in the absence of very complete evidence. Professor Rupert Jones made a good remark in the same direction—that in some levels you find together palæolithic, neolithic, and eolithic. Along with implements made by the old Egyptians and other men of not very great geological antiquity you find these very things, and you conclude that because they are in the same level they are of the same age? “No, not on that account,” you

say. What right have you to do it on any other? I think we shall see with Professor Prestwich that man cannot possibly be assigned to an earlier time than the pleistocene. As to the real antiquity of man, I think, on competent authority,* it has completely broken down in every case where it has been attempted to assign man to an earlier date than post-glacial times.

Professor E. HULL.—I should like to say a word with regard to the age of these plateau gravels. I have studied them a good deal in various places—the Isle of Wight, at a level of 400 feet above the sea, and the counties south of the Thames amongst others—and I have satisfied myself that they are certainly not of pliocene age. We know what the pliocene strata of the East of England are very well, but these are entirely different—different in position, and different in character—and the conclusion I have come to is that they are really neither the early pleistocene nor the pliocene, but that they represent the middle pleistocene, in other words, the inter-glacial stage. They are representative of those beds which, in the North of England and Wales, rise to a level of 1,100 and 1,200 feet with sea shells of existing species. If you go south the level decreases and descends to 600 and 400 feet in Hants and Dorset, at which height they are very definitely shown in central Isle of Wight at St. George's Downs. They are separated from the pliocene beds by that great deposit of early boulder clay, or early glacial drift, which is not represented in the South of England at all, but which constitutes an important member of pleistocene series in the North of England, Scotland, and the West of Ireland.

I accept these specimens on the word of Mr. Bullen and Mr. Stopes as unquestionably the work of human art; but I would take a *caveat* in assigning them to the early pleistocene, and a *fortiori* to the pliocene age. I do not think the evidence that Mr. Bullen has afforded is at all convincing, and I do not think that he would himself say that it was convincing with regard to the early pleistocene age.

On the other hand, I venture to think that they are really representative of the middle or inter-glacial period, when there

* Professor McKenny Hughes, F.R.S.

was the great submergence of the British Islands over the whole area, and when these gravel beds were deposited.

The CHAIRMAN.—Before I ask the lecturer to reply I would ask him if he has seen something which illustrates the deposit in the form of the large and varied collection of stone axes in the Antiquarian Museum of Stockholm. It is a remarkable collection. I do not express an opinion as to their age; but they are contained in a room as large as this, with glass cupboards all round the walls and up to the ceiling. The colours are very remarkable, from a bright orange, brown, and yellow to white. It is a perfect study of beauty to see them, whatever opinions there may be as to their antiquity.

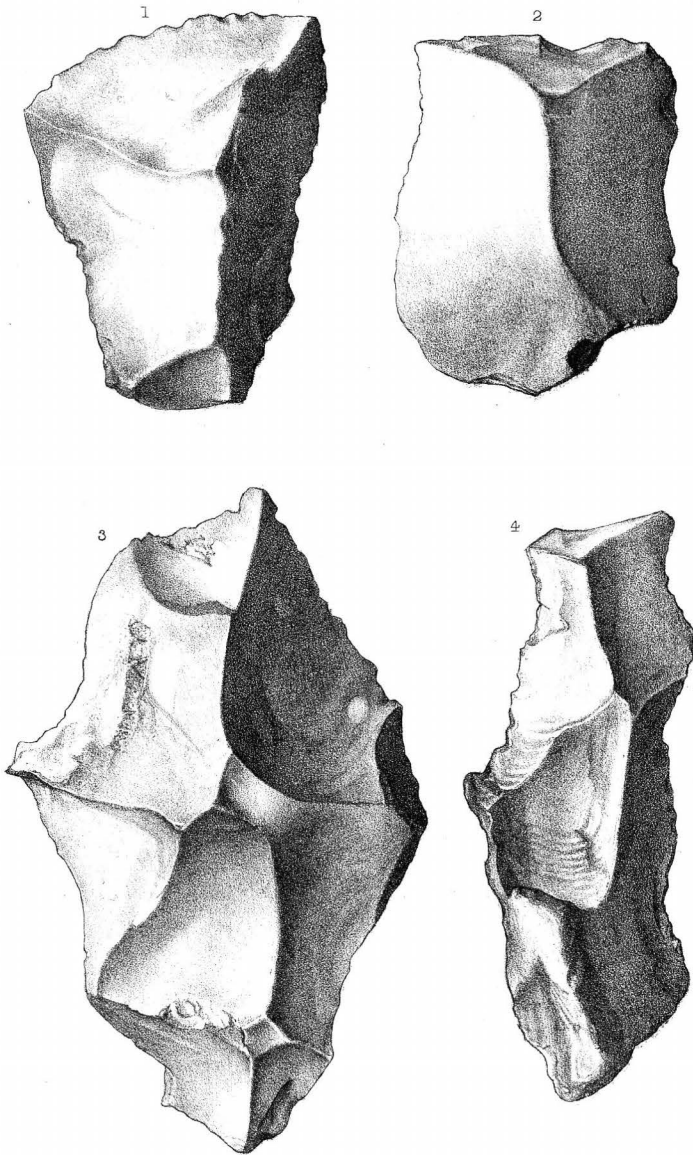
Mr. MARTIN L. ROUSE.—I think the lecturer stated, in regard to the colour of this deposit, that the chocolate colour indicated an immense period of weathering; but, as a fact, are not stones found in these gravels of all colours? In my garden I have been picking up silicious stones for some time past, and I have found them red right through, sometimes with black exteriors, and sometimes with yellow. I understood him to say that these axes were of such enormous age because they turned to that red colour; but may they not have obtained that red colour from the banks? I only put it as a question. Would he give us evidence for being pleistocene?

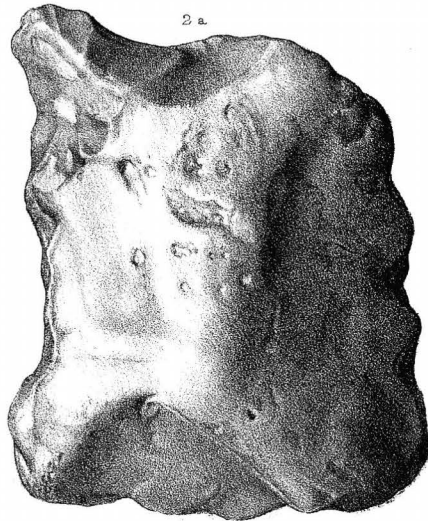
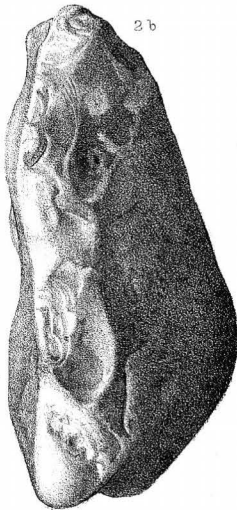
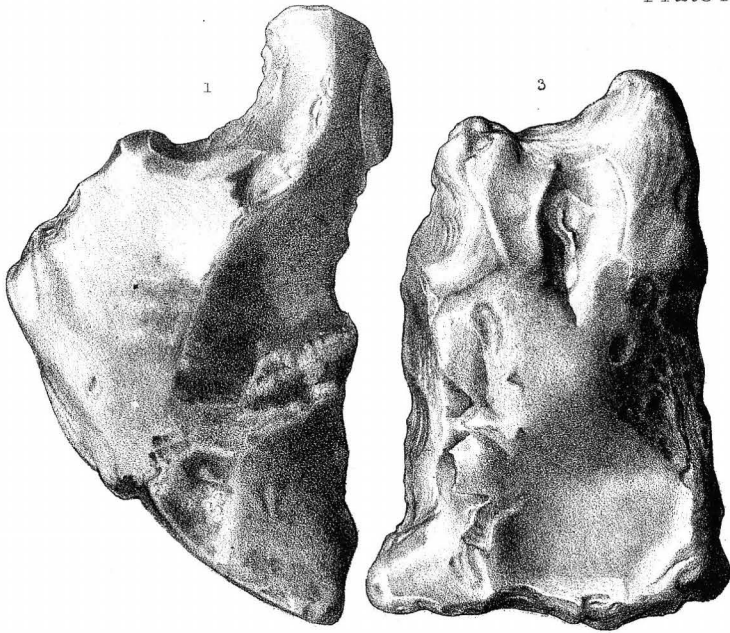
The Rev. R. A. BULLEN, in reply, said: With regard to the pleistocene age of these implements, I thought I had carefully guarded myself against saying anything about "pleistocene" or "pliocene." I said that the important point in regard to these implements was that Dr. Blackmore has found worked flints in gravel that came from the *Elephas meridionalis* bed, Dewlish, Dorset, that pachyderm died out before the glacial age, and there is no evidence of its having existed into the glacial age. The only real evidence we have that man existed before the glacial age is from the Forest-Bed in the north of Norfolk, of which we know the geological age, and if we find man's implements in connection with remains of *Elephas meridionalis*, we say that man lived at the time of the *Elephas meridionalis*.

I cannot agree with Professor Orchard that there are any "hasty generalizations" in my paper. They are simply statements of fact.

Professor E. HULL, in reply to Mr. Rouse, explained that he

Plate I.

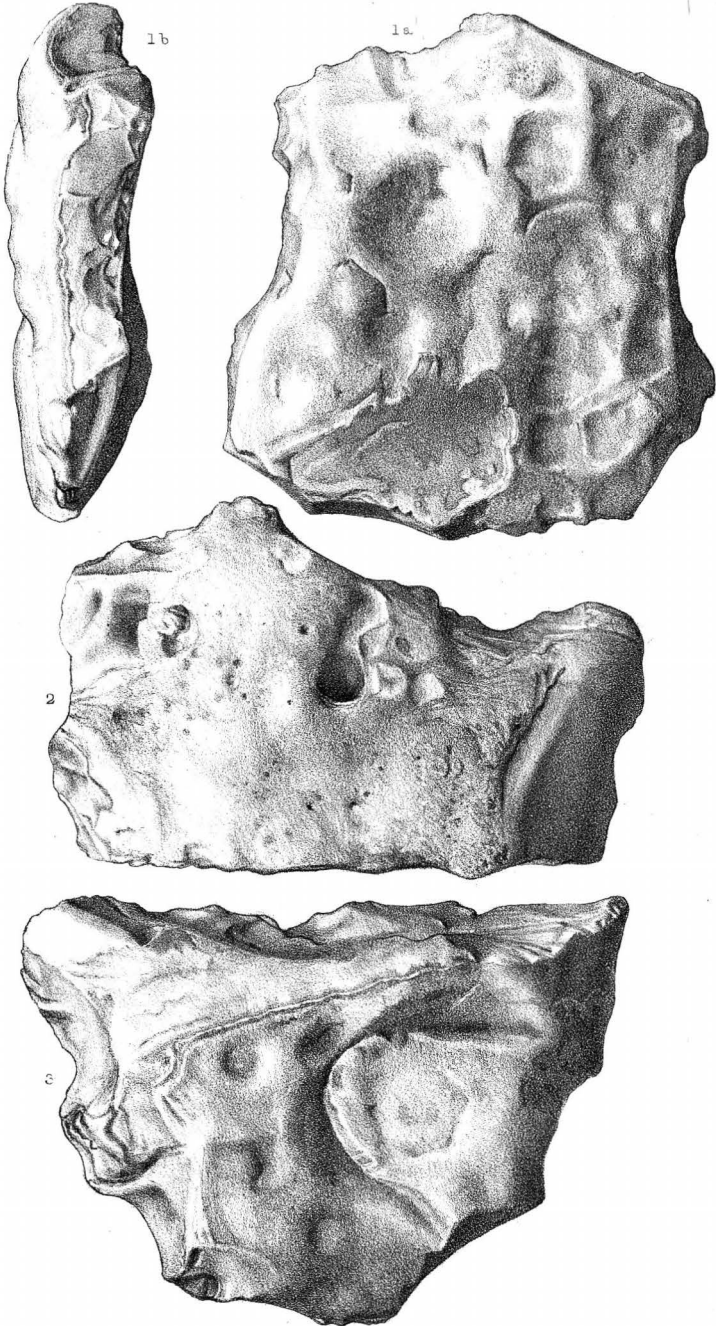




GM Woodward del. et lith.

West, Newman imp.

Implements. Alderbury, Wilts.



GM Woodward, del. et lith.

West, Newman imp.

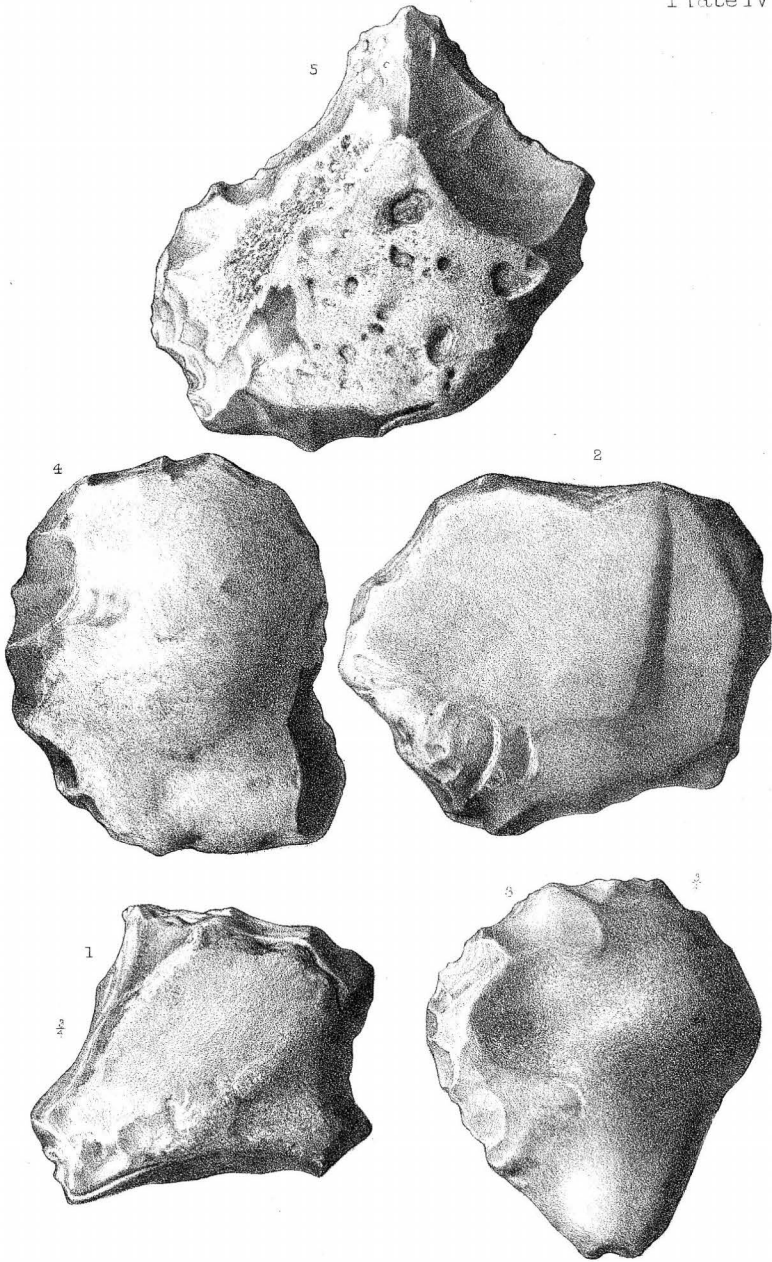
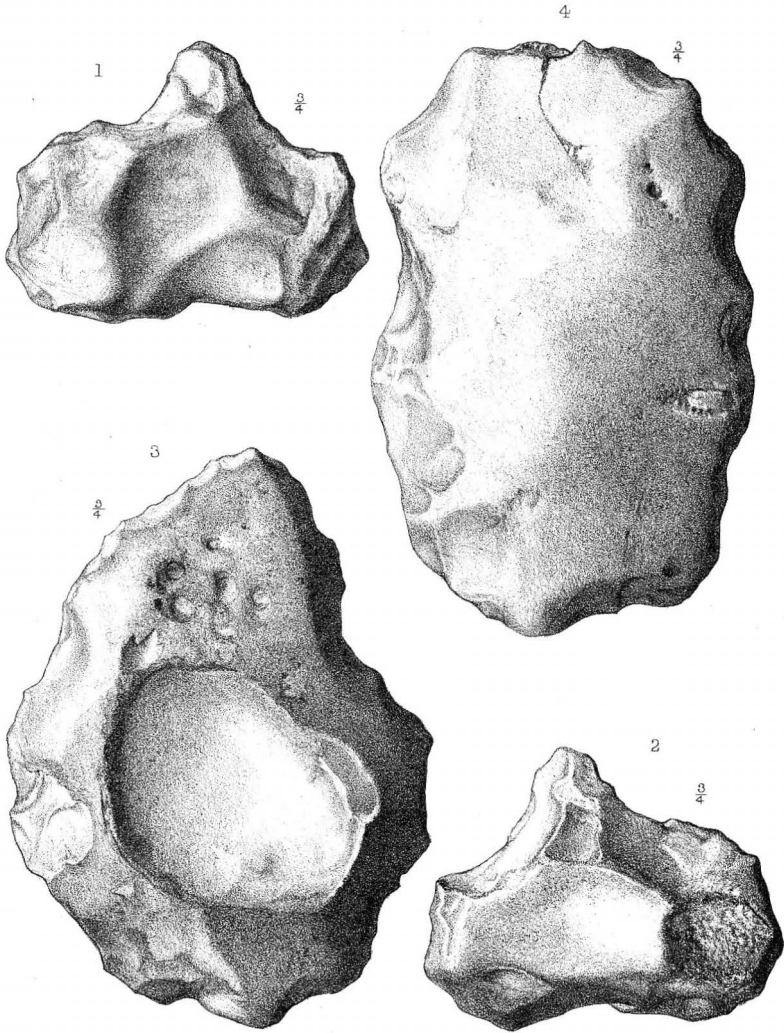
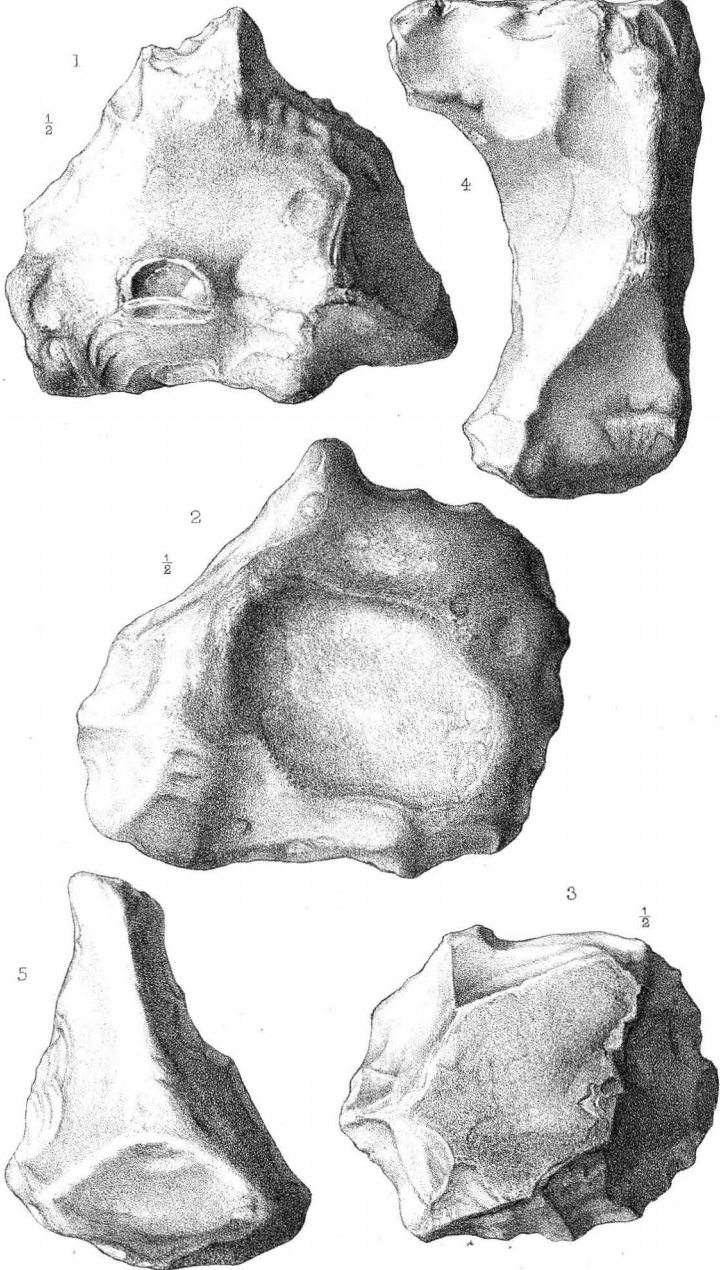


Plate V.



GM Woodward del. et lith.

West, Newman imp.





intended to say, in regard to the boulder clay, that the excessive cold in the South of England in the pleistocene period would have been quite sufficient to destroy the *Elephas meridionalis* if it existed at that time.

The Rev. R. A. BULLEN (continuing) said: Anything that Professor Hull states commands great respect, but these plateau-gravels of Kent are so far removed in their relative position from demonstrably pleistocene gravel that we must consider them to be pre-glacial. I do not care whether you call them pre-glacial or not; but they certainly have nothing to do with the mid-pleistocene, and if Professor Hull studied the evidence on the spot I think he would come to the same conclusion. It is such a tremendously wide subject that we must be guided by the opinions of specialists.

I have never had the pleasure of seeing the museum at Stockholm. That is a great pleasure to come, I hope. As far as I understand, the implements of which the Chairman spoke are of neolithic age. I think all those who have to do with this subject will say they are not masters of it as yet, but just simply students.

The proceedings terminated.

ORDINARY MEETING.*

DAVID HOWARD, ESQ., D.L., F.C.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following paper was read by Mr. Theophilus G. Pinches in the absence of the Author :—

A VISIT TO THE HITTITE CITIES EYUK AND BOGHAZ KEUY. By Rev. G. E. WHITE, Marsovan, Turkey.

FINE spring weather and fine Turkish courtesy from officials, local boys, and villagers, supplied the outward conveniences for the interesting visit named above, and made by three young Americans of the Marsovan missionary circle in March, 1898. The first night was spent at Chorum, near the junction of the three ancient provinces of Pontus, Galatia, and Cappadocia, and the 1st chapter of I Ep. of St. Peter furnished suitable devotional reading that evening.

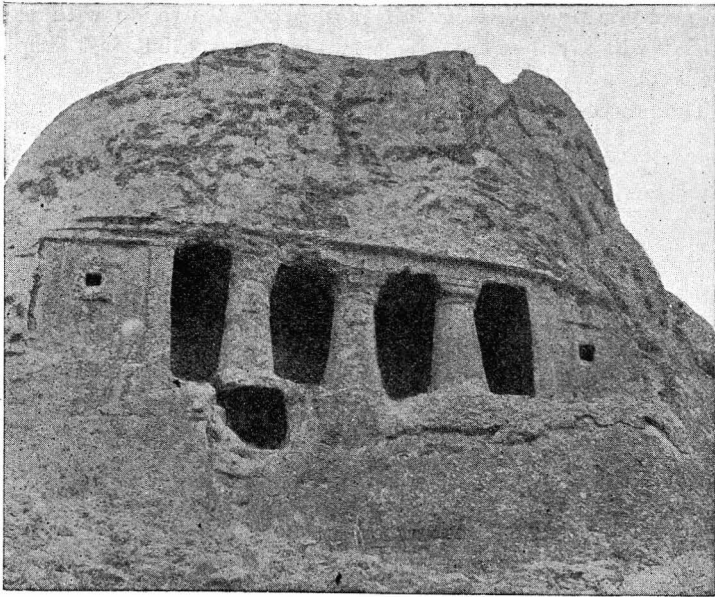


FIG. 1.—“THE BRIDAL CHAMBER.” EXCAVATION NEAR ALAJA.

(From photograph by Rev. G. E. White.)

* March 4th, 1901.

The next day, an hour before reaching Eyuk, we came to Kaloh Hissar, Castle Wall, a double peak rising 500 to 600 feet above the plain, with a village of Circassian refugees from Russia at its foot. The peak has some of the crumbling masonry so common in Turkey, but at the summit we found something different. On the topmost of four steps, cut in the rock, once sat an idol, or a human figure nearly life-sized, the feet resting on the third step and cut from the same stone that formed the step. The feet are broken off at the ankles now, and the rest of the figure is gone. The toes of the shoes are round, not sharp pointed or up-turned according to the usual Hittite custom, but the Hittites did not carve all their shoes with sharp up-turned points, and the conclusion seems natural that Kaloh Hissar also was a Hittite shrine in the times of the Old Testament.

Eyuk, meaning in Turkish, "mound," is built upon a low level mound, in which the villagers say strange stones are sometimes found when they dig for the foundations of dwellings. At one corner of the town the stones remain exposed that once formed a temple, wonderful not for its size or beauty, but for its age and the peculiar character of the Hittite sculpture. Of the building nothing worthy the name is left save the outline of a room about 25 x 30 feet square. But the entrance is still guarded by two huge basalt stones some twelve feet high, the face of each of which is carved into the form of a sphinx, with fillet across the forehead, ear-rings, necklace, and wing-like attachments from the head to the sides of the body. There is a striking resemblance to the pictures that come from Egypt. On the inner wall of the sphinx at the right as one enters the temple, is a double-headed eagle with a hare in either talon, and a human figure above, almost or quite life-size, supported by a foot, resting on the double head of the eagle. On the left was a similar carving, now almost effaced.

The entrance is approached by a double line of huge basalt stones forming a dromos, which presently turns a sharp angle to the right and left. Two processions approaching the temple are represented on these walls. They are a series of human figures cut in bas-relief on the face of the stones about three feet high. They are mostly clad in tunics reaching to the knees, with sometimes a loose cloak draped from the shoulders to the feet, skull-cap with a horn in front reminding one of the Egyptian uræus, shoes (usually) turned up at the point, and the figures have large noses and large

ear-rings. One figure has either a long tassel on a close-fitting cap, or hair depending in a closely-tied queue; either supposition favours a Mongol origin for the Hittites, for the first resembles the custom of the Turks; the second that of Chinamen. Such customs of dressing the hair or covering the head are very persistent in the Orient.

In one case a priest seems to be ministering before an altar, another priest is dragging a ram by the horn, with three more rams in the field behind and above; another pours a libation upon the foot of a seated goddess. One figure is playing a guitar, another blowing a horn, several have each a lituus, a musical instrument, depending from the hand; a man climbs a ladder half higher than himself and consisting of seventeen rounds. One of the great stone blocks exhibits six similar figures marching; two have bulls, one with something on his back, perhaps an altar; and there are two lions on blocks that have been displaced from the series—the lion is the most characteristic animal of Hittite sculpture. The whole scene seems to be clearly religious, not political or military, and is attributed by Professor Sayce to the thirteenth century before Christ.

Eyuk and Boghaz Keoy are five hours apart, and the latter was evidently a great capital. It is suggested that it was the cool summer abode of the "kings of the Hittites," who were natives of this region, but operated in Syria or elsewhere in winter. The space enclosed by a wall is over a mile long by a half mile broad, and contains remnants of

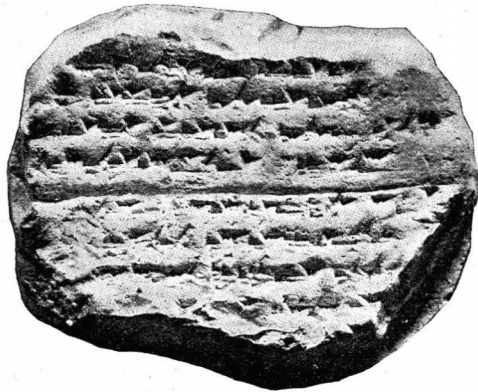


FIG. 2.—TABLET FROM BOGHAZ KEOY, SHOWING CUNEIFORM CHARACTERS.

three castles and three palaces. From the top of the wall to what was the bottom of the moat in places exceeds 150 feet in a straight line. These walls were built without mortar, the great rampart of earth being topped by a double-faced wall of large cut stones, the space between being packed with rubble. The outer upper edge of each cut stone has a little turned-up ledge, which prevents the stone laid upon it from slipping outward, while its fellows on either side and the rubble behind kept it from moving in those directions. The outer slope of the walls is in some places paved with flat stones, which both held the earth and would place invaders at the mercy of defenders. The principal palace was of the form of an Oriental inn, with a series of rooms about a large central court. Near by is an overturned chair or throne mounted upon and between two lions.

Boghaz Keoy has but one inscription, Nishan Tash, a lettered stone face six feet by eighteen in size, but, sad to say, this is defaced beyond decipherment. We were fortunate however in securing some fragments of cuneiform tablets (Fig. 2) and seals, probably Hittite or Mycenaean. One of these last had a figure 4 in the centre, surrounded by rope-work and with a loop at the back for passing a cord through. We found also a whorl of the sort found in such numbers by Dr. Schliemann at Troy.

One of the spots we found most interesting is an abrupt rock called "School Rock," two slopes of which have been hewn into the shape of bowling floors. The larger, about 18 by 30 feet, and as nearly semi-circular as the configuration of the rock permits, forms quite an auditorium. The rock faces are cut down eight feet, and decorated with striated lines, and the floor is a series of low broad tiers or stairs. At the focal point the rock has been drilled with several holes, where the platform of players or the bench of a judge might easily have been erected. The whole is a rough but distinct form of a theatre, and the query at once arose, Have we not here a copy of the original of that famous structure, the Greek theatre? If the Hittites of Cappadocia could make sphinxes like those of Egypt, correspond in cuneiform characters with the people of Mesopotamia, and amuse themselves with playthings of a kind more abundantly used at Troy, how natural for them to pass on to the Greeks anything of their own worth while copying, for the Greeks to improve upon? Here is a small rough assembly hall, within the walls of a capital and near

the throne, why not a model to the Greek? The suggestion is made for what it may be worth.

The most important sculptures at Boghaz Keoy are those of Yazili Kaza, two miles from the ancient town. Here again the design is devotional, not military. The larger of two rock galleries contains on its sides a double procession meeting in the middle. The figures are like those at Eyuk, but more in number and of greater variety. The skull-cap gives place to high and flat-topped, or high and conical caps, the peak sometimes drawn forward in the "Phrygian" style. Lions, tigers, and double-headed eagles support various human forms. Others stand on mountain summits, or on the heads of men. At the head of the two processions, which contain more than three score figures, a priest and a priestess of gigantic size meet each other with peculiar symbols in their hands. Would that the key to all this were known to us; that we understood what were the thoughts in the minds of the men who carved these images in the rocks long before the time of our Lord! The Hittites faded from history 700 B.C.

The smaller of the Yazili Kaya rock galleries contains other figures like those in the larger. One interesting series of twelve men seem to be reapers, each with his sickle over his shoulder, but they may be soldiers marching with swords. Many places in the region were described to us by the villagers as having "idols and writing," or "lions and dogs," etc., some that we were able to examine yielding nothing interesting. Rock-hewn tombs with Doric columns, and a spiral stairway cut through solid rock down to a river, but with no trace of a castle above, aroused our curiosity.

One place, however, the village of Eski Yapar, one hour west of Alaja, deserves special mention. It is built like Eyuk on a flat mound in an open plain, and discovers peculiar stones to the inhabitants when they dig. Apparently the *débris* of an Oriental village occupied for generations had lifted the very site of the place up to the height of a man above the plain. Here we found several Greek inscriptions on stones used as tombstones, perhaps a thousand years ago. A round column inverted and half buried proved to be a Roman milestone with the name Cæsar plainly to be read on it. Apparently it was a milestone of Antoninus Pius, well nigh two thousand years ago, set up to guide travellers on roads long since forgotten. Then a villager invited us to look at a queer stone built into the corner of

his house, and there we found cut in red sandstone rock another figure of a lion. This one had lost its head, and being set up on its tail occupied an awkward and uncomfortable position for so noble an animal and so valuable an archæological specimen. For what can it be but another Hittite lion made and left more than three thousand years ago?

That little village of Redhead, *i.e.*, "Shiite" Turks, with its relics of three other peoples with their mighty governments, their races, languages, religions, customs, and civilizations distinct one from another, and a thousand years apart, and with Doric and Ionic capitals in the near vicinity, is an example of what is waiting for the spade of the explorer, and the genius of the archæologist in the soil of Asia Minor.

NOTE.—Two plaster casts, and a photograph of one of them will be exhibited. They are now in the hands of Mr. Theophilus G. Pinches, who has kindly undertaken to give his views of the language at the meeting of the Institute to be held on the 4th of March.—E. H.

Then there is this letter from Mr. White which has been received by the Institute:—

"Anatolia College,

"Marsovan, Turkey in Asia.

"February 19th, 1901.

"Professor Dr. Edward Hull,

"Secretary, the Victoria Institute, London.

"MY DEAR SIR,—Since writing my paper on the Hittite cities Eyuk and Boghaz Keoy, scheduled to be read before the Institute March 4th, I have had the opportunity of another visit to Kaleb Hissar. On the top of the sharp peak mentioned in my paper, and near the staircase and broken feet, I saw a seat or saddle mounted between two lions which are looking upward. The whole is worn with time and moss-covered, but the two lions' heads, with nose, nostrils, mouth, cheeks, forehead, mane, and ears, finished in square corners were unmistakable. Near by are two mounds, apparently artificial and believed by the natives to contain buried antiquities. Many coins are found in the fields about. These lions' heads can hardly be other than Hittite. It was the throne of a Hittite prince.

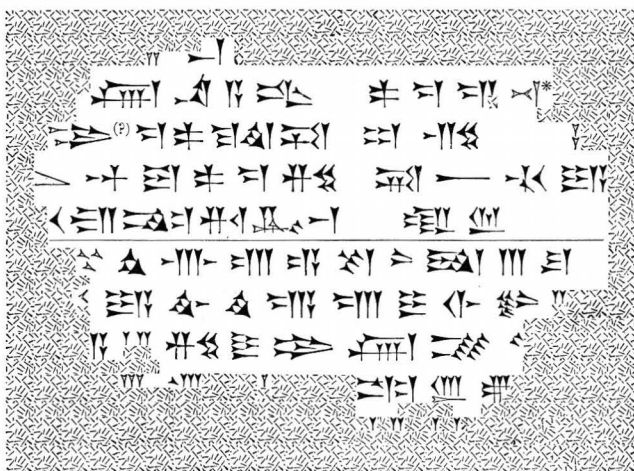
"I send you this item thinking that you might like to give it a place along with my paper, which I trust may draw out interesting information from some of the able scholars connected with the

Institute. I should be very glad to know of any other important facts brought out in connection with the subject on March 4th.

“Sincerely yours,

“G. E. WHITE.”

Dr. PINCHES continued.—Here are two casts of the fragment of a tablet found by the writer on the spot. Some of the audience may like to see a drawing, which has been made by somebody in America, giving the characters as he saw them. Professor Hull, our Secretary, was kind enough to lend me this photograph, which shows better what a fragment of a tablet is like, and from that and the casts (principally the casts) I have been able to make a copy of the inscription. I have also written a few notes on it which I will read. By the kindness of our Secretary I received a photograph of the small fragment of tablet referred to rather more than a fortnight ago. The width is about $2\frac{3}{8}$ by 2 inches, and it has remains of ten lines of writing, in a style resembling the Babylonian of the tablets of Cappadocia and certain of the tablets of Tel-el-Amarna, especially those which are regarded as having been sent from Mesopotamia and the districts to the north of Syria. The following is a reproduction of my copy:—



COPY OF THE TABLET FROM BOGHAZ KEUY, MADE BY T. G. PINCHES FROM THE CASTS.

* Or 𒀭𒀬 , perhaps part of 𒀭𒀬 , *zi*.

wedge following the Υ , α , be the determinative prefix for the name of a man, is probably to be completed Υ Υ Υ , A-zi. To all appearance the name of the district over which his father ruled was Bit-tahhi, though the reading of the first component (*bîi*) is doubtful on account of the uncertainty as to what the language of the fragment is, and the last syllable is in the same case on account of the mutilation of the inscription.

It will thus be seen that there is every probability that the fragment is historical, and its arrangement would suggest that it was in the form of annals.

With regard to the language there is considerable doubt. Besides the words transcribed as if they were Semitic, but which may, as has been already stated, have been pronounced in an entirely different way, there are several others, phonetically written, which are not impossibly Semitic. These are *ittabzi* (resembling a verbal form with inserted *t*), *izzi* (which may be a noun or an adjective), *taštia* (which resembles an Assyro-Babylonian noun with the suffixed possessive pronoun of the first person), *šerru*, and *karû* (both of which resemble nouns). Besides this, *etenit* and *išin* might also be Semitic (verbal forms). Concerning the numeral "three" or "third" in line 6 I have already spoken.

On the other hand, *na-a*, *an da pa*, the combination of characters at the beginning of line 6, and the greater part of line 7, if not the whole, have a non-Semitic look. A comparison of the letter in the language of Arzapi or Arzawa from Tel-el-Amarna shows an inscription written in a precisely similar style of writing, and containing words which have some likeness to Semitic expressions, but which are certainly not Semitic, and are to all appearance not by any means so numerous. There is little or nothing, however, in the inscription from Arzapi which throws light upon the fragment now under consideration, though this may be simply due to the fact that the former is a letter, whilst the latter is apparently historical, and on that account would naturally contain entirely different words and phrases.*

* An examination of the copies published by M. Chantre from the pens of Boissier, Delitzsch, and Scheil shows that in the other tablets found at Boghaz Keoy there are not only Semitic words (one, in an inscription which seems to contain forecasts, seems to be the Assyro-Babylonian word *ērâti*, "pregnant women"), but words having a Semitic

After writing the above, I went this afternoon to the British Museum to consult a book by Ernest Chantre, entitled *Mission en Cappadoce*. Unfortunately the Museum reading-room was closed; but Mr. Fortescue, the Keeper of the Department of Printed Books, at once took me into the large room at the back of the reading-room, and after some delay, as the book was in the possession of one of my former colleagues in the Department of Assyrian and Egyptian Antiquities, I obtained it; but unfortunately the waiting consumed the amount of time I thought to devote to that book. I did, however, what I could in the time at my disposal, and compared the copy I had made with the fragments (which are rather numerous) described by M. Chantre. Those fragments contained, as far as I could see in a short time, the same kind of inscriptions, and there were also remarks on them by M. Boissier, the Swiss Assyriologist, and Professor Delitzsch, and copies of the inscriptions. Some of them were by Professor Delitzsch, and his copies I found to be by far the best. The texts differ much in character, and the opinion expressed seemed to be that they were not historical and not contracts; nor were they letters, but religious texts. If that be the case, we have something here which differs from the known documents, because this inscription seems to be, on account of its mentioning the name of a son of a king, historical, more or less, or it may be part of a letter.

With regard to the language, as I have indicated, it is similar to the idiom of the ancient city, called in the tablet I have mentioned Arzapi,* and possibly akin to Hittite; but whether it is the same as Hittite, or only akin to it, I am not in a position to say. Professor Delitzsch's signature, I noticed, was not at the end

appearance, and also (as was to be expected) ideographs which are used as in Semitic Babylonian inscriptions, and which may have been read with their Babylonian pronunciation, *i.e.*, as words borrowed from that language. It is also worthy of note that one of the inscriptions published in M. Chantre's book contains, as there stated, the name of Sargon (probably the Babylonian ruler of about 3800 B.C.). Another of these inscriptions, moreover, seems to refer to the sceptre-bearer of Sargon, and an official with a similar title *may* occur in line 3 of the fragment now published, in which case the first character would be that for "man," not "king." If, however, the reading of the copy and the transcription be correct, the line in question probably means "the king took (held, or something similar) the sceptre."

* Or Arzawa, as it is generally read.

of the statement containing that section, but at the end of the next section—but perhaps his signature covers both of them; and his opinion was that the safer course, at present, was to say nothing with regard to the language, and I feel, in view of the opinion of such an eminent authority, I cannot go very far wrong if I follow his example.

With regard to the position of Arzapi, M. Chantre says:—“Faut-il rapprocher le nom d'Arzapi de celui d'Anazarba, ville de Cilicie? Il est impossible de formuler autre chose que des conjectures. Rien malheureusement ne vient encore confirmer l'hypothèse de M. Théodore Reinach, suivant laquelle il faudrait placer les Mitanniens (Matiènes) dans la région montagneuse de Boghaz-Kcui.” The names Arzapi and Anazarba, however, are not quite so much alike as one would wish; it is hardly likely that the earlier form of the name of a city would be shorter than the later form; but there may be something in it, and the suggestion made by M. Reinach that the language was spoken in Cilicia.

The CHAIRMAN.—We have to thank the author of the paper for a very interesting communication. These fragments of Hittite literature and chronology, which are being so constantly investigated, open up some very interesting points. It is a very difficult study, and I am sure we have to thank the author and Mr. Pinches for the contributions they have given to this important subject, upon which we shall be very glad to hear remarks.

The SECRETARY (Professor EDWARD HULL, LL.D.).—Before the discussion commences, perhaps you will allow me to say a word as regards the manner in which these very interesting inscriptions, or casts taken from them, came under the notice of the Institute.

The Rev. Mr. White is an American missionary in Turkey in Asia; like many missionaries scattered over those countries, he has not confined his labours to the first object of his mission, but he has also endeavoured, by personal observation, to add to the sum of human knowledge of ancient times in the countries in which he labours.

This short paper was sent to the Institute by Mr. White, and I at once submitted it to Professor Sayce, who happened then to be in England. I wished, before he left, to have his opinion upon its merits as a paper to be submitted to the Institute, and he

kindly read it and sent it back saying, "Certainly; read it by all means. We are very anxious to have as much information as we possibly can on Hittite remains and inscriptions." Here it is, and we are again fortunate in having such a high authority as Mr. Pinches, who so kindly undertook to read the paper this evening, and to draw up some notes of his own regarding its character and relation to other countries, and the language in which the inscriptions are given.

I feel sure we are all highly indebted to the author and to Mr. Pinches for what they have done in this matter.

Mr. ROUSE.—I feel deeply indebted on this subject, as we all do, and very grateful to the author of the paper and to Mr. Pinches for contributing so much to our knowledge of this ancient part of the world; and I should like to add a few general remarks in the nature of links with other discoveries.

First of all, when Mr. Arthur Evans brought back from the island of Crete, in the year 1894, a number of works of art which he attributed to the Caphtorim, he had, amongst those things, a jar on which there was a representation of two men, apparently nude, but with very long pointed shoes. They also wore very long hair and beards. I suppose they were fishermen who had cast off their "fishers' coats," but nevertheless kept on their shoes to guard their feet from the sharp rocks. It appears these men had been found portrayed in Egypt and were there called Caphtorim. Moreover, he showed us by the language he had found on many of these porcelain vessels in the caves of Mount Ida that the writing of that people greatly resembled the Hittite characters. Further, he observed that the Bible several times calls the Philistines Cherethim, which he reads as only another name for Cretans. He thinks that Crete was "the isle of Caphtor,"* and that in Crete, as he put it, we have the Philistines at home. Last year I had the pleasure of listening to him again at the British Association; and his researches had then raised the number of hieroglyphic signs from seventy to a hundred. A linear system of writing to a small extent founded on this prevailed more considerably at Knossos; but the hieroglyphic, with its resemblance to the Hittite, was in his judgment the alphabet of the original Cretan stock—"the Eteocretans of the

* Jer. xlvii, 4 (R.V. and Heb.).

Odyssey." Moreover, in the pointed shoes we seem to have a link supplied between these Caphtorim and the Hittites; in which case we have a confirmation of Holy Scripture which shows us that these people were, anciently, related to each other.

There is another curious point. We are told twice here, I think, that there has been found a double-headed eagle inscribed on the rocks. The Tell-Amarna tablets and the inscriptions found in the ancient Hittite empire show us that the Hittites spoke a language similar to Turkish—an Altai language. The Turks originally, as we know, inhabited the Altai mountains; and a vast number of people speaking a similar language to the Turks are settled round the Altai mountains, and the Turkomans of Turkestan are held to belong to the same ethnic branch. We know that the Tartars, as they have been called in later times, overran Russia in the early and middle ages, and held sway over Russia for several centuries. Must the double-headed eagle, then, which the Russians now have as their symbol, be derived from the Turko-Tartars and these Hittites, who lived on the borders of Cappadocia?

In regard to musical instruments that have been referred to, it is very interesting to find that these ancient people used musical instruments. We used to be told that the Egyptians only played the cistra, which was something like a baby's rattle; but afterwards there were discovered harps with fourteen strings, which goes to confirm the story of Miriam and the Israelitish women praising the Lord with musical instruments. I see in the paper the *lituus* is called a musical instrument. I always thought it was a crook which the augurs used for divining in some way. I daresay that is merely a misprint.

There is a statement here, speaking of the figures found carved on the rock at Eyuk, "one figure has either a long tassel on a close-fitting cap, or hair depending in a closely-tied queue. Either supposition favours a Mongol origin for the Hittites, for the first resembles the custom of the Turks; the second that of Chinamen." Of course we have not seen those pictures so we cannot hope to discriminate; but I think it is a mistake to talk of the Turks and Chinamen as if they belonged to the same race. Philologists do not, so far as I know, ever classify the Chinese language with the Turkish. So far as I know Chinamen have a still more differing type of language.

The CHAIRMAN.—If there are any other remarks to be made we shall be very glad to hear them.

A letter has reached us which was to be read. We rather wish it had been typed, as it is rather difficult to read without preliminary examination.

The SECRETARY.—The letter in question is from the Rev. Dr. Walker, who, I am sorry to say, is laid up by illness. He takes great interest in the subject, and he has sent us a long communication, but from my ignorance of this particular subject I cannot read it without great difficulty, which would take up much of your time.

I would humbly suggest that those who send in communications should kindly get them typed. It is a simple and cheap process, and makes communications absolutely as legible as if they were printed.

Mr. PINCHES.—I do not think I have much to say in reply. Naturally, not being the author of the paper, I cannot speak of its contents as I should like to do. I have not been to the part to which he refers, and which he has visited; and unfortunately I have not had time enough to read certain books on the subject which I should have liked to do, especially that by M. Chantre, to whom I have referred, who has written a very important work upon it, but it is rather too voluminous to master in a short time, especially when one has other occupations. Then, I believe, Ramsay has been there and has written about it, but I am not quite certain on that point.

There are one or two points that have been mentioned by Mr. Rouse to which I think I might refer. First as to the double-headed eagle. It is a very remarkable thing that that eagle, which is found on a great many monuments of Hittite origin, has its counterpart on a statue which is rather far from the Turki, and which was the centre of Hittite civilization, viz., the ancient Babylonian city of Lagash. From that place a large number of very important antiquities have been, as will be remembered by many, obtained by the French Government, and on some of the sculptures the double-headed eagle is shown.

I have also been studying, for the last year or so, a very important collection of Babylonian tablets from that spot, viz., Lagash—now Tel-lo—belonging to Lord Amherst of Hackney, and I have paid special attention to the mutilated cylinder seals

with which those documents are impressed. On several of these I have found birds of various kinds—generally in the position of the double-headed eagle, though the bird itself is probably not double-headed, and naturally that suggests a connection with the Russian, and probably, also, the Prussian eagle. On one of the tablets, instead of an eagle there is a winged dragon, and on another of the tablets one of these birds has a dragon's head, which would seem to connect these devices, viz., the double and single-headed eagles and winged dragon. Naturally these impressions are often not very well made, and there may be doubt as to some of the details; but I examined them very carefully with magnifying glasses, and I think the drawings I made of them are substantially correct.

Referring to musical instruments, a sculpture from the same place, Tel-lo (now in the Louvre), has a representation of a harp, and I believe that is the oldest representation of a musical instrument known—at least from that part of the world. The date is put down at 4,000 years B.C. (that is not my date), and the remarkable thing about this harp is that it has eleven strings. Possibly the sculptor wished to represent twelve, which would make the complete octave,* with semi-tones, which implies a certain knowledge of harmony on the part of those very ancient people, if, as seems probable, it is intended to represent twelve strings.

MR. ROUSE.—Would not it want thirteen to complete the octave?

MR. PINCHES.—Yes, it would have to be thirteen to complete the octave. However, the number is sufficiently suggestive, it seems to me.

MR. ROUSE.—Yes.

REV. J. TUCKWELL.—Could Mr. Pinches give us any information with regard to the language? I believe Professor Sayce and others have been devoting attention to that, and I believe the impression is that it is monosyllabic.

DR. PINCHES.—I would rather not pronounce an opinion as to the language at present. I know several scholars have been studying it (I mean the Hittite language), and Professor Jensen

* I intended to say "scale" (without repeating the first note an octave higher).—T. G. P.

has made very comprehensive and lengthy studies, and has written a considerable amount upon it. I am bound to say, however, that there is considerable difference of opinion. Professor Sayce agrees, in the main, with a great many of Professor Jensen's statements. On the other hand, Professor Hommel, some of whose attempts at decipherment I was reading a few days ago, differs from Professor Jensen considerably, and the question naturally arises, which of the two is right? That being so, I do not see how one can pronounce an opinion as to the family to which the language belongs, and for that reason I would, myself, rather not say anything about it.

I am at the disadvantage of not having (I may as well frankly say so) studied the Hittite language at all. I find the study of Assyrian, with Akkadan and its dialects and possible linguistic connections, quite enough, with archæology and other things, to fill up all my time.

[The meeting then adjourned.]

ORDINARY GENERAL MEETING.*

THE PRESIDENT, SIR GEORGE G. STOKES, BART., IN THE
CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following election was announced :—

ASSOCIATE :—Dr. Chr. Mudd, of Fitzroy, Melbourne, Victoria.

The PRESIDENT.—I will now call on Sir Charles Wilson to have the goodness to deliver the Address, which he has most kindly promised us, on “Moab and Edom.”

RECENT INVESTIGATIONS IN MOAB AND EDM.

By Major-General Sir CHARLES W. WILSON, K.C.M.G.,
K.C.B., F.R.S.

SIR GABRIEL STOKES, LADIES AND GENTLEMEN,—Many years ago, when I was surveying Jerusalem, I used to sit on the Mount of Olives and look with longing eyes on the richly tinted mountains of Moab. The colouring, as those of you who have visited Jerusalem will remember, is most brilliant, and in the light of the setting sun the mountains have the appearance of a veritable fairyland. The only picture I have seen which does justice to the colouring is the “Scape-goat” of Helman Hunt, which has occasionally been exhibited in London.

Last spring, by great good fortune, I was able to make a short tour in the country I had so longed to visit in the early sixties. At that time travelling was difficult, and the few travellers who had visited Moab had only been able to accomplish their object by the expenditure of large sums of money. Afterwards Canon Tristram and others travelled in Moab; but the Canon, as many of you may remember, had a rough experience on one occasion, when he was held prisoner at Kerak for a considerable time. Since the occupation of Moab and Edom by the Turks, travelling

* Monday, February 5th, 1900.

has been comparatively easy, and I had no difficulty in moving about the country, except when the Turks were so anxious for my safety that they insisted upon sending a couple of soldiers with me.

Edom and Moab, so closely connected with the history of Israel, are interesting from the complete agreement of their physical features, as in the case of Palestine, with the slight topographical notices contained in the Bible. From the Dead Sea and the Jordan valley there is a steep ascent to a high-lying plateau. This plateau, which, on the north, has an elevation of 2,640 feet above the sea, rises gradually southward until it attains above Petra an altitude of 5,300 feet, or a height of something like 6,500 feet above the surface of the Dead Sea. Eastward it falls away with an easy slope until it loses itself in the Syrian desert, which extends to the Euphrates. The plateau, and the remarkable valleys that intersect it, are the result of the physical processes which caused the formation of the Jordan valley and the Dead Sea; and this fracture of the earth's crust gives much of its peculiar character to the scenery. As regards the geological formation, a section in the vicinity of Petra gives at the bottom red sandstone and conglomerates, and then, in ascending order, carboniferous limestone with fossils, the variegated Nubian sandstone in which the tombs and temples of Petra are cut; and limestone, with thick beds of flint, which corresponds to our chalk. It is this cretaceous limestone which forms the surface of the plateau and gives to Moab and Edom many of the characteristics of our Sussex downs and Yorkshire wolds. The limestone, dipping towards the east, passes here and there under sheets of basaltic lava due to comparatively recent volcanic action.

A peculiar feature of the country is the number of deeply cut ravines that intersect it from east to west. These ravines are not wholly formed by the action of running water, but are connected with the fracture and subsidence of the earth's crust to which the great rift owes its origin. They are really cracks at right angles to the line of the Jordan-Arabah fault. This great line of fracture is continued down the Red Sea and is apparently found in the great rift of Central Africa. The recent investigations of Captain Lyons in Egypt have shown that the Nile valley is also due to a fracture probably of the same age.

The natural features of the country are well distinguished

in the Bible. In the first place there are the downs of the plateau, which are called "the plain country" or *Mishor*. The downs form an almost ideal pastoral country, and Moab, as we know, was celebrated for its large flocks of sheep and goats. The basalt tracts, which I have mentioned, are exceedingly rich and productive. Nearly everything can be grown in them, and they are called the *Sadeh Moab*, that is, the "Field," or cultivated districts of Moab. Beyond the downs is the desert, which during the rainy season, and for a short time afterwards, is covered with sufficient desert vegetation to give food for camels and the flocks and herds of the Bedawin. This is the *Midbar* or wilderness of the Bible. These three districts are common to Moab and Edom; but the whole country is now little cultivated. No better land for the growth of wheat and barley could be found than that in some of the districts, and since the Turkish occupation small areas have been brought under cultivation and have given rich returns. Wherever there is water, as at Kerak, Tuffleh, Elji and M'aán, the olive, fig, pomegranate, and vine thrive well.

The kingdom of Moab at one period extended northward to Mount Gilead and included that part of the Jordan valley which lies opposite Jericho and is called *Arboth Moab* or the "plains of Moab." The Moabites were driven south of the Arnon by the Amorites, and that river was their boundary when the Israelites entered Palestine. The divisions of the country are clearly marked by its physical features. The northern boundary of Moab is the Wády Mojib, or Arnon, a very deep valley, almost a cañon, which it is difficult to cross. The descent from the north is a very rough one of about 1,860 feet, and the ascent on the south side is about 2,040 feet. Formerly it took a day to cross this ravine; but since the Turks have made a mule-track it can be crossed in from four to five hours with comparative ease. The southern boundary is the Wády el-Hesi, which in its eastern portion has a fine stream that is probably the Brook Zered of the Bible. This ravine, which is more deeply cut than, but not so difficult to cross as, the Arnon, separated Moab from Edom. South of Wády el-Hesi is the district of *Jebeil*, which corresponds to Gebal, a place mentioned only once in the Bible (Psalm lxxxiii, 7). This district is separated from Edom proper by a remarkable break in the hills above the Arabah which I have ventured to call the "Shobek Gap." Edom proper is separated from Midian

by an equally well marked valley—the Wády el-Ithm. The general direction of the roads is controlled by the physical features, and it is comparatively easy to trace, up to a certain point, the route which the Israelites must have followed. There is only one road from Western Palestine to Edom north of the Dead Sea, and that follows the line of the old Roman road to Medeba. But south of the Dead Sea there are several roads. One leads directly to Kerak and Moab; another runs up Wády Músá, and passes by Petra, to Edom; and a third, ascending to the plateau by Wády el-Ithm, continues northward along or near the eastern boundary of Edom. Now, adopting the view that the Israelites endeavoured to travel by the easiest natural route, it seems probable that they came, in the first place, to the mouth of the Wády Músá with the view of passing through Edom to the Holy Land. The Edomites, however, refused the necessary permission, and the Israelites then marched southward, along the Arabah and up Wády el-Ithm, so as to avoid Edomite territory. One of their camps—it is difficult to say which—must have been near the desert town of M'aán, where there is, and must always have been, an abundant supply of water. The Israelites then journeyed northward, along the line of the present Haj road, by which the pilgrim caravans journey from Damascus to Mecca. The Israelites were practically confined to this route; for if they had diverged to the east they would have got into the Syrian desert, and if they had kept more to the west they would have become involved in a complicated system of ravines, and have encountered great difficulties. By keeping to the Haj road they avoided the ravines, or crossed them at the easiest points, and were able to turn westward over the plateau by a very easy road to Dibon (*Dhibán*). The lines marked out by nature for the construction of roads, and for the passage of large bodies of men, explain many points connected with the history of the country. They also throw light on the wars between the Israelites and the Moabites, upon the expeditions of the Crusaders, and upon the raids of that prince of freebooters, Renaud de Chatillon. One of the most important roads, especially during the Roman period, when it was made a great highway by Hadrian, was that which connected Damascus with the Gulf of 'Akabah and Arabia. The Israelites, in their campaigns, used the roads south of the Dead Sea. On one occasion they passed through the wilderness of

Edom and were in want of water (2 Kings iii, 8, 9). This seems to indicate that they marched by the desert road, and the battle was fought on the border of Moab, probably in the Wády el-Hesi.

I think that the incident of the blood, or red-coloured water, that the Moabites saw may possibly have been due to a cloud-burst in the hills at the head of the valley, which was not visible to the Israelites. The flood-water probably came down with a rush during the night, as it often does in those regions, and a stormy sunrise, after the rain, would give the red tinge to the water which the Moabites saw in the early morning.* All the expeditions by the Crusaders were made by the roads south of the Dead Sea and had as their objective the line of communication that linked Egypt and Arabia to Damascus and Northern Syria. The rich caravans which passed along this road were frequently raided by the freebooters of Shobek and Kerak. Renaud de Chatillon, who was a very remarkable man, at one time fitted out an expedition to attack Mecca. Following the example of the Kings of Judah and Israel, he built large galleys at the head of the Gulf of Akabah and sent them down the Red Sea with orders to prey upon the Arab boats, and if they could effect a landing, to try to take Mecca. The expedition failed, principally, I think, because Renaud was not with it, and not a man returned to tell the tale.

The climatic changes on the plateau, due to the desert on the east, and the deep depression of the Dead Sea on the west, are interesting. In the vicinity of the latter, the air, which has been superheated in the great rift during the day, rushes up through the ravines with a loud roar and much violence at sunset and for some hours afterwards. At Tuflekh our tent was in danger of being blown down, but after a few hours the wind suddenly dropped and it became quite calm. I was told that this strong rush of heated air occurred every evening and that sometimes it was of almost cyclonic violence.

In winter there is usually heavy snow on the higher portions of the plateau, and even throughout the spring and well into the summer it is often very cold. The cold wind is the east wind that blows off the desert, which cools down very rapidly after sunset. A curious feature about this east

* An interesting description of a sudden freshet in the valley of the Arnon is given by M. Lucien Gautier, *Autour de la Mer Morte*, 1901.

wind is that it becomes a hot wind west of Jordan. Whilst we were shivering on the eastern plateau, the people at Jerusalem were having one of those hot sirocco winds which bring fever and sickness. This may be attributed to the fact that the east wind from the desert drives before it the heated unhealthy air that is always rising from the Dead Sea and the Jordan valley.

The efforts made to impound and store water in the olden times are remarkable. The whole country is full of large cisterns and reservoirs. I was also much struck with the way in which terraces had been built across the valleys to retain the surface soil and prevent the too rapid escape of the rainfall. Arrangements were also made for irrigating the lands.

At one spot on the plateau of Edom, in the vicinity of Petra, there is an oak forest, or rather the remains of one. It was still a large wood and in some places so dense as to be difficult to pass through. I think Professor Hull mentions that he saw from the Arabah what he took to be trees on the hills above him, and I have no doubt that what he saw was a part of this forest.

The old towns well deserve examination. There are fine Roman remains, but some of the most interesting ruins are those of the Christian period, which have, here and there, marked characteristics. There was little or no wood in the country suitable for building purposes, and all the roofs of the houses were of stone. They built, without mortar, a series of closely spaced parallel arches, or arcades of stone, and then laid large flat slabs of stone on the crowns of the arches to form the roof. Some small churches and nearly all the large reservoirs were roofed in a similar manner. In the latter case the stone roof kept the water clean and prevented evaporation. The Turks have done much for a country in which, a few years ago, no one could travel without fear of being robbed. In that part of the world they have, at any rate, been civilizers, and their occupation has made it easy for travellers to visit Moab and Edom.

I have no time to go into the numerous instances in which the history of Moab and Edom comes into contact with that of the Israelites; but it is extremely interesting to study that history with a knowledge of the geography of the country. I was fortunate enough to obtain a few Greek inscriptions of Christian origin, which are the first that have come from Moab. They were discovered accidentally, and

this seems to indicate that many others might be found. I heard of many inscriptions from the Arabs, but the present Turkish law with regard to antiquities is so unfortunate in its action that when any one finds an inscription or an antiquity he at once buries or destroys it. I am afraid that the effort to secure all antiquities for the Constantinople Museum has led to the loss of many objects of great value, but I feel sure that there is much to be discovered by excavation in Moab and Edom. At Petra we were able to find two or three new Nabataean inscriptions. There, too, excavations would certainly bring to light much that would be of great historical importance. Moab and Edom have been recently visited, on three or four occasions, by Professor Brünnow, who spent eight or nine weeks at Petra. I believe his book, when it appears, will give much new and valuable information, especially with regard to the inscriptions and to the general condition of the country. I was fortunate to have with me Mr. Hornstein, of the London Jews' Missionary Society, who is a perfect Arabic scholar, and seemed to be the friend of every one in the country. He is also an accomplished photographer, and I will now show you some of his photographs, as they will enable you to realize better than any words of mine the general aspect of the country.

[The lecturer then exhibited on the screen a series of interesting photographs of the *locus in quo*, and after some discussion the meeting terminated.]

DISCUSSION.

The Rev. Canon GIRDLESTONE.—I am sure we are all under a very great debt of gratitude to Sir Charles Wilson. He has given us a great treat and a great deal of illustration of the Old Testament. Many of these points must be quite new to some of us, and they are very interesting.

Canon Tristram's name has been referred to many times, and you will all be interested to know that to-day is his golden wedding

day, and I hope we may send him a message of congratulation from the Victoria Institute.

With regard to Kerak, it is very interesting, I think, to see how the old and new systems are both face to face and side by side. In the new we have medical missionaries, under the Church Missionary Society, doing most excellent work in that place.

With regard to some of the names mentioned to-day, such as Tophel and others, one's mind naturally goes back to the 1st chapter of Deuteronomy, where you have certain localities pointed out in connection with the camping-ground immediately before the people crossed the Jordan in a westerly direction. Sometimes, perhaps, disappointment is felt that all these places have not been exactly identified; but one has to remember that there were two million people at least—men, women and children—and you cannot camp two million people in a village; so that all the writer could do would be to give certain locations as the main centres of the camping-ground. That probably accounts for the peculiar terminology which you get in this early account.

The only other point which I should like to know about, and which I have often been puzzled over, is with regard to that vast desert to the east of the region which Sir Charles Wilson has referred to and to the west of the Euphrates. Was it always a desert, and will it always be a desert? Is it possible that under any special circumstances that land can be cultivated? In the book of Ezekiel it appears, from the ordinary reading of the book, that the tribes are to have long strips of territory running right across that very region. Of course we can explain it symbolically; but still one would like to know if it is possible, under any circumstances, to explain it literally.

It is delightful to hear that the Turks are doing a little good there. I have not heard a good word for the Turks for I dare not say how many years. If the Turks could be put to cultivate that region it would keep them out of the mountains and enable them to do some good work as a little set-off against the bad work they have done in certain regions which we know about so well. [Applause.]

Professor E. HULL.—I join with Canon Girdlestone in expressing my great pleasure and gratitude to Sir Charles Wilson for his address to us this evening, and particularly at the present time, when, as is known probably to some of you, he has two gallant

sons at the front in South Africa, who I am sure we all hope will return home to their country not only safely but scatheless. [Applause.] I think, under the circumstances, we are particularly indebted to Sir Charles Wilson for coming forward this evening.

To refer to the subject of his lecture, I may mention that a short time ago I was invited by the Royal Artillery Institution at Woolwich to give a lecture before the officers. I gave them two or three subjects to choose from, but the Exodus, at any rate, was the subject which they themselves chose. Just as I was about to go I read a message from a distinguished literary friend living in London to say that there was "no Exodus." I replied if there was no Exodus then William the Conqueror never landed on the shores of England! [Applause.] And I wish my friend could have been here this evening to hear the testimony of Sir Charles Wilson, from actual observation and experience, that there had been an Exodus of the Israelites from Egypt to Palestine.

I will take, if the lecturer will permit me, several points in rotation which have been referred to. In reference to "faults" in the strata, I go so far as to think that it is exceedingly probable that whatever faults run along the valley of the Nile (and I have seen them myself in more than one place) they are geologically contemporaneous with the great Jordan-Arabah fault, which bounds the region lying over to the east of the Jordan-Arabah valley—in other words, the tableland of Edom and Moab.

Now about Kerak, which he described and represented on the sheet. When our party, sent out by the Committee of the Palestine Exploration Fund, which included Lord Kitchener, were encamped down by the Dead Sea, we had a polite invitation from the Sheik of Kerak to pay him a visit. No doubt his intention was entirely hospitable; but recollecting the experience of my friend Canon Tristram when he found himself within the walls of Kerak, I think we were unanimous that we would not trust our precious skins in the same isolated district, where we might be kept a considerable time and only freed on paying a handsome ransom. We sent back a polite message to say that our time was so short that we regretted we were unable to accept his hospitable invitation.

Now Sir Charles Wilson mentions the names of several valleys that I have personally visited and explored to a certain distance, and one he identifies as the Brook Zered. I entirely agree

with him that the Wadi el-Ithm is the valley that the Israelites were obliged to traverse in order to get up out of the Arabah valley when they were forced to return southward again after being refused passage by the King of Moab. That was the only valley by which they could ascend to the tableland of Edom, and it is not to be wondered at that in consequence of that journey it is stated that the people were seriously discouraged by the length of the way. It is a dry valley under an almost tropical sun and must have been very trying to the large multitude of men, women, and children. But with regard to the route by which the Israelites proposed to traverse Edom. I think our party explored what we thought to be the very "king's highway" by which the Israelites might have passed up from the Arabah valley to the tableland of Edom. This valley lies to the north of Petra. They had, I think, a well trodden road passing up towards the tableland and the one used at the present day, I believe, by the pilgrims going from Palestine to Mecca.

Then I would refer to one other point, and that is the lecturer mentioned that on the tableland of Edom and Moab the cold is very intense in winter. When we were there in the middle of winter we saw the whole country forming the tableland covered with deep snow, and we found Western Palestine covered deeply with snow. But when we were descending from the valley of the Arabah into the great depression of the Ghor, as it is called, in which the Dead Sea lies, we were surprised to see the whole of the plain occupied by the tents of the Bedawin Arabs. They had come down from the pasturages of Edom and Moab to the warm climate bordering the Dead Sea, where they pastured all their flocks and herds in the cold part of the year; and really it is a wonderful natural provision by which these Arabs are enabled to pass through the severe climate of the winter months. It was a very pretty sight that was presented to us. Children came up from the camping-ground and arranged themselves in line along our pathway as we descended on our camels and saluted us in a most cordial and friendly manner.

I am sure we are all gratified to learn that there is a prospect of another Moabite stone, or something of the kind, when the country may be more accessible and opportunity is given to travellers to examine it more fully.

[After some further discussion, in which the Rev. F. A. Walker, D.D., and Mr. Martin Rouse took part, the lecturer briefly replied, and the proceedings terminated.]

POSTSCRIPT.—In answer to a question put by Canon Girdlestone (see above) in reference to the possibility of cultivating the land of the Arabian Desert lying between Moab and the Euphrates, Sir Charles Wilson writes, "I do not know the country between Moab and the Euphrates, but should say, from all that I have heard of it, that it is not cultivable excepting perhaps a few patches, here and there, in hollows which may occasionally produce a scant crop of barley."

ORDINARY GENERAL MEETING.*

THE PRESIDENT, SIR GEORGE GABRIEL STOKES, BART.,
LL.D., SC.D., F.R.S., IN THE CHAIR.

DEATH OF HER LATE MAJESTY THE QUEEN.

The PRESIDENT.—It is proposed that an address of condolence should be sent from the Institute to His Majesty with an expression of our sympathy. The Secretary will read what the Council have drawn up.

The SECRETARY (Professor E. HULL, LL.D.) then read the following Address:—

“TO HIS MOST GRACIOUS MAJESTY THE KING.

“The Council and Members of the Victoria Institute humbly beg leave to approach Your Majesty with the expression of their heartfelt condolence for the loss which Your Majesty and the Royal Family, together with the whole nation, have sustained by the death of her late Majesty Queen Victoria of blessed memory; whose assiduous devotion to the highest interests of the nation, whose kind and thoughtful consideration for those who were in any way brought into contact with her; and whose sympathy with those on whom calamity had fallen, have endeared her to the hearts of her subjects. Her Majesty’s gracious condescension in accepting from time to time the Transactions of this Institute affords one slight illustration of Her

* Monday, 4th February, 1901.

Majesty's deep interest in the religious and intellectual welfare of her subjects.

“They desire at the same time to tender to Your Majesty the humble expression of their devoted loyalty, and pray that God may long preserve Your Majesty's life in health and happiness, to rule over a loyal, contented, and prosperous people.”

It was moved by the Rev. Prebendary WACE, D.D., and seconded by DAVID HOWARD, Esq., D.L., and carried unanimously, that the above Address be adopted.

The following paper by E. J. Statham, Assoc. M.Inst.C.E., entitled “Ancient Script in Australia,” was then read by the Secretary in the absence of the Author.

ANCIENT SCRIPT IN AUSTRALIA. By E. J.
STATHAM, Esq., Assoc. M.Inst.C.E.

MORE than half a century has elapsed since the late Sir George Grey's discovery of the remarkable drawings illustrated in the Right Rev. S. Thornton's paper on “Problems of Aboriginal Art in Australia” (*Transactions of the Victoria Institute*, Vol. XXX, page 205); yet it appears that only now is the great interest and value of those records becoming apparent.

Since the publication of the volume of proceedings of the Brisbane Session of the Australian Association for the Advancement of Science—from which Dr. Thornton's illustrations are derived—another Session of the Association has been held at Sydney (proceedings not yet published), and an interesting paper contributed by Professor John Campbell, LL.D., of Montreal, on “Syllabic Characters on a Cave Painting on the Glenelg River, N.W. Australia,” was read before the Section devoted to ethnology and anthropology. The characters treated of are those shown in figure 4 of Dr. Thornton's paper.

To ascertain the meaning of these characters Dr. Fraser, LL.D., of Sydney, submitted a copy of the figure to the professor, who unhesitatingly pronounced the characters on the head to be old Japanese, earlier than the twelfth century

A.D. According to the old Japanese syllabary the inscription read "*Ki o chi o sa shi*," or in words "*Kiochi osa shi*," which meant "The number of the hopeless ones is 62" (the number of o's in the upright column on the right hand side of the figure), the conclusion being drawn that the record had reference to shipwrecked Japanese. It was also stated that similar character and language are found on the American Continent.

In the more detailed and coloured drawing which is given in the Australian Association's publication, the figure in question is shown to be not only clothed but shod, apparently with a soled boot without heel, such as those made and worn by Hindoos. In contrast with this clothed figure and evidently of the same period of art is shown a figure, nude, except for the turbaned head, on which he is carrying a kangaroo; the man's feet are well drawn and the toes clearly delineated. It appears, therefore, that both full attire and the fashion of its absolute abandonment—as prevalent with the Aborigines in their wild state—was familiar to the artist or artists who drew these pictures. The 62 o's accompanying the clothed figure have a peculiar method of arrangement, being vertically in three columns and horizontally either singly, or two or three approximately in a line; there is, doubtless, some meaning in this, possibly the three columns may represent men, women, and children, and the grouping may show their affinity. That there were women in the assemblage is evident by the representation of clothed female figures in the same style of drawing. It may be presumed that the "hopeless ones" were a party of emigrants bound for Java, Timor, or one of the intermediate islands, blown out of their course in one of the cyclonic disturbances frequent in these latitudes, and carried to the N.W. coast of Australia.

Whilst it would be going beyond the evidence to contend that these were the first inhabitants of Australia, it is quite within the range of possibility that they may have been. The Aboriginal Australian is a distinct race, bronze rather than black-skinned, tall, straight-haired and bearded; of one language, differing merely in dialect; moreover, unique in weapons, customs, laws and ceremonies. It has been too much the habit of writers on the subject to decry the Australian as the lowest of the human race; far from that he is—under favouring conditions—unsurpassed in physical perfection and thoroughly adapted to his environment. See

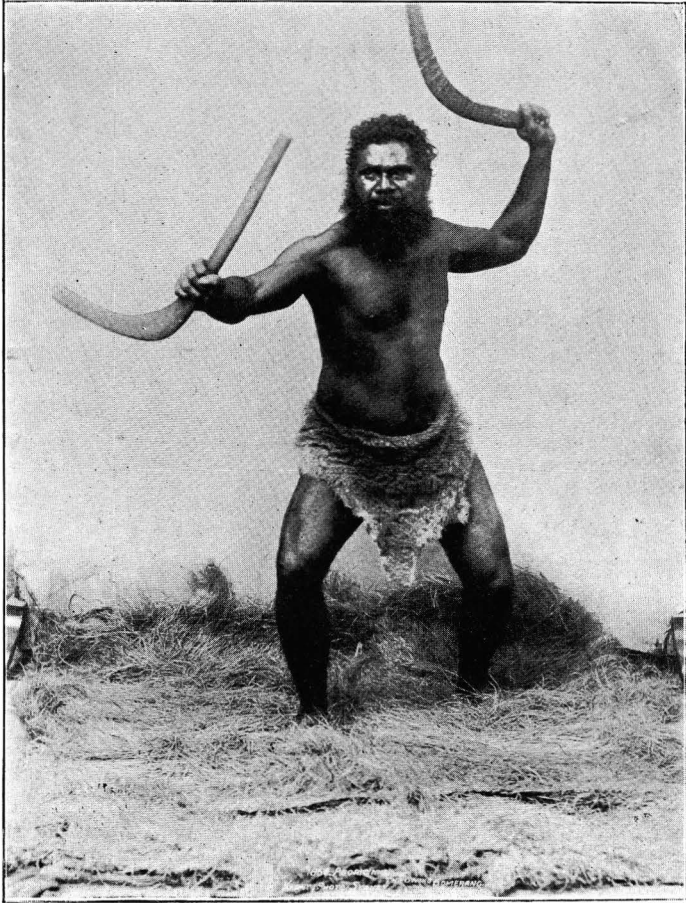
the grand specimen of a man shown in the accompanying photograph, a warrior (see Plate VIII); a "mighty hunter before the Lord"; only forty years ago such men were plentiful, now, alas! they are scarce; contact with our civilization has destroyed them, drink has done its deadly work, above all, clothing and blankets have been fatal to them.

Governor Phillip estimated the Aboriginal population at the close of last century at one million—admittedly on insufficient data; later writers on more extended information estimate at half a million. At the census of 1891 the Aboriginal population for New South Wales, Victoria, South Australia, and West Australia is given as 38,304. Queensland is not given, but the blacks being more numerous there than elsewhere in Australia, possibly there may be 40,000, so that the grand total can hardly exceed 80,000, and it seems probable that even the half million estimate of original population was excessive; allowing, however, that it may have attained that amount, and turning to the analogy of Scripture history, we find that the Israelites went down into Egypt "70 persons," and at the exodus in little more than 200 years numbered 603,550 *men*.

In contrast with this we have a record of 62 persons, who—if the first inhabitants—had before them a land free from enemies, teeming with animal life, a mild climate, every facility to increase and multiply, with 600 years in which to fulfil their destiny, and yet they can only represent half a million; it therefore seems demonstrated that the numerical development of the Australian race does not postulate a high antiquity. If the first settlement of population were on the N.W. coast, its distribution would naturally trend north and south along the coast line; along the north coast they would find conditions of life easy, and every requisite to ensure rapid increase and the development of a fine physique; then as population increased, it would gravitate down the east coast, finding extensive and rich valleys very few miles apart. Again, not far from the Queensland coast line, extensive downs well stocked with game all the way to the head waters of the Darling, opening out a veritable "land of promise" extending into the heart of the continent and away down to South Australia.

All the conditions tend to the development of a race of hunters and fishers, and the encouragement of a roving disposition, hence so few relics of any sort to show what the migrations of the people have been.

PLATE VIII.



AUSTRALIAN WARRIOR—FLOURISHING BOOMERANGS.

An image carved in "soapstone" is referred to (pp. 226, 230, of Dr. Thornton's original paper) as having been found in the northern territory of South Australia, stated to be "an image of the god of longevity"; as a strange coincidence it may be mentioned that in the Technological Museum of Sydney is an exhibit bearing the following description: "Plaster cast of soapstone carving (? Thibetan priest on camel), original found 25 feet below surface at Northern territory, Australia." It represents a hooded figure clothed in a long flowing robe and seated on a camel; it has been in the museum several years; inquiries so far have failed to elicit further information as to the original, which acquires new interest in view of late researches.

Sydney, N.S.W.

October 15th, 1898.

The following letter from the author of the paper, and addressed to Captain Petrie, contains some additional matter of interest, and may find a place here:—

"Rockdale, N.S.W.

"October 15th, 1898.

"Dear Captain Petrie,

"I am sending herewith a paper and a photo. which may interest the Members of the Institute, and would ask you to kindly bring it under notice. Without setting up for an authority or laying claim to any status as an anthropologist I have nevertheless travelled over a large extent of Australia, have had many opportunities of studying the natives, and have taken an interest in their manners, customs, and traditions. In venturing to differ from Dr. Thornton in his conclusion that the antiquity of the arrival of the native race of Australians is attested by 'the complicated diversity of the tribal vocabularies, and the length of time required for the whole continent to have been overrun by them,' I would point out that in the comparatively small island of Great Britain you have, extant, three distinct languages, and various dialects, yet you can hardly be regarded as an ancient people. Again, seeing that early in the settlement of these Colonies by the British, explorers went all over the country, even with hostile natives to contend with, it would be surprising if the original immigrants did not overrun it in the first generation, there being no carnivora at all formidable until the introduction of the 'dingo,'

and considering the extreme fecundity of the Marsupialæ, means of subsistence must have been exceedingly easy. Since the disappearance of the Aborigines in some localities, the opossums have increased to such an extent that whole tracts of timber country have been destroyed on account of the trees being denuded of their leaves by them. The poisoning of the 'dingo' in other localities has been followed by such an increase of the kangaroo that various methods have been adopted to effect their wholesale destruction. Again the rabbit has got adrift within the last 20 years and has overrun New South Wales and Victoria, has become a burning political question, and has cost hundreds of thousands of pounds to cope with. It may thus be seen how possible it is that the primitive increase and distribution of the natives may have been very rapid. If you have not the *Proceedings of the Australian Association* you certainly should have them in the library, as they contain a great deal of information on these subjects.

" I remain,

" Dear Captain Petrie,

" Yours faithfully,

" E. J. STATHAM."

DISCUSSION.

The PRESIDENT.—According to our usual practice I should now invite remarks on this paper. At the same time I would say that the subject of the paper is one that seems hardly to lend itself to much discussion, and the remarks that may be made, I hope, will not be very long, as the Secretary has more photographic slides here, and preparations have been made for projecting them on the screen in illustration of some questions which he has brought before the Society on river valleys under the ocean.

Mr. MARTIN ROUSE.—Mr. President, about twenty years ago a Japanese junk was stranded on the coast of Oregon in the United States of America, and it led Professor Daniel Wilson, of Toronto, to write a paper on the possibility of ancient blood relationship with the Japanese amongst the American Indians, and of the spreading of civilization from Eastern Asia through such means. Such events must often have happened in the past,

through the great cyclones that are prevalent in those vast oceans.

But now the question arises whether these Australian blacks could have been descended from the Japanese, they being so unlike them in their personal appearance. The Japanese have oval faces, with rounded foreheads, and their eyes are slightly oblique, whereas this figure in the paper of an Australian represents him with a broad face and a forehead by no means prominent, and eyes perfectly straight. He has a face, I should say from my little observation, intermediate between that of an European and a negro. His lower jaw, however, does not seem to protrude much like that of a negro; but his nose is very broad, like that of the usual negro type. On the other hand his hair and beard are long and copious, both of which features are unlike those of the Japanese. But we know that in Japan there is a race of people, called Inas, who are noted for their abundance of hair, and the Japanese records tell us that they had many encounters in early days with "hairy barbarians." Those people now inhabit the north of Japan; but it is very likely that they were driven out from a wider extent of territory anciently.

It is thought by some that the Japanese early races come from Siberia, as they bear so striking a resemblance to the Eskimo of America and Asia, and that they overcame the Ainos in the North, and the Malays in the South; leaving the more inclement regions finally to the subject Ainos. Be that as it may, the natives of Australia might possibly have descended from the Ainos; and as the Ainos, so far as I am aware, had no written language, they would, on landing in Australia (if they knew the Japanese writing) naturally make a record therein. But while that is possible, there is this against it—that Professor Haddon, who is a very great investigator into the appearances, manners, customs, traditions, and language of the natives in and around New Guinea and Borneo, recently spending a day or two with the Yanai-kanna Tribe near Cape York in the far North of Australia, when returning from New Guinea, as I heard him tell at Dover the year before last,* and he found that while of Australian build and aspect, they had customs very similar to those of the Papuans,

* *Brit. Assoc. Report*, 1899, p. 585.

especially in the manner of initiating children into manhood; while they must have spoken a language similar to those of the Papnans, or he would not have understood the explanations in the very short time at his disposal.

So, without mentioning other evidence, we must infer that the immigrants who first peopled Australia must have settled over large tracts of Oceania besides.

Commander HEATH, R.N.—Having lived in Australia for many years and having seen these natives in various parts of the country, from Port Albany, in Western Australia, to the most northern point of Queensland in Torres Strait, and also at Port Essington on the North West Coast, I cannot see the slightest reason for thinking that there is any connection whatever between the Japanese and the Australian natives, or even with the hairy Ainos, the Australian native not being a particularly hairy individual.

The picture that we have before us does not represent the Australian native under normal conditions: I have never seen one so fat as this. Though many of them are well developed, they as a rule have no superfluous flesh about them, and the calf of the leg, which here appears so conspicuously, is generally one of their weakest points, the way in which they often sit being somewhat injurious to its development. They are extremely intelligent and clever as hunters and fishermen, and their perceptive organs are wonderfully developed, no doubt from having for many generations been dependent for their food upon what they could catch. Over a large portion of the country there is nothing on which they can fatten. The few animals that they could catch would not help them much, while the dryness of the climate over a great part of the year prevents their obtaining anything like a liberal supply of vegetable food, which consists principally of the tuber of the wild yam. They have no idea of cultivation of any sort, never living at one spot for any time. The white woman whom we rescued from the natives at Cape York, in H.M.S. *Rattlesnake*, who had been living with the natives for some five years—during which time she had never seen a white man, and had almost forgotten her own language—gave us to understand that at times they were very short of food, though those living on the coast were better off, as they had fish when they could catch them.

It is curious that the natives distributed over this large continent are so much alike in appearance and characteristics, and yet that the area over which any one tribe has possession is very limited. When some time ago Bishop Thornton read a paper on a somewhat similar subject to the present one, his brother the Archdeacon of Middlesex, who was in the chair, suggested that the drawings found in certain caves in Australia represented Hindoo Buddhist missionaries who had come over on a mission to the natives, but of course it is not improbable that wrecked crews from different parts of the world have reached this coast and have left traces behind them.

The impression that the Australian natives have left on me is, that they were separated from the rest of the world by the convulsion which separated Australia from the Asiatic continent, during the Marsupial period, and that like the Marsupials they have never made any further progress.

Mr. ROUSE.—Would the Japanese or the Inos wear a turban? I never heard of it.

Commander HEATH.—No; but the Hindoos would.

Mr. ROUSE.—It occurred to me that it is more likely that such men came from Java, or one of the islands affected by Hindoo Buddhists' customs.

The SECRETARY.—I think we ought to recollect, in reference to the author of this paper, that that picture undoubtedly represents an Australian. He did not manufacture him, or bring him from another country, or take a photograph of him from another country. He is there and we have to account for it, and he endeavours to account for the appearance of these remarkable figures by their contiguity with Europeans and their habits.

Mr. ROUSE.—I should like to say that this is the first picture I ever saw of an Australian that represented him as a very hairy man indeed, with a bushy head of hair and a bushy beard.

A vote of thanks to the author having been accorded, the SECRETARY then exhibited and explained lantern pictures on the screen illustrating the river beds at the bottom of the ocean.

The meeting then adjourned.

ORDINARY GENERAL MEETING.*

DAVID HOWARD, ESQ., D.L., F.C.S., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

MESSAGE FROM THE KING.

The SECRETARY (Professor E. HULL, LL.D.).—You will recollect that the Council passed and conveyed a very loyal and dutiful Resolution to the King on his accession to the throne, and their expressions of condolence on the death of Her late Majesty Queen Victoria. I have now received a reply from the Home Secretary:—

“Home Office, Whitehall.

“29th March, 1901.

“SIR,

“I am commanded by the King to convey to you hereby His Majesty’s thanks for the loyal and dutiful address of the Council and Members of the Victoria Institute, London, expressing sympathy on the occasion of the lamented death of Her late Majesty Queen Victoria, and congratulations on His Majesty’s accession to the throne.

“I am, Sir,

“Your obedient servant,

“THOS. S. RITCHIE.

“*To the Secretary of the Victoria Institute.*”

* Monday, 1st April, 1901.

The following elections were announced :—

LIFE ASSOCIATES :—The Rev. C. E. Sherard and Captain E. G. Farquharson, R.E.

ASSOCIATE :—Louis J. Rosenberg, Esq., LL.B.

HON. CORRESPONDING MEMBER :—Mrs. Tyndall.

The following paper by Joshua Rutland, Esq., on "The Maori's place in History," was then read by the Secretary in the absence of the Author :—

THE MAORI'S PLACE IN HISTORY. By JOSHUA RUTLAND, Esq.

AS far back as we are able to retrace the history of mankind by means of written documents or inscriptions, we constantly discover certain peoples or nations actively engaged in diffusing their particular arts, customs, and institutions, often violently imposing them on their less powerful, or as they are wont to style them, less civilized contemporaries. At this work of civilization the peoples of Northern Europe and their descendants in other parts of the world now occupy the place which was formerly held by Arabs, Turks, Romans, Greeks, Phœnicians, and a host of others who have either entirely passed away or fallen so far behind the mark as to be numbered by their more progressive neighbours amongst those who require civilizing. Even in places of which no written history has come down to us, or where the art of writing has never been known, we discover evidences of this same law of progress, or facts which it alone can explain. Thus the peopling of Eastern Polynesia, the presence there of foreign cultivated plants and the domestic animals when Europeans first entered the region, as well as the monuments scattered throughout the numerous groups, especially those of Easter Island, can only be accounted for by the existence of a prehistoric people, or peoples, imbued with the same spirit of adventure that

made the Phœnicians leave the land-locked waters of the Mediterranean to go forth upon the wild waves of the Atlantic, and centuries later led Columbus across the same ocean to the discovery of the New World.

To the ancient civilizations of Egypt and Chaldea we can readily trace back our modern European civilization, but the origin of some of our most important arts must be looked for elsewhere, recent investigation having proved that the Nile Valley, long considered *the birthplace of civilization*, must have been colonized by a people well advanced in those arts.

Though certain Chaldean remains, when compared with the rudest Egyptian monuments, seem to indicate a more primitive state of society, the physical conditions of Mesopotamia preclude the possibility of its being the birthplace of agriculture or metallurgy, arts without which the country could not have supported its ancient population, nor the vast works now amongst the wonders of the world have been executed.

As far as we are able to discover the civilization of China is purely indigenous; for thousands of years the inhabitants of the Celestial Empire have been agriculturists, potters, weavers, and workers in metal, besides having a written language in which their history has been recorded. Though aware that these arts must have had their rude beginnings and must have appeared in order, not simultaneously, in vain we look for their commencements. Nor is it possible amongst the surrounding peoples to point to any from whom they may have been derived.

Though the Chinese have long pursued a policy of isolation, at some former period they must have headed the march of civilization. In Central Asia as far west as the Caspian and throughout Southern Asia to the western boundary of Hindustan we find traces of their discoveries and inventions, but evidently their influence did not extend to the Egypto-Chaldean peoples; for rice was unknown to the agriculturists of Asia Minor until after Alexander's conquests, though it had been cultivated in China for more than twenty-five centuries previously, and the raising and manufacture of silk, though important industries amongst the Chinese since 2600 B.C., were not introduced into Europe until the twelfth century of our era.

From a very remote period an intermingling of eastern and western civilizations, the result of conquest and

commerce, had been taking place ; still it can be readily perceived they are specifically distinct.

Throughout the scattered islands of Eastern Polynesia the inhabitants, when Europeans came in contact with them, though a mixed race, were so uniform in their arts, their customs, their institutions, and their language that Captain Cook after discovering the Hawaiian Archipelago styled them a *nation*.

Excepting such sparsely populated regions as the Australian continent, Greenland, etc., there is none approaching in area the space of ocean occupied by the island groups from Samoa to Hawaii in the north and Easter Island in the south, wherein the people varied so little in their social conditions.

Throughout these widely scattered islands the natives were invariably agriculturists cultivating the same assemblage of plants. Though unacquainted with pottery, with the art of weaving, and with the use of metal, as mariners they surpassed all other peoples of whom we have any knowledge, excepting perhaps the Arabs and maritime nations of Europe as far back as the thirteenth century.

The cultivated plants on which the inhabitants of Eastern Polynesia chiefly depended for food and clothing, being foreign to the region, furnished the best possible means of determining from whence agriculture was introduced. An analysis shows that excepting the Kumara (*Convolvulus batatas*) a New World plant, all belonged to the flora of the Asiatic islands or mainland, where they have been in cultivation from the earliest historic period.

Through long cultivation several of these plants had become seedless and could therefore only be increased by offsets or cuttings. Hence they not only prove from whence the numerous islands were populated, they clearly disprove the long accepted theory of accidental peopling ; for it is impossible that plants of that description could have been transported to places like Easter Island and the New Zealand archipelago without preparation and care.

Although the inhabitants of Eastern Polynesia were unacquainted with the loom and spindle, even in their rudest forms, they were habitually clothed, using for the purpose felted cloth made from the barks of the paper mulberry (*Brussonitia papyrifera*) and *Hibiscus*, besides hand-plaited fabrics of *Dracena* fibre and prepared dogskins. The skill and taste displayed in the preparation of the bark cloth and

the care bestowed on the paper mulberry tree—which was only grown from cuttings—together with their having in use textile materials, discountenances the supposition that the art of weaving might have been lost.

Regarding the absence of pottery the information we possess is very unsatisfactory. If the people of Easter Island had earthenware vessels when Europeans discovered the place, we are almost forced to conclude that the art was elsewhere lost, but how such a simple and useful art fell into disuse, while other arts far more complex were preserved, and how the numerous scattered communities all alike fell back on the rude laborious method of boiling water with heated stones, it is impossible to conceive. It could not have been the lack of a material Easter Island was capable of supplying, as every group throughout the region contains similar volcanic rocks. Should future research prove that at some period previous to the advent of Europeans pottery was in use throughout the whole of Polynesia, we may rest assured that, like the article manufactured in Fiji and New Guinea, it was of the very rudest description. Instead of the homogeneous society that called forth Cook's remark, we find in Melanesia and New Guinea a population divided into innumerable small communities, differing not only in their arts, customs, and institutions, but speaking such a babel of tongues that the residents at one end of a small island were frequently unable to understand the occupants of the opposite end.* On analysing this heterogeneous society, we immediately discover that the use of metal was everywhere unknown. Though the weapons and implements differed considerably, when the various groups were compared,

* After the late Bishop Patterson had mastered several Melanesian languages sufficiently for conversation, he told me he was only beginning to perceive they had something in common. Wishing to ascertain whether any of my Maori neighbours could comprehend the language of Eastern Polynesia, I recently showed four of them a tradition told in the dialect of the Cook Islands. One of the party, who had been educated in a small country school, after looking over the story for a few minutes read it to his companions. Occasionally the reading was interrupted to discuss a word or make remarks. When finished, all assured me they had the same tradition amongst themselves. These facts and Ellis's remarks on the language of Madagascar quoted at pages 7 and 8 illustrate an important difference between the Papuan and Maori-speaking peoples of Oceania.—J. R.

stone, wood, bone, and shell were invariably the materials out of which they were fashioned. In Melanesia and the portions of New Guinea with which we are acquainted agriculture of the Eastern Polynesian type was general, the same foreign plants being everywhere in cultivation, with the same absence of cereals; roots and fruits being the only esculents.

Like the natives of Australia and Tasmania many of the Papuans and Melanesians went naked, but wherever clothing was used bark cloth was the principal material. In the Santa Cruz archipelago a rude loom is said to have been in use when Europeans discovered the islands. As mariners the inhabitants of Eastern Polynesia were far beyond the natives of Melanesia and New Guinea; the latter had, however, a greater variety of vessels. The unwieldy raft-like *lanata* employed in trading along the northern coast of Torres Straits resembled the balsa of Peru.

In some of the groups the natives constructed large highly ornamented canoes, in others they were contented with a small miserable "dug-out"* incapable of accommodating more than one or two persons. In Fiji the canoes were of the Eastern Polynesian type, the best being constructed by artisans who resorted there from Samoa.

In most of the primitive arts common to this region the Fijians surpassed their eastern neighbours; their inferiority as boat-builders is therefore the more remarkable.

The rude loom found in the Santa Cruz group has already been mentioned. Besides this, in parts both of New Guinea and Melanesia the natives possessed certain arts and institutions that must have been survivals from some former period, or recent introductions from the more civilized Malay region. Thus in certain islands the men were armed with the bow and poisoned arrow, while in other islands within the same group the weapon was unknown, or had been discarded. In New Britain and the adjacent islands cowrie shells were used as a medium of exchange. On the south-east coast of New Guinea betel-chewing was in vogue, and the houses were built on tall piles after the Malay and Burmese fashion.

Considering the geographical position of Madagascar, and

* A canoe made out of the hollowed trunk of a tree.

the capabilities of the island for supporting a large population, the inhabitants have remained singularly low in the social scale. At the commencement of the present century their language had not been reduced to writing. Though they possessed the arts indispensable to civilized communities, such as agriculture, pottery, weaving, and the working of metals, all were of the rudest or most primitive fashion. The population of Madagascar, as far back as our information extends, has been divided into tribes constantly at war with each other. Amongst these tribes no one was conspicuously superior until the recent rise of the Hovas, which was probably due to the highlands they occupy being better adapted for European residents who influenced them than the malarious districts of the coast.

Throughout the great island only one language was spoken. Though the tribes had different customs, their arts were everywhere similar, merely varying according to the physical conditions of the districts they occupied. As in the population of Eastern Polynesia, amongst the Malagasy two distinct types, one negroid, the other Asiatic, were perceptible. The Rev. William Ellis, whose long residence in the Society Islands and the Hawaiian archipelago and careful observation of the inhabitants enabled him to compare them with the Malagasy, shortly after his arrival at Tamatave in 1856 remarked:—"I was much struck with the perfect identity of the Malagasy and the Eastern Polynesians, in the names of many of the things most common to both. One of these was a cocoa-nut tree, and to my surprise they pronounced the name precisely as a South Sea Islander would have done. The same was the case with the *Pandanus* or *Vacoua*, one of the most common trees on the coast both of Madagascar and Tahiti; also the word for flower, and the names of several parts of the human body. The numerals were also, with but slight variation, identically the same. The discovery of this resemblance between the languages spoken by two communities so widely separated from each other, besides seeming to point out the source whence Madagascar had derived at least part of its present population, promised me great facility in acquiring their language." Though the effects of Arab intercourse are plainly discernible in the arts and customs of the Malagasy, when the Europeans discovered the island the sumpitan or blowing pipe was one of their weapons, and bark cloth was not entirely superseded by the coarse woven fabric made

from the untwisted strips of the *Rofia* leaf which is now the national costume.

When Europeans commenced trading directly with the East the population of the Malay Archipelago included peoples who must be classed amongst the most civilized oriental nations of the period, as well as savages who habitually went naked, and subsisted on the wild productions of the forest within which they led a wandering existence.

In the first century of the Christian era Java was colonized from Hindustan, and became one of the great centres of the Buddhist faith. The vast ruins of ecclesiastical and other buildings referable to this period found in various parts of the island show that the Javanese must have then ranked amongst the most civilized nations of the world.

In Java as in Hindustan the Buddhist religion was displaced by Brahminism, which in its turn was partially swept away by the great Mahomedan inundation. Throughout Malaya as far east as the Philippines, Mahomedanism was the prevailing religion in the sixteenth century, but it was far from universal. In Lombok Brahminism still held its place, while into parts of Borneo, Celebes, and other islands evidently none of the great Asiatic creeds or their accompanying civilizations had penetrated, the inhabitants even to the present day adhering to their cruder beliefs, their more primitive arts, and their ruder institutions.

Neither in Polynesia nor Madagascar can any traces of the Hindoo invasion or the results that followed be discovered. To the rude tribes of the Asiatic islands the Malagasy and Polynesian people were plainly allied. In these tribes we find the same light-complexioned and negroid individuals, following the same simple arts, and having the same barbarous customs that prevailed throughout the Pacific and in the great African island when Europeans first entered those regions. Thus bark cloth similar to the Polynesian *tapa* was their principal clothing material; calabashes, bamboos and cocoa-nut shells furnished their household utensils. Tattooing was their most characteristic personal decoration. Many were head hunters and cannibals, the sumpitan or blowing pipe being their national weapon.

Of the modern Malay language Ritter gives the following analysis:—"The Malay language comprises in every one hundred words: fifty Polynesian words, all answering to a very inferior social condition, only designating arts and

objects for which all languages have names (heaven, earth, moon, mountain, land, eye, etc.), twenty-seven Malayan words, giving evidence of a more advanced civilization, and of the existence of arts already in a state of perfection ('*Kriss*'), sixteen Sanscrit words expressing religious ideas and abstract terms (time, cause, wisdom, etc.), five Arabian words relating to mythology, poetry, etc., two Javanese, Dravidian, Persian, Portuguese, Dutch, or English words, all relating to commerce. We see therefore that the language of the Malays explains, so to speak, under another form, the same facts as their physical characters."

In one respect the inhabitants of the Malay Archipelago, however rude, were in advance of the Polynesian natives. All have been acquainted with the use of metals as far back as we have any information. To discover whether this was amongst the arts introduced from Hindustan we must return to the Pacific. Scattered over the great ocean from the Carolines to Easter Island are the remains of stone edifices and other monuments, which could not have been constructed without metal implements. Though these ancient structures differ considerably, all clearly belong to the same epoch in the history of architecture. On comparing them with the Javanese ruins already mentioned, we are forced to conclude that they are the relics of a people much lower in the scale of civilization than the builders of the Buddhist and Brahminical temples.

When Magellan crossed the Pacific the inhabitants of the Carolines were unacquainted with the use of metal. From subsequent voyagers we learn that all the Polynesian and Australasian people were in the same condition; hence it has been inferred that they could not have been the architects of the monuments found in their midst. Assuming that these monuments are the remains of a people who occupied the islands previous to the present Polynesian race, we have to account for their being supplanted by a ruder population. If, on the other hand, we supposed the monuments were constructed by people who entered the islands since the present inhabitants took possession, we must ask why have they left no other trace of their existence. As none of the groups wherein the ancient monuments are found contained the necessary metals, the builders, whoever they were, must have been supplied from without with implements or with the material for their fabrication. In various parts of the world, places once the homes of civilization are now unin-

habited, or only tenanted by people little better than savages owing to the failure of external aid.

Near Mizdah, in Northern Africa, a few wandering Bedouins now eke out a miserable existence, though costly tombs and other remains prove that the country had a wealthy and luxurious population during the period of Roman supremacy. What the land lacked the great civilizing nation supplied. A similar fate is in store for Northern Chili when the nitre deposits are exhausted.

Cut off from the rest of the world, it was impossible for the inhabitants of Eastern Polynesia to maintain a civilization much higher than Europeans found amongst them. Taking everything into consideration, it seems by far more probable that the modern Polynesians are the direct descendants of the people by whom the mysterious monuments were constructed than that another people once occupied the widely scattered islands of the great sea.

Borneo, Madagascar, and South Africa furnish examples of people capable of extracting iron from the ore and working it into well finished weapons and implements, but who otherwise were no higher in the scale of civilization than the natives of Eastern Polynesia in the sixteenth century. We can thus perceive that in many parts of the world a knowledge of metal-working preceded much simpler arts.

In seeking the birth-place of metallurgy, we may at once discard Central and Northern Asia, Europe, and Africa, for even if we had not the evidence of the early Egyptian monuments, we can at once see that the lower Nile valley was not a place wherein metals might have been first discovered and brought into use.

As the swamps of Mesopotamia, where Chaldean civilization commenced its existence, contained no metals, there remains only South-Eastern Asia and the adjacent archipelago, wherein the "Age of Metals" may have commenced. Here were all the conditions favourable to a discovery—an abundance of the metals that came first into use, and a large population since a very remote period.

Tin and copper ornaments being still worn by the Dyaks of Borneo, it is at least probable that the ingredients employed in the manufacture of bronze were made use of in the region prior to the discovery of the compound. The invention of bronze, and its application in the manufacture of weapons and mechanical implements, must have given an impetus to civilization analogous to the impetus given by the

perfecting of the steam engine during the present century. Besides this it would give to the people by whom the art was first understood, and who had the necessary materials at their command, an advantage over the rest of mankind. This may account for the extraordinary precocity of the yellow race, so frequently commented on, and for the south-eastern extremity of the Asiatic mainland being such an ancient centre of an indigenous civilization.

Returning again to Polynesia, it is generally agreed that the ancient monuments in their style of architecture correspond with monuments of the bronze period in both the Old and New World. Many of these structures so closely resemble ancient Peruvian temples, some writers have concluded from them that the islands were first peopled from the American continent, while others, recognizing in them a likeness to early Japanese and other South Asiatic monuments, attribute them to an Old World people. Though all the Polynesian monuments are of the same rude cyclopean order, they differ much in design. The tomb of Toobatoii, in Tonga-tapu, is merely a cromlech, the large stones being jointed or dove-tailed together. The colossal statues of Buddha, common throughout the regions wherein the religion prevails. The Pyramid of Morai or Oberai, in Tahiti, regarding which Captain Cook wrote in his journal, "The outside was faced partly with hewn stones and partly with others, and these were placed in such a manner as to look very agreeable to the eye," transports us to Mexico on the one side and to Chaldea and Egypt on the other. In the great Morais found throughout all the groups we have in a rude form the open temples of antiquity, amongst which the temple of Solomon must be classed.

The most important feature in the religion of Eastern Polynesia was human sacrifice, frequently accompanied by cannibalism. Excepting Mexico at the period of the Spanish conquest, we have no direct knowledge of any place where these rites were practised on such an extensive scale. Though human sacrifice was at some period practised in every quarter of the globe, it has long been discarded in the Old World, excepting amongst rude tribes like the Khands of Orissa.

None of the four great religions, Brahminism, Buddhism, Christianity, or Mahomedanism, that have dominated civilized nations during the last two thousand years, countenance it,

but in all there are certain observances and ceremonies that plainly point to the cruel rite.

The licentious Aroei societies that existed in many of the Polynesian groups when the missionaries commenced their labours remind us of the religious processions on the Nile described by Herodotus. Of the Hawaiian "Pahu tabu" Ellis has left the following particulars:—"Hither the man-slayer, the man who had broken a tabu or failed in the observance of its rigid requirements, the thief, and even the murderer fled from his incensed pursuers, and was secure. To whomsoever he belonged and from what part he came he was equally certain of admittance, though liable to be pursued even to the gates of the enclosure. Happily for him those gates were perpetually open, and as soon as the fugitive had entered he repaired to the presence of the idol and made a short ejaculatory address expressive of his obligations to him in reaching the place with security. Whenever war was proclaimed and during the period of actual hostilities a white flag was unfurled on the top of a tall spear at each end of the enclosure, and until the conclusion of peace, the symbol of hope waved to those who, vanquished in fight, might flee thither for protection. It was fixed a short distance from the walls on the outside, and to the spot on which this banner was unfurled the victorious warrior might chase his routed foes, but here he must himself fall back—beyond it he must not advance one step on pain of forfeiting his life. The priests and their adherents would immediately put to death any one who should have the temerity to follow or molest those who were once within the pale of the 'Pahu tabu.' In this institution we have plainly represented the Israelites' cities of refuge, from which the Christian sanctuaries of the middle ages emanated."

The right of tapuing, or declaring sacred, possessed by the priests of Polynesia and New Zealand, with the terrible punishment the breach of tapu drew down upon delinquents, gave the order immense power both in temporal and spiritual matters; for much that is done by civil authorities in more civilized communities was, amongst the Polynesian peoples, done by the priests exercising their right to tapu. Thus, a close season for game, a prohibition to fish in certain places, or the observance of a fast were alike insured by merely declaring the animals, localities, or days tapu. Our own history is marked by a gradual separation of Church and State with the excluding of Churchmen from civil offices.

In some countries (the United States for example) this separation is more complete than in England, while in others it has not advanced so far; thus society is evidently progressing on the same lines. Amongst the Polynesian nations the civil and religious rulers were one, priests directing, and laymen executing. Besides discharging their civil and religious functions, the Polynesian priests had to preserve the histories of their tribe, and were the astronomers, geographers, and navigators, without whom the widely scattered people could not have reached the islands they occupied or kept up the intercourse to which their language testified. We learn from tradition that when the Arawa canoe was prepared to leave Hawiki for New Zealand she could not put to sea owing to the want of a skilful pilot, and that Tama-te-kapua, the owner of the canoe, having inveigled the priest Ngatoro and his wife on board, immediately weighed anchor, and set sail. How these ancient mariners found their way across the ocean and how they determined the position of places discovered are lost arts; only a few disconnected fragments of the knowledge they possessed have been collected and recorded. We are aware that they knew the position of the equator, which they called Piko-o-wukea, and that after crossing it southward the North Star disappeared, southern constellations, for all of which they had names, coming in sight. By means of the stars and dead reckoning, based on the distance traversed by a canoe in twenty-four hours, these old navigators went from island to island and from group to group. Throughout Eastern Polynesia various divisions of time were in vogue, all being natural, or the result of observations. Thus the year was divided into two portions, one commencing when the Pleiades rose immediately before sunset and called *Matarii i nia*, the other when the group rose just before sunrise and called *Matarii i raro*. The year consisted of thirteen lunar months, a distinct name being given to each day of the month. Before the introduction of Christianity the division of time into weeks was unknown. Recognizing that the solar year, which was divided into seasons corresponding with the ripening of the bread-fruit, differed from the lunar year, means were adopted to rectify the discrepancy. In addition to their astronomical knowledge the Polynesian priests had a system of enumeration so perfect that Ellis thus commented on it:—"The precision, regularity, and extent of their numbers has often astonished

me; and how a people, having comparatively speaking but little necessity to use calculation and being destitute of knowledge of figures, should have originated and matured such a system is still wonderful, and appears, more than any other fact, to favour the opinion that these islands were peopled from a country whose inhabitants were highly civilized."

We are wont to regard the old Chaldean and Egyptian priests as the "Fathers of Astronomy," but judging by the Phœnicians, and Greeks, who inherited their knowledge, it was of little use to the navigator or geographer. The Phœnicians, who were the great mariners of our classical times, in their voyages dared not lose sight of land, and years after they had circumnavigated the African continent by creeping round the coast, their statement that during a part of the voyage, while steering west, they had the sun on their right hand, was considered an impossibility by learned Athenians. With all their philosophy the Greeks had only a very vague idea regarding the portion of the world known to them. According to Herodotus the Danube rose in the Pyrenees, and even Strabo was unable to determine the direction of the Alps. If the Polynesian navigators had not some means of arriving at a more intelligent knowledge of the region they inhabited, the great ocean on which they ventured forth must have been their grave. It is not to shepherds guarding their flocks by night we must turn for the origin of astronomy, but to fishermen labouring for their subsistence on the perilous deep. Again and again, when overtaken by darkness, the stars would be beacons guiding them to their homes. Long before the spangled vault awakened their curiosity or imagination the instinct of self-preservation would have stamped on their memory the relative positions of certain stars and the land they inhabited. Thus the association in various religions of the priest, the fisherman, and the astronomer may be accounted for. The Malay Archipelago, with the countless islands spread out within the tropics, was above all other portions of the globe calculated to call into existence a seafaring people and the twin sciences astronomy and navigation, the islands sometimes close, sometimes far apart, the regular periodical trade-winds, the zone of equal days and nights, the sun vertical twice annually to every place within the archipelago, the Pole Star on the one side and the Southern Cross on the other, with the rising

and setting of the sun, indicating the cardinal points. In a region thus favoured we can readily understand how maritime enterprise would gradually expand, and that discoveries would be made which to the rude inhabitant of higher latitudes were impossible. In this we have probably an explanation of why until the close of the fifteenth century the Atlantic remained a gulf across which man never found his way, if we except the unproductive voyages of the old Norsemen, though the far broader expanse of the Pacific had been traversed in all directions by peoples whose histories were even then lost in the mists of time.

The preponderance of Asiatic species amongst the foreign cultivated plants of Polynesia and the names by which many of these species were known in the Eastern Pacific being common to the Malay Islands and Madagascar proves that agriculture must have entered Polynesia from the west. Between Polynesian agriculture of the sixteenth century and Malayan agriculture of the same period there was such a marked difference that it is impossible the former could have been derived from the latter. The Polynesian peoples, being unacquainted with the cereals, and having merely roots and fruit-bearing trees in cultivation, can only be assigned a place in the history of agriculture analogous to the place they hold in the history of mechanical art owing to their ignorance of metals. Though the system of cultivation practised in Polynesia was common to all semi-nomad agricultural races, we are not aware of any people limited to a similar assortment of plants. In the forest region of Africa, where new clearings are constantly made, various kinds of corn are grown, and in the New World, wherever the inhabitants cultivated the soil before the European discovery, maize and beans were amongst the crops. In North America the cultivation of these grains appears to have preceded the growing of roots. Although there is not sufficient evidence to justify any broad conclusion, there are reasons for believing that the exclusive cultivation of roots was not always confined to Polynesia. Dampier remarked the preponderance of roots and fruits grown by the natives of the Bashee and other islands of the Eastern Malay Archipelago.

In parts of Brazil where manioc starch is produced very little corn is used, and the Irish furnish an example of how largely an agricultural people can subsist on a root crop

even in high latitudes. The entire absence of domestic ruminants in Polynesia before the advent of Europeans cannot be attributed to the region being unfitted for them or the difficulty of transport. The goat, one of the first animals subjugated by man, could have been conveyed from place to place more easily than the widely distributed pig, as it requires little water and there is scarcely an islet or rock within the tropics that would not furnish it something to eat, while the way in which this and our other domestic animals have multiplied since their introduction proves that the islands are well adapted for them. Sir Joseph Hooker in his *Himalayan Journals*, referring to the inhabitants of the Khasia Hills, remarked:—"The Khasias eat fowls and all meat, especially pork, potatoes and vegetables, dried and half putrid fish in abundance, but they have an aversion to milk, which is very remarkable, as a great proportion of their country is admirably adapted for pasturage. In this respect, however, they assimilate to the Chinese and many Indo-Chinese nations who are indifferent to milk, as are the Kumi people. The Bengalese, Hindus, and Tibetans, on the other hand, consume immense quantities of milk. They have no sheep, and few goats and cattle, the latter of which are kept for slaughter; they have, however, plenty of pigs and fowls." Before the first incursion of the pastoral peoples from the grassy plains of Central Asia there can be little doubt that the south-eastern portion of the continent and the adjacent islands were occupied by exclusively agricultural nations, one of which, Japan, remains almost unaltered. Dogs, pigs, and fowls, being the only foreign domestic animals Europeans found in Polynesia, naturally suggest a connection with these ancient agricultural people.

In the art of tattooing, and the scale on which they practised it, the inhabitants of Eastern Polynesia and New Zealand surpassed all the modern people. Yet both in the tropical and temperate islands clothing was general, reminding us of the Japanese, who also adorn their skins and clothes. In common with the less civilized inhabitants of the Pacific, the Japs before coming in contact with Europeans did not consider going naked even in public places an impropriety. Throughout Polynesia the principal article of clothing was the *tapa* or felted bark cloth, manufactured from the bark of the paper mulberry (*Brussonetia papyrifera*), a native of Japan, which was extensively cultivated for the purpose. In Japan the bark is still used for making paper and a woven

fabric called grass cloth. Besides the better description of tapa the Polynesians made coarser cloth from *Hibiscus* and other barks. Amongst their arts, felting and hand-plaiting occupied the places of spinning and weaving, with which they were unacquainted. In the Malay Archipelago, in Madagascar, and throughout Africa as far north as the Soudan, felted cloth made from the bark of various trees, hand-plaited garments, and the prepared untanned skins of animals were formerly the principal articles of clothing. The grooved mallets used in the manufacture of the African bark cloth might be mistaken for the mallets used in the preparation of the Polynesian tapa. Wherever weaving, even in its rudest form, has been introduced, or woven fabrics have been procurable, bark cloth has been speedily discarded, showing that, like the stone implements, it is a survival from an older and ruder time.

In the Middle Island of the New Zealand archipelago and in New Caledonia, *jade* or greenstone is found *in situ*, but at the time of Cook's discovery the natives of both countries made of it weapons, implements, and ornaments, which were regarded with superstitious veneration, used as insignia of rank, and frequently buried with the dead. In various parts of Europe jade articles have been recovered from burial places of the "stone age," though the rock has not been discovered in any part of the continent.

Amongst the Chinese, jade, which is obtained in Central Asia, commands a price which cannot be explained by its intrinsic value, its scarcity, or its appearance.* Sceptres of polished wood inlaid with jade are presented to Chinese matrons, and are carried by them when receiving visitors of distinction. One of these sceptres or *Hui*, made of jade, was amongst the articles sent to Queen Victoria on the occasion of her Jubilee by the Emperor of China. As a particular mark of friendship, four pieces of jade were presented by Montezuma through Cortez to the King of Spain. In Mexico at that time ornaments of jade were restricted to princes and nobles of the highest rank.

For people unacquainted with the use of metals, jade, being one of the best substitutes, would have an intrinsic value. This and the comparative scarcity of the rock sufficiently account for its being so highly prized during the stone age,

* The extreme hardness, beauty of colour (leek green) and scarcity in a few countries, sufficiently account for the high value set on jade.—Ed.

the importance attached to it by the ancient Mexicans and modern Chinese being merely a survival of the ideas and customs of the same rude time.

From the jade implements discovered in European tombs, some archæologists have concluded that the material was an article of commerce during the stone age. Against this it has been urged that a trade necessitating long sea voyages could not have been carried on by people in such a rude condition, but we know that trade on an extensive scale involving long voyages was carried on round the coast of New Guinea and between the Polynesian islands by people unacquainted with the use of metal. Early European voyagers found a few articles of greenstone or jade amongst the natives of Eastern Polynesia, though New Zealand and New Caledonia are the only places in the Pacific where the rock occurs. There is no difficulty in accounting for this.

The extraordinary development of navigation and the backward state or entire absence of many simpler arts amongst the natives of Polynesia enable us to comprehend how the discoveries and inventions of ruder times were diffused. When the Hindoos invaded Java the inhabitants of the Eastern Archipelago had not discarded stone implements; thus, notwithstanding their proximity to the continent, they must be classed with the natives of Polynesia rather than with the civilized nations of Asia. Without going back to a very remote antiquity, throughout the great region extending from Madagascar to the eastern limits of Polynesia, a language akin to Maori must have been spoken and a uniform civilization must have prevailed. To find a parallel for this widely spread society in continental Asia we must go back to pre-Aryan times, when the inhabitants of Southern India were agriculturists and mariners—callings which the conquering herdsmen regarded with contempt or aversion. The intermingling of the inland pastoral people with the agriculturists of the coast could not fail to stimulate discovery and invention, but wherever the former became dominant maritime enterprise was discouraged, and the stream of civilization was directed overland, beasts of burden facilitating its expansion. The breaking up of the old agricultural nations explains the backward condition of the insular Asiatic peoples at the commencement of our era, when even the Japanese were unacquainted with the art of writing. Since their written history commenced the Japs

have not been subjugated by foreigners; they may therefore be regarded as a people who have evolved their own civilization. Without the stubborn conservatism of the Chinese, they still display many of their ancient characteristics. In a report furnished by Dr. H. Maron to the Prussian Minister of Agriculture the following highly descriptive passage occurs:—"Among the great questions which still remain in dispute with us, whilst in Japan they have long since been settled in the laboratory of an experience extending over thousands of years, I must mention, as the most important of all, that of manuring. The educated sensible farmer of the Old World, who has insensibly come to look upon England, with its meadows, its enormous fodder production, and immense herds of cattle (and in spite of these with the great consumption of guano, ground bones, and rape cake), as the beau ideal and the only possible type of a truly rational system of husbandry, would certainly think it a most surprising circumstance to see a country even much better cultivated, without meadows, without fodder production, and even without a single head of cattle, either for draught or for fattening, and without the least supply of guano, ground bones, saltpetre, or rape-cake. This is Japan."

In its general features the history of Oceania during the same epoch is the reverse of Japanese history. In the Malay Archipelago, the most important portion of the region, Hindoos, Arabs and Europeans, Buddhists, Brahmins, Mahomedans, and Christians have alternately forced their arts and institutions upon the inhabitants. Though these compulsory changes did not extend beyond the western boundary of Polynesia, the destruction of the old society explains how that portion of Oceania became isolated. From the uniform social conditions of the Eastern Polynesian peoples it is evident that, like the Japanese, they had not been disturbed by foreigners during a long period previous to the advent of Europeans. Instead of steady progress, the isolation of the Polynesians owing to their surroundings was a cause of decay. We can therefore only obtain from them an imperfect knowledge of the ancient Oceanian civilization. Previous to these disturbances, while the continental civilization was developing and spreading inland, the insular civilization, of which the extraordinary development of navigation was the most important feature, was also progressing. Its diffusion through Oceania has already been noticed.

The extremely barbarous condition of the Australian and Tasmanian aborigines and the heterogeneous societies of New Guinea and Melanesia show that in parts of the region it has been imposed on peoples very much lower in the social scale.

On the African continent, though the natives have long understood how to obtain and manufacture iron, a few primitive Oceanian arts are still in vogue, and traces of the ancient Oceanian or Maori language have been detected by philologists amongst certain negro tribes. In his well-known work *The Races of Man* Dr. Pickering thus closes a chapter on "Migrations by Sea":—"Arabia being situated entirely within a desert region, the timber used by the inhabitants is all imported from abroad, either from the Malabar Coast or from Zanzibar. And leaving the absence of natural inclination for maritime pursuits, it would seem a fair inference that navigation did not take its rise in a country devoid of the materials of construction.

"South of the Arab colonies of East Africa, we have Malay influence of unknown antiquity at the Comoro Islands and Madagascar. Here too the outrigger makes its appearance, an article not used by the Arabs, but which is general in the Pacific and occurs at Sooloo, and, if I am rightly informed, at Ceylon. The Maldive Islanders make regular voyages only to the eastward; but the fact of a Maldive canoe with several persons on board having recently drifted to the vicinity of the African coast shows at least the practicability of intercommunication. We have thus designated, between Eastern Africa and the coast of America, no less than five separate theatres of maritime intercourse. Each of these has different attendant circumstances, is navigated by a different people and in vessels of a different construction; each if thoroughly examined would furnish ample materials for a separate volume; and this state of things has existed for ages notwithstanding the silence of history."

The distribution of the cultivated kumara (*Convolvulus batatas*) and the curious *sumpitan* or *gravitana* being found amongst the natives of the Malay Archipelago, Madagascar, and the Amazon valley are positive evidences of the ancient Oceanic navigators having extended their voyages to the eastern shores of the Pacific, as well as to the western limits of the Indian Ocean.

The civilization of Central America has been a fruitful source of speculation ever since Europeans discovered the

continent. From the institutions and customs of the Mexicans and Peruvians many have argued that they must have been offshoots from some Asiatic people, but it is quite evident that there was no direct intercourse within historic times between the New World and any of the ancient centres of Asiatic civilization. Had Peru or Mexico been colonized from any of these centres, the pastoral industry, the cultivated Old World esculents, the art of manufacturing iron, the potter's wheel, writing, etc., could not have been wholly unknown on the American continent. The Mexicans and Peruvians, having bronze implements and ornaments of gold and silver when conquered by the Spaniards, were higher in the scale of civilization than the natives of Polynesia, who were dependent on stone, shell, and wood, but probably they had not been very long superior, as the ruined structures found in many of the islands could not have been erected without metal tools.

The human figures on the colossal statues of Easter Island, though well featured, have enormous pendent ears. According to native tradition the monuments found in this small isolated island were erected by a people called "The Big Ears."

The small stone images recently discovered on Necker Island, over 3,000 miles distant, having also disproportionately large ears, an artificial enlargement of this organ must have been a mark of distinction amongst the inhabitants of Oceania in remote times. The following passage from Robert Drury's Journal describing some persons he met in Madagascar shows that the custom was preserved there at the commencement of the last century:—"I asked them where their country lay. They said it was a mountainous inland place divided into two kingdoms, called Amboerlambo, and governed by two brothers—they had vast large ears with bright silver plates in them glittering like comets. I was very curious to know how they became so, and they told me. When they are young a small hole is made and a piece of lead put in it at first. After the wound is healed they have a small spring-ring put in which dilates it by degrees, and after this another till the hole is large enough; then they place in it these silver plates, which are neatly made and exactly adjusted to the hole with great care for fear of breaking it. Some of these holes in their ears are large enough for a woman's hand to go through. They have artificers among themselves who make these ornaments.

The poorer sort, they said, who could not afford silver, had them of tutaneg, which they call ferotchfuty."

The natives of Easter Island, when discovered by Europeans, enlarged their ears by means of an elastic ring, and the Dyaks of Central Borneo still drag their ears down to their shoulders with heavy ornaments of tin and other materials. Amongst the rude tribes of the Amazon valley Mr. A. R. Wallace noticed enormous ears artificially produced, and we learn from Prescott that the Peruvian Inca and his nobles were styled Orejones by the Spanish conquerors on account of their great pendent ears weighted with gold ornaments. Referring to this curious badge of chivalry, a contemporary writer remarks, "The larger the hole the greater the gentleman." This curious custom links together the builders of the mysterious monuments, the modern inhabitants of Oceania, the natives of the Amazon valley, and the highly civilized Peruvians.

No systematic exploration of the ancient Polynesian structures has yet been undertaken. We are therefore much in the position of a jury allowed to see, but unable to question, the most important witness in the case before them, but from the resemblance to Asiatic monuments of the bronze age and to ancient Peruvian remains we seem justified in concluding that they mark how a knowledge of metallurgy found its way from the Old World to the New. It is extremely improbable, or we might say impossible, that the art of compounding bronze was independently discovered on both sides of the Pacific. A comparison of the cultivated plants and domestic animals of Peru and Mexico with those of Polynesia shows clearly that between the great island region and the continent there was no intercourse for a long period previous to the sixteenth century. This was the period of isolation and decay, into which alone traditions and genealogies can give us obscure glimpses. If we have correctly attributed the decay of Polynesian civilization to the invasion of the Eastern Archipelago, it must have commenced since the first century A.D.; but probably the period of decay did not extend back nearly so far. Though Mahomedanism had reached the Philippines at the commencement of the sixteenth century, Brahminism and Buddhism did not extend so far eastward. Until a proper archæological survey of the region has been effected, it is impossible even to place in chronological order many of the most important events in the history of Oceania, such as the

establishment of the Maori-speaking people in Madagascar, their appearance in the Pacific, and the erecting of the Polynesian monuments; but to a people who have left such traces behind them a place amongst the leading nations of antiquity must assuredly be accorded.

DISCUSSION.

The CHAIRMAN.—We shall be glad to hear remarks on this interesting paper, which is certainly of great importance.

The SECRETARY.—I would just like to say a word in reference to one particular part of this paper, which the Chairman has justly entitled one of great importance.

It shows a large amount of research in the country with which I think Mr. Rutland is, to a certain extent, personally acquainted. But it refers to the evidence adduced from the distribution of certain plants over a large portion of those islands, and it seems to me that he has not taken into consideration (perhaps the idea has never presented itself to him), that plant and animal distribution is not, necessarily, to be accounted for by the agency of man, or the inhabitants of certain portions of the world; but that it is the result of physical conditions—in the distribution of land and ocean, which were in force at a period not so very far back, in the history of the world—possibly within the human period; but in any case not very much before the human period. Now observations that have been carried on by geographers, and I might say geologists, and also by such eminent naturalists as Dr. Wallace, whose name has been referred to in the paper, have shown that plants and animals have had a wide distribution for which it is impossible to account on the hypothesis that the relative positions of land and sea are now exactly what they were at a period preceding that of the human population. Very great changes in this distribution have taken place unquestionably within the late Tertiary and even the Post-Tertiary Period; and therefore plants and even animals, such as the pig (which is evidently an animal which has had wide distribution) may be the survivors of those which were extensively distributed throughout the Pacific Ocean and the Southern Ocean at a period just

preceding that of the human race; and that the present inhabitants, who by various ways, and by navigation, peopled those islands, made use of those animals and plants ready to their hand, and turned them to use for sustenance and clothing and the various arts they followed. Therefore, I think a great deal of the information that Mr. Rutland gives us in this paper as regards the distribution of animals and plants, may be probably attributed to the different positions of land and sea, and connections of various parts of the continent with the islands which have since been submerged.

The Rev. F. A. WALKER, D.D.—The paper we have just listened to with great interest is entitled "The Maori's place in History"; but I think you will agree with me that its scope extends over a great many nations and peoples distinct from the Maoris, and over different periods of time and different customs, prejudices, and ideas of many parts of the globe. We have heard a great deal about Madagascar and about the Malay Archipelago and other places. There are so many points of interest here that I have written a few notes on them. There are one or two that I would draw your attention to. The author refers to the *gravitana*, or blow-pipe, in use for hunting amongst the eastern and western nations, the use of which is widely spread. Any who are interested in the mention of the *sumpitan*, or *gravitana*, can find a detailed account of its construction as well as of the accompanying quiver and arrow, on page 236 of Vol. 22 of Bates's *Naturalist on the Amazon*, and the method of its use, and an account of the famous Urari poison on page 238 of the same book.

[Dr. Walker here read some lengthy notes on the history of the *sumpitan*.]

Then there is a question from the Rev. William Ellis's work on Madagascar, taken from page 32 of the same work, which contains the record of three visits to that island made respectively in the years 1853-1854-1856. The date given in the quotation of his arrival at Tamatave, 1856, is erroneous, for though he visited that place in 1854 and again in 1856, the date when being at Tamatave he remarked on the resemblance between the Malagasy and the Polynesian languages was, as given in the book itself, 1853, on his first visit.

Again, the author says: "The invention of bronze and its application in the manufacture of weapons and mechanical implements, must have given an impetus to civilization analogous

to the impetus given by the perfecting of the steam engine during the present century." How greatly bronze entered into every relation of life—sacred, warlike, domestic—in the days of old, the records of the Jewish tabernacle and temple, the poems of Homer, the history of Herodotus, and its introduction into myths and folklore of the ancients sufficiently bear witness.*

The Rev. G. A. SHAW, F.Z.S.—I quite agree with the Secretary that the distribution of plants and vegetables that have been cultivated by various peoples in the different islands of Oceania, ought not to be taken as an ethnological test as used in the paper, or that the presence of the same kind of vegetation observed on the peopling of Eastern Polynesia indicated the existence of a prehistoric people. It is, as the Secretary remarks, far more worthy of acceptance that the islands being at one time united, may have caused this by a survival of both the flora and fauna rather than that they are of recent introduction.

I also take exception to another matter mentioned in the paper, having reference to the arts. The arts in Madagascar are not similar throughout the country. In some parts of the country the people work in iron. In other parts of the country they never work in iron, and they do not understand the working of it. In some parts sculpture, or rude carving, has been practised from time immemorial. In other parts of the country it is altogether unknown, and no kind of art in those parts exists. So I think it is not quite correct to take this as one of the points of evidence regarding the unity of people living widely apart.

I agree with the last speaker that the paper is of great interest.

It is not unlikely that the art of working in iron has been introduced into Madagascar by the Arabs.

Iron is dug from the hills in much the same way as we dig gravel here in England. And this applies to the remark made in the paper with regard to pottery in Polynesia. It is true there is no pottery, at any rate so far as I have seen, in any of the islands to the east of and including Samoa. That is to be accounted for in exactly the same way as I am accounting for the absence of iron working amongst some of the inhabitants of Madagascar, viz., the non-existence of the material necessary, and

* Also bronze (translated "brass" in our English version of the Bible) was, probably, the metal in the composite image of the Book of Daniel.

from that cause the gradual cessation of the art has come about until it has died out from national use altogether.

Then as to navigation. Something is said with respect to this in the paper, and it has been hinted, though not expressly stated, I think, in so many words, that the islands of Polynesia have been populated by navigators who have been of such an order that they, like the Phœnicians, could launch their vessels and sail right away into the trackless ocean in search of other lands. The traditions amongst the Samoans go to show that these islands have been populated by chance, *i.e.*, the canoes, some of them of immense size and capable of taking 200 or 300, have started out from their own homes with the intention of, perhaps, making for an island, which, after they had sailed a few miles, became visible. Storms came on and the canoe drifted along, carried by the trade winds until it grounded on some new island. As a matter of fact some of those near the equator, in the South Pacific have, within historic times, been populated in that very way; and I think it is begging the question to suppose that the Polynesians were, in the olden times, such splendid navigators, that they could launch forth from the Eastern Islands to make for new islands, as is implied in the paper. And again, from my knowledge of the Eastern Polynesians, I think that their "system," as it is called in the paper, of astronomy will not account for their cleverness in navigation. At any rate, if it ever existed, it has died out. The natives do not now sail or paddle by either sun or star, but, practically, their one compass is the trade wind.

Then, with regard to the weapons indicated as uniting the people under one class, it is quite true that the blow-pipe or blow-tube, has been used as stated, and it is used still by one or two of the tribes living in the forests of Madagascar. It is used not as a weapon, in the ordinary sense of the term, which seems to imply a warlike weapon, but simply as a means for the chase.

One other point. The author refers to the *topa*, or felted bark cloth, which I think is somewhat misleading. Cloth in the South Pacific is not felted, according to my idea of the term. It is really welded. The bark is taken from the paper mulberry and soaked in water, then beaten into flat strips on pieces of wood. Two strips are laid overlapping at the edges, and they are then welded together: but it is not done in Madagascar. It is used in the paper to indicate a connection between Madagascar and the

Pacific: but in Madagascar bark cloth was used simply soaked until it was comparatively soft, but it was not welded. I have brought two pieces with me, if you would like to see the difference.

Here is a piece of Samoan *topa* cloth made of the paper mulberry; and attached to this piece of matting is a piece of Malagasy cloth made from the bark.

[*Exhibiting the specimens.*]

But while dissenting from some of the propositions used in the paper, I entirely agree with the general conclusion, namely—the ethnological affinities of the Maories, Polynesians, and Malagasy.

Professor ORCHARD.—I think we are indebted to the author for his interesting paper. Whether or not we agree with him in all his conclusions we shall probably do so on the final one—“to a people who have left such traces behind them a place amongst the leading nations of antiquity must assuredly be assigned.”

I could have wished that some explanation had been given with regard to the curious custom of enlarging the ears. It appears to have been a custom followed by the predecessors of the present inhabitants of Easter Island—the predecessors who erected the wonderful monuments found there. The author says, “This curious custom links together the builders of the mysterious monuments, the modern inhabitants of Oceania, the natives of the Amazon valley, and the highly civilized Peruvians.” Whether or not the evidence would be considered decisive on this point, I think we at all events apprehend that the paper shows the extreme antiquity of human civilization, and it gives another blow to the theory once held, but now, I suppose, pretty well exploded, of the primeval savage, and confirms the doctrine of Heber that the savage could not have been the primitive state of man. The savage was never known to civilize himself, but in every instance is the descendant of a more civilized set of people.

Mr. MARTIN ROUSE.—I would only say that despite the criticisms which have, in some cases, been justly spoken against the paper, it is one of the most fascinating and well-considered papers that I have had the pleasure of listening to or have taken part in reading at the Victoria Institute. It may be that some of the arguments are not so complete as to justify the conclusions, but certainly the argument of language is exceedingly strong. What could be stronger than the fact that the same word, pronounced in the same way, denotes the cocoa-nut tree in Madagascar and Eastern

Polynesia, and that the numerals are the same in the languages of both countries ?

One remark more I would add. The writer alludes to the vast buildings in Egypt in ancient times, and intimates that when they were built the Egyptians had no knowledge of iron. Now it is true that Prof. Flinders Petrie holds that view: but M. Maspero holds the contrary. He says that in the masonry of the Pyramids a few remnants of iron tools have been found and none of bronze; and if more have not been found elsewhere it is highly probable that it is because iron rusts away more readily than any other metal; and he holds it as inconceivable that those vast structures could have been built without iron tools and especially that the statues could be so finished. He also denies that the Egyptians had the power to make their copper "as hard as iron," or to give it an iron-like temper. On the other hand he says the Egyptians had no knowledge of *steel*, but that in all likelihood they work, as he has known skilled forgers of antiquities to do. "These men," says he, "work with some twenty common iron chisels at hand, which after a very few turns are good for nothing. When one is blunted, they take up another, and so on till the stock is exhausted. Then they go to the forge, and put their tools into working order again. The process is neither so long nor so difficult as might be supposed. In the Boulak Museum there may be seen a life-sized head which was produced from a block of black and red granite in less than a fortnight by one of the best forgers in Luxor."

Mr. THEO. PINCHES, LL.D.—There is one question as to metals which is a very interesting one. My speciality, the study of Assyrian and Babylonian inscriptions, shows, it seems to me, that the use of iron was known at a very remote period—how far back I cannot say; but the Babylonians and Assyrians used it largely, and also copper and bronze.

It is a remarkable thing that jade is so very scarce in that part of the world, and that there have been so few examples of it found. If I remember rightly there is only one object of jade from Babylon and that is a cylinder seal, now in the British Museum. Others may have been found of late years; but, if so, no knowledge of it has come to me.

The question of the colour of jasper, referred to in the paper, is somewhat new, and, as the Secretary remarked, in the course of reading it, it is generally of a red colour; but green jasper does occur.

There are some green salt-cellars in the British Museum that are described as jasper.

The Babylonians studied astronomy for the purpose of foretelling events, and not for the purpose of navigating the ocean; and their knowledge of it is shown by the fact that they had named most of the stars, probably all the stars they could see, and it is to them that we owe the present names of the signs of the zodiac, and probably of most of the constellations.

The CHAIRMAN.—I think I shall be entirely in accord with the feeling of the meeting in asking our Secretary to communicate to the author our thanks for his very interesting paper.

The SECRETARY.—I should like to ask Dr. Walker what authority he has for making brass synonymous with bronze? Certainly they are not anything of the kind.

Rev. F. A. WALKER, D.D.—All I meant to indicate was that the word translated “brass,” in the Holy Scriptures, is really bronze. It is not the same amalgam as brass.

[The meeting then terminated.]

ORDINARY MEETING.*

THE REV. CANON GIRDLESTONE, IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following paper was read by the Rev. Dr. Walker in the absence of the Author :—

*PICTORIAL ART AMONG THE AUSTRALIAN
ABORIGINES.* By R. H. MATHEWS, Esq., L.S.
(With two Plates.)

INTRODUCTORY.

MOST of the drawings of the Australian aborigines are very primitive in execution, and conventional in type, but they are nevertheless of unquestionable value to the student of archæology. I have made accurate copies of a large number of these pictorial representations, which have not hitherto been recorded, and propose to treat the subject under the following divisions, namely: Rock Paintings—Rock Carvings—Marked Trees—Drawings on the Ground—Images—and Carvings on Wooden Implements.

The Right Rev. Dr. Thornton, Bishop of Ballarat, Victoria, having favoured me with a copy of his valuable paper on "Problems of Aboriginal Art in Australia," read before your Institute on the 7th of April, 1897,† I have presumed to forward the following pages on the same subject, in the hope that they may, in some slight degree, serve to continue the interest awakened by his Lordship's paper. (I

* December 4th, 1899.

† *Journ. Trans. Vic. Inst.*, vol. xxx, pp. 205-232.

may state that this subject was treated by me before the Australasian Association for the Advancement of Science, Section F, at Sydney, New South Wales, January, 1898.)

ROCK PAINTINGS.

In a number of articles contributed to different ethnological and philosophical societies, I have given a short account of the first discovery of these drawings in several parts of Australia, and described the manner in which the different styles of rock paintings are produced by the native artists, so that it will not be necessary to again refer to these parts of the subject. I shall therefore proceed at once to describe the cave paintings.

Cave 1.—This shelter is situated in a high escarpment of Hawkesbury sandstone, known as "The Wallaby Rock," near the left side of a small creek, about 15 chains in a north-easterly direction from the north-east corner of Portion No. 58 of 40 acres, in the parish of Bulga, county of Hunter. It is 85 feet long, and extends into the face of the cliff 18 feet at the widest part; the height from the floor to the roof at the back of the recess is 8 feet, which increases to 11 feet 6 inches at the entrance. The floor consists chiefly of soil and ashes, through which the rock protrudes in places. The front of the cave faces N. 60° W., and judging by the smoke-stains on the roof, as well as by the ashes on the floor, appears to have been used as a camping place by the aborigines. On digging into the floor, I found several stone-knives used by the natives in dressing the skins of animals, and for other purposes.

The total number of hands in this shelter, all of which are shown in the plate, is ninety-seven, four of them being shut hands, and thirty right hands. Some of them are smaller than others, and in several the arm is delineated almost to the elbow. Among the hands are a boomerang, and tomahawk with handle, executed in white stencil in the same manner. There are also three groups of lines drawn in white; the first group contains eight lines 9 inches long, with a white bar across the top of them; the second group has ten white lines 2 feet long; and the third group eight lines 15 inches in length. White and red lines, similar in character to these, have been observed in a number of caves, and are worthy of careful study and comparison. On the left of the boomerang is a pick-shaped object drawn in red,

the only instance of the employment of that colour in the cave. The other paintings represent a fish, a human figure, and two irregularly shaped objects, all drawn in white outline.

This cave is one of the largest—as well as being amongst those containing the greatest number of drawings—which I have visited. To a spectator standing in front of it, with its immense array of upwards of a hundred objects painted in white on the dark coloured rock, the view is very imposing. The distance from the cave to the Macdonald river, in which the water is permanent, does not exceed half-a-mile.

Cave 2.—This rock-shelter is situated at a place known as “The Gulf,” about 13 or 14 miles from Rylstone, in the parish of Growee, county of Phillip. It is within sight of the main road from Rylstone to Bylong, and on the western side of it. The cave consists of a large hollow in a huge isolated boulder of Hawkesbury sandstone about 60 feet in diameter, and 35 feet high. The cavity measures $37\frac{1}{2}$ feet in length, 13 feet in height, and 12 feet in depth from the entrance to the back wall, and faces N. 35° E. The floor is composed of sandy soil near the front, but farther in the rock comes to the surface, and the cave bears evidence of having been occupied as a place of residence. Permanent water is obtainable in Gulf Creek which runs close by.

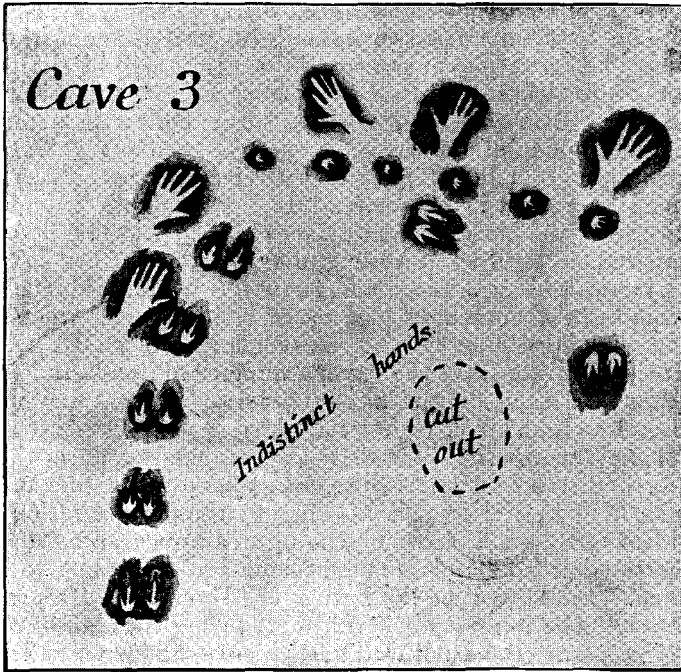
If the observer faces the cave, a number of hands and two feet may be seen on the left—the latter being apparently those of a child, six or eight years old—all done in red stencil. Looking towards the right we see seven hands, one of them being shut, stencilled in white, and above them four more hands done in red stencil. Owing to the disintegration of the face of the rock on which the figures appear, a considerable number of hands have become too indistinct to be copied. The lowest of the figures are about 8 feet from the floor, and the highest about 12, there being a ledge of rock running along the back wall of the cave, about 6 feet from the ground, upon which the operators probably stood when doing the work.

This cave is chiefly remarkable for the two stencilled feet, which are about 12 feet from the surface of the ground. In order to stencil them at that height, it is likely that forked saplings were placed against the rock to support the weight of the child, who held its feet in position whilst the artist blew the colouring pigment around them. A theory propounded by some of the white residents in that district is

that perhaps the feet were severed from the body of a dead person, and applied to the rock.

Cave 3 (Fig. 1).—This cave is in a high rocky escarpment of Hawkesbury sandstone, forming the boundary of Portion No. 65 of 40 acres in the parish of Price, county of Phillip. The nearest permanent water is in Cooyal Creek, about a mile to the southward. The shelter is 30 feet long,

Fig. 1.



extending into the rock about 15 feet. The height at the entrance is 6 feet, increasing to 8 feet inside, owing to the dome-shaped roof.

The end of the cave on the right hand side of the interior on entering, is somewhat circular, the back wall curving round towards the front, or outwards. Out of a considerable number of paintings in this shelter, I have reproduced one

of the most important groups, drawn around the curved wall referred to. The figures plainly distinguishable, at the time of my visit, in this part of the cave, consisted of two left and three right hands; seven double tracks of a kangaroo, and six tracks of what appears to be a native dog's foot. Probably the feet of dead animals were employed in both instances. There is also the mark where some object has been cut out by some white visitor—most likely a hand. To the left of the kangaroo tracks—between these tracks and where the object has been cut out—and also above the dog's tracks, several paintings of hands have become too indistinct to copy.

This cave faces N. 35° E., and is about 150 feet above the flat ground to the south of it. It would have formed a very comfortable camping place in the winter time, when water could have been obtained in the small gullies running out of the hills close by. All the drawings have been executed in the red stencil method.

Cave 4.—This rock-shelter is situated in a high escarpment of Hawkesbury sandstone about 5 chains on the eastern side of the old Bulga road, and about a mile north-easterly from Portion No. 4, of 21 acres 2 roods 16 perches, in the parish of Milbrodale, county of Northumberland. It is 37 feet long, 17 feet deep, and 12 feet high, and faces N. 70° E. The floor contains hearth rubbish, and the roof is begrimed with smoke, indicative of the place having been used for residential purposes. Water is obtainable in Bulgar Creek, about a quarter of a mile distant.

At the present time there is but one right hand, done in white stencil, in this cave. There is a human figure and parts of two others outlined in black, and shaded in the same colour. There are three representations of snakes drawn in the same manner; also two objects, one on the right and the other on the left of the plate, probably intended to represent native weapons. What appears to be intended for a human head and shoulders is drawn in black outline, filled in with lines of red and black mixed indiscriminately. Towards the left is shown a pick-shaped object, similar to the one represented in Cave 1, outlined in black, and shaded with the same colour. There is also a native shield outlined and shaded in red, with a median bar down the centre. Crossing the lower end of the last named is a drawing in black, the meaning of which is not very obvious. Besides the foregoing there are three groups of

those remarkable white lines before referred to, one group containing three strokes, another five, and another eight. Between the last mentioned and the stencilled hand are seven white spots, with a short stroke downwards from the central one.

Cave 5.—The low escarpment of sandstone containing this shelter is within Portion No. 9 of 47 acres, in the same parish and county as the last described. It is about $2\frac{1}{2}$ chains easterly from the new Bulga road, and about 12 chains from Darkey Creek, in which the water is permanent. The cave, which faces N. 40° E., is 37 feet long, 11 feet high, and varying from 18 to 26 feet from front to back. The floor consists partly of rock, but chiefly of hearth rubbish and soil, the roof bearing the stains of the smoke of numerous fires, showing that the place has been used as a camp by the aborigines.

The drawings, which are all done in white stencil, consist of thirteen hands, two boomerangs, and an object 3 feet 9 inches long, by 3 inches wide, evidently a native weapon either flat and sword-like, or cylindrical and solid, as a waddy. Although the rock is hard, durable and dry, and the cave faces the forenoon sun, most of these paintings are rather faint, indicating that they are of considerable age.

ROCK CARVINGS.

It is not my intention on the present occasion to add a plate showing specimens of rock carvings, but will invite the reader to peruse a series of articles on this subject written by me during the past four or five years, which are illustrated by numerous plates.

In some of the articles referred to, I gave an account of the discovery of rock carvings in the vicinity of Sydney in 1788, shortly after the colony of New South Wales was founded, and also mentioned other parts of Australia where similar carvings have been observed since that period. In other papers directions were given for copying these drawings from the rocks on which they occur, by means of measurements and sketches made in a note-book, with instructions for the preparation of plates for publication. In other communications I explained the manner in which carvings were cut upon the surface of the rocks by the native artists, and the possible purpose of the drawings. Several of my papers were largely occupied with illustrative

specimens, amounting in the aggregate to upwards of two hundred and thirty separate carvings, representing human beings, animals of various kinds, warlike implements, dances, hunting and fishing scenes, etc.*

MARKED TREES.

Aboriginal drawings on trees consist of representations of men, animals, weapons, the different heavenly bodies, lightning, and a variety of characters consisting of curved and zigzag lines, lozenge and oval shaped designs, chevrons, bars, etc. Marked trees of this kind are found at those camps where the initiation ceremonies are performed. The graves of the natives, the scenes of some of their fights, and remarkable events in their daily life are likewise commemorated by curious symbols marked on trees standing around the spot.

The specimens of native art found upon trees are executed in various ways. The mode of drawing most generally adopted is to outline the object by a nick cut with the tomahawk into the bark of the tree. In some cases the whole of the bark within the outline of the figure is removed; in other instances a portion of the bark is first removed from the tree, and the design cut into the wood. Some of these native drawings are merely scratched upon the bark of the tree, whilst others are painted upon the bark with red ochre or charcoal.

I will now proceed to describe some carvings copied by me from a number of trees on a Kamilaroi Bora ground on Redbank Creek, a tributary of the Weir River, in the parish of Tallwood, county of Carnarvon, Queensland. These carvings are shown on Plate X, hereto annexed, as Figs. 1 to 18 inclusive. Fig. 8 represents the crescent moon, cut through the bark, and a short distance below it are four zigzag lines. On another tree, Fig. 13, there is a centipede 3 feet 1 inch in length, with eighteen legs, chopped through the bark into the wood, with some diamond or lozenge shaped devices below it. On a forked box tree was the outline of an iguana, Fig. 17, 5 feet 2 inches long, cut through the bark. Fig. 18 represents a carpet snake

* *Proc. Roy. Geog. Soc. Aust.*, Queensland Branch, vol. x, pp. 46-70; *Ibid.*, vol. xi, pp. 86-106. *Journ. Anthropol. Inst.*, London, vol. xxv, pp. 145-163; *Ibid.*, vol. xxvii, pp. 532-541. *Proc. Amer. Philos. Soc.*, Philadelphia, vol. xxxvi, pp. 195-208 and pp. 466-478.

9 feet 4 inches in length, with its head toward the ground, cut in the same manner. The marking on the remainder of the trees shown in the plate consists of the usual zigzag, lozenge, oval, and other devices. Growing near these was a small box tree, along the bole of which a wavy band about 2 inches wide had been cut with a tomahawk through the bark, extending from near the ground to a height of about 25 feet, representing a tree which had been struck by lightning; this tree is not shown in the plate.

DRAWINGS ON THE GROUND. (Plate X.)

Earthen figures formed in high relief, or engraven upon the turf, representing human beings, different animals, implements, and the curious designs called *yowan* by the Kamilaroi and Wiradjuri tribes, are found chiefly at those places where the youths are admitted into the status of manhood. Where they have been observed in other localities the circumstances would lead us to suppose that they were connected with some tribal myth or superstition, or were used on festive occasions.

Native drawings on the ground consist of several kinds. Some are first outlined by laying down logs, bark, bushes, or stones, to a certain height, and then covering them with earth to complete the figure. This was obviously done because the natives had very primitive tools for digging; in large drawings, raising a considerable quantity of earth would require much time and labour, especially if the ground were hard or clayey. In other instances the figures are formed entirely of the loose earth heaped up so as to resemble the horizontal image of the required object. Another kind of drawing consists of representations of men, animals, and devices in various patterns cut into the surface of the ground; a nick or groove from 2 to 3 inches wide and about 2 inches deep being dug in the turf along the outline of each figure. These grooves were dug with tomahawks, or with flat pieces of wood on which an edge had been formed. Other figures again are merely drawn upon the sand with a stick held in the hand of the operator.

In the annexed plate I have reproduced some of the ground drawings copied by myself at the same Bora camp as that containing the trees already dealt with. Figs. 19 to 45 will fairly represent the different patterns of *yowan* carved

upon the turf on that occasion. The largest of the designs was 37 feet in length, by 7 feet in width, part of which is shown in Fig. 31; another was 29 feet by 5 feet, and is shown in its entirety in Fig. 34. Some of the smallest of these carvings in the soil were only 2 or 3 feet in length, filling out spaces between trees. A good deal of the soil cut out in carving these designs was used in building the raised representations of Baiamai and Goberangalnga described farther on.

Fig. 46 represents a legendary, serpent-like monster called the Kurree, which is supposed to have its abode in deep lagoons and other sheets of water, and devours human beings who may come within its reach. This drawing measures 39 feet in length, and its greatest width is about a foot. It is formed by a groove about 3 inches wide dug into the turf along its outline. Fig. 47 is a woman cut in the ground in a similar manner. The height is 7 feet 4 inches, but would be more if the legs were not so much distended.

Fig. 48 is a huge horizontal representation of Baiamai, lying on his back, formed by building up the loose earth, which was 1 foot 2 inches high at the chest. The length of the figure was 9 feet 6 inches, and the width from hand to hand 9 feet.

Fig. 49.—On the opposite side of the pathway, close to the last described, was a figure of Goberangalnga, the wife of Baiamai, formed in the same way, but with the addition of a coat of kneaded clay on top, in which were moulded the features of the face, the mammæ, etc. The length of the figure was 10 feet 9 inches, with a distance of 8 feet between the hands.

Fig. 50 delineates a man with a boomerang in each hand, and a belt around the waist. The object 2 feet 5 inches long rising from the top of the head, was, the native artist told me, intended to represent a feather stuck in the hair. This drawing bears a striking resemblance to some of the aboriginal rock pictures found in other districts.

Fig. 51 represents two death adders, formed of raised earth, with their heads in the same direction. One of these reptiles is 9 feet long, the other 10 feet 6 inches.

Fig. 52. This drawing, which is outlined by a nick dug into the soil in the way already stated, represents a cod-fish 9 feet in length, and 3 feet 8 inches across the body.

Fig. 53 was intended to denote an emu, and was formed

in the same manner as the last described. Its length from the bill to the tail was 12 feet 6 inches, and its height from the feet to the top of the back 7 feet 9 inches. The legs are short in proportion to the body, being 2 feet 6 inches long—perhaps to indicate that the bird is sitting or crouching down.

Fig. 54 represents two more drawings of death adders, also formed by heaping up the loose earth into the required shape. Their heads and tails are almost touching, and the length of each reptile is a little over 16 feet.

In a paper contributed by me to the Royal Society of Victoria in 1896, describing the initiation ceremonies of one of the native tribes, I briefly referred to the marks on the trees and on the ground dealt with in this article, but no plate illustrating them has hitherto appeared in any publication. They are therefore quite original.

IMAGES.

Under this designation I propose to include all figures formed of wood, bark, clay, or other material. These images or effigies differ from earth-moulded drawings lying flat upon the surface of the ground, because they are not attached to the soil, but are movable. They comprise human figures, representations of the sun, moon, reptiles, birds and other objects.

At the Burbung ceremonies of the aboriginal tribes on the Lachlan and Murrumbidgee rivers, New South Wales, I have seen an image of Dhurramoolun—a spirit whom they reverence, or rather fear—formed partly of wood and partly of clay, and placed leaning against an adjacent tree to keep it in a vertical position. This effigy was manufactured in the following manner. A sapling on which were two opposite branches was selected, and cut down; the two branches were then chopped off at such a length as to be equal to that of a man's arms. The stem of the sapling was next cut through about a foot from these two lateral branches, for the purpose of representing a man's head and neck. The main stem was again cut through about 5 feet on the other side of the branches in order to form the body and one leg. Mud or clay was then plastered all over this wooden framework, or "skeleton," in such a way as to make it resemble a human being. Only one leg was represented, because Dhurramoolun is believed to have but one of these

useful members. The fingers, toes, face, and other features were formed of clay, and attached to the wooden frame. Human hair and feathers were then fastened on the head, thus completing the rude image.

Black fellows belonging to the south-east coast of New South Wales, between Sydney and Cape Howe, have told me that at their Bunan and festive gatherings, images were formed of mud or clay and placed against trees for the purpose of supporting them in an upright position.

In an article dealing with the Bora ceremonies of the Kamilaroi tribes at Gundabloui,* I described two male figures cut out of bark, and fixed up against trees. One of these had his head ornamented with emu's feathers, and the other held in his hand a *hielamon*, or native shield. I also described the figure of an iguana about 3 feet long, a figure of the sun 2 feet in diameter, and one of the full moon 18 inches in diameter, all cut out of bark and fastened to trees.

Mr. John K. McKay, of Dungog, informs me that when travelling on the Moonie river upwards of thirty years ago, he saw an image made by the aborigines on the right bank of that stream, about thirty miles above Nindigully, Queensland. It was apparently intended, he thought, to represent a swan of enormous proportions, or some mythologic creature of aboriginal lore. The body was about 15 feet long, 6 feet wide, and about 4 feet high; it was formed of bushes and leaves pressed closely together, and covered with a thick coating of mud. The head and neck consisted of a bent log of the required shape, about 10 feet long, one extremity of which was fixed into the ground at one end of the heap of bushes, the other extremity being cut into shape to represent the head, which was elevated several feet above the surface, the whole figure was then ornamented with daubs of white and red—the head being painted with the latter colour. This image was at a deserted camp of the natives, and before going away they had taken all the sheets of bark which they had been using for their own *gunyahs*, or shelters, and laid them over the monster to protect it from rain. There was a cleared space several yards wide all round this animal, where the natives had apparently been dancing corroborees while remaining in the camp adjacent.

* *Journ. Roy. Soc. N.S. Wales*, xxviii, 113; *Journ. Anthropol. Inst.*, xxiv, 417.

At a corroboree witnessed by Mr. W. T. Wyndham near either the Barwon or Condamine river, Queensland, he saw an image made of earth and logs, which the blacks told him represented the bunyip, warway, or polgun, a water monster.*

Mr. T. A. Parkhouse, in describing the customs of some native tribes in the neighbourhood of Port Darwin,† states that he was present at a corroboree held in connection with a marriage ceremony. A post was fixed in the ground to which bark was then attached forming the grotesque representation of a man—the whole being painted with red ochre, and surmounted with a conical cap, covered with white down, similar to that worn by the bridegroom. This image was representative of the *biráuel*, or evil spirit.

Mr. E. J. Eyre witnessed a remarkable dance at Moorundie on the Lower Murray river, South Australia, in 1844. The dancers were painted and decorated as usual, and had tufts of feathers on their heads like cockades. Some carried in their hands such tufts tied to the ends of sticks, and others bunches of green boughs. After exercising themselves for some time, they retired, and when they reappeared they were seen carrying a curious rude-looking figure raised up in the air. This singular object consisted of a large bundle of grass and reeds bound together, enveloped in a kangaroo skin, with the flesh side outwards, and painted all over in small white circles. From the top of this projected a thin stick with a tuft of feathers at the end to represent the head, and sticks were stuck out laterally from the sides for the arms, terminating in tufts of feathers stained red to represent the hands. From the front a small stick about 6 inches long was projected, ending with a thick knob formed of grass, round which a piece of old cloth was tied. This was painted white, and represented the navel. The figure was about 8 feet long, and was evidently intended to symbolize a man. This figure was carried for some time in the dance. Subsequently there appeared in its place two standards made of poles, and borne by two persons. The standards were abandoned, and the men advanced with their spears. Mr. Eyre believed that these dances, and the image, and the standards, had some connection with their

* *Journ. Roy. Soc. N.S. Wales*, xxiii, 41.

† *Austn. Assoc. Adv. Sci.* (1895), vi, 642.

superstitions, and that the figure was regarded in the light of a charm.*

Mr. Edward S. Parker says he has witnessed ceremonies having resemblance to an act of worship, when the blacks have assembled to propitiate *Mindi*, an evil spirit, whose sole business it was to destroy. They used certain prescribed ceremonies in order to appease his anger, and to avert death and other calamities from themselves, and to excite him to exercise his power for the injury or destruction of their enemies. "Rude images," writes Mr. Parker, "consisting of one large and two small figures, cut in bark and painted, were set up in a secluded spot; the men, and afterwards the women, dressed in boughs, and having each a small wand, with a tuft of feathers tied on it, were made to dance in single file, and in a very sinuous course, towards the spot, and after going round it several times, to approach the main figure, and touch it reverentially with the wand. I believe this to be a relic of the ophiphatria, or serpent-worship of India."†

Under date of 1875, the Rev. R. W. Holden speaks of the natives "cutting out an image of a man out of a sheet of bark, and erecting it, and dancing around it."‡

CARVINGS ON WOODEN IMPLEMENTS.

The carvings under this heading comprise decorative or symbolical designs cut upon shields, boomerangs, womeras, message sticks, bullroarers, and other articles. As the devices on a large number of native weapons have already been illustrated by different writers in other publications, I shall not at present add a plate representing this kind of native art, but will refer the reader to R. B. Smyth's *Aborigines of Victoria*, vol. i, pp. 283-341; E. M. Curr's *Australian Race*, vol. i, pp. 143-151.

MESSAGE STICKS, also known as "stick letters" or "talking sticks," are pieces of wood of different sizes. They are in some cases flat on both sides, ornamented more or less by

* *Journals of Expeditions of Discovery into Central Australia* (1845), vol. ii, pp. 236-238.

† R. B. Smyth's *Aborigines of Victoria* (1878), vol. i, p. 166.

‡ *Folklore, Manners, Customs, etc. of the South Australian Aborigines* (1879), p. 26.

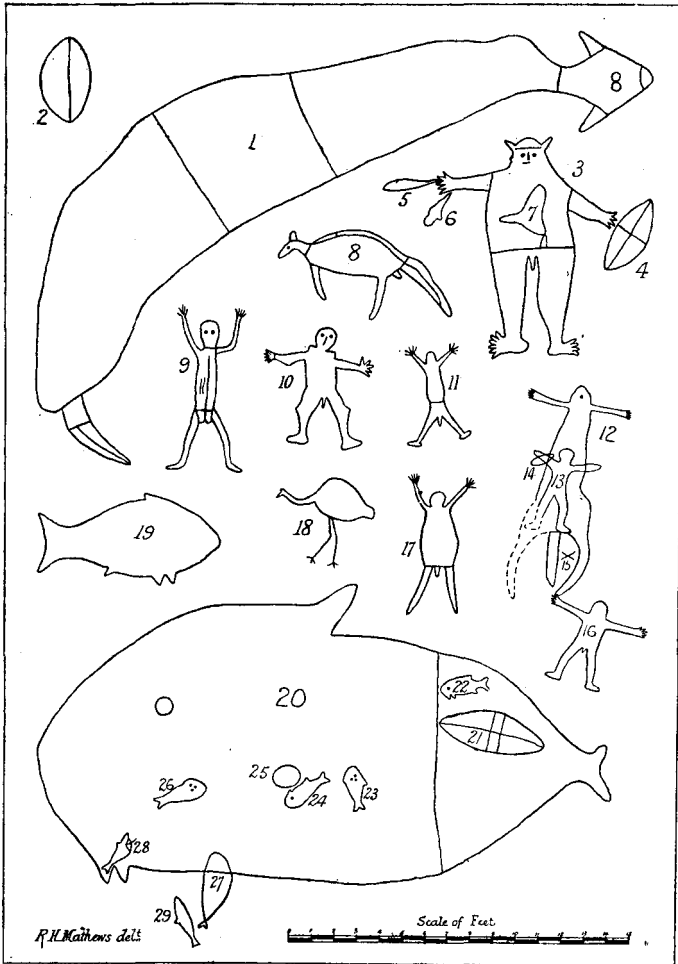
carving, and are painted a bright colour; in other instances they are merely a rounded piece of wood, or a rod cut from the branch of a tree; whilst a still more primitive kind are made of a piece of bark. Instances have been observed where marked pieces of bone are used in a similar manner. They are marked in various ways, consisting of notches, dots, strokes, curves; and also with triangular, quadrilateral and zigzag devices.* In some of the more elaborately carved there are rude representations of human beings, whilst in some tribes they are not marked at all, but consist merely of a plain piece of wood. "Stick letters" summoning festive gatherings are sometimes decorated with the down of birds, with or without other marks. In some tribes the wood used for making the stick must be of the same totemic division as the sender of the message, and the man who carries it must also belong to the same division. The marks are cut upon them with a piece of sharp stone, bone, or broken shell.

These "talking sticks" appear to have been made according to some conventional design known among the tribes using them. One kind of stick is used for a corroboree where a large number of people assemble; another is used to convey messages or reminders between friends residing at some distance from each other. A certain sort of stick would be used for festive gatherings; another in cases of sickness or death, and so on. These sticks, differing perhaps but little in general appearance, would nevertheless be recognized by the people inhabiting the tract of country in which they were used, and would thus, to a certain extent, have a more or less fixed significance; which would, however, be very much restricted unless accompanied by a verbal explanation by the bearer. The stick is given to the messenger to assist him in remembering the heads of the message, by connecting them with certain pictures, marks, or notches cut upon it, which are explained to him before he sets out on his journey. The stick also serves as his credentials, being a confirmation or guarantee of the genuineness of the message.

BULLROARERS made of wood, sometimes ornamented by carving on one or both sides, are used at those ceremonies where the boys are inaugurated into the rank of manhood.

* For copies of the carvings on seven "message sticks," see my paper on that subject in *The American Anthropologist*, vol. x, Plate VII.

PLATE IX.



ADDITIONAL DRAWINGS BY NATIVES.

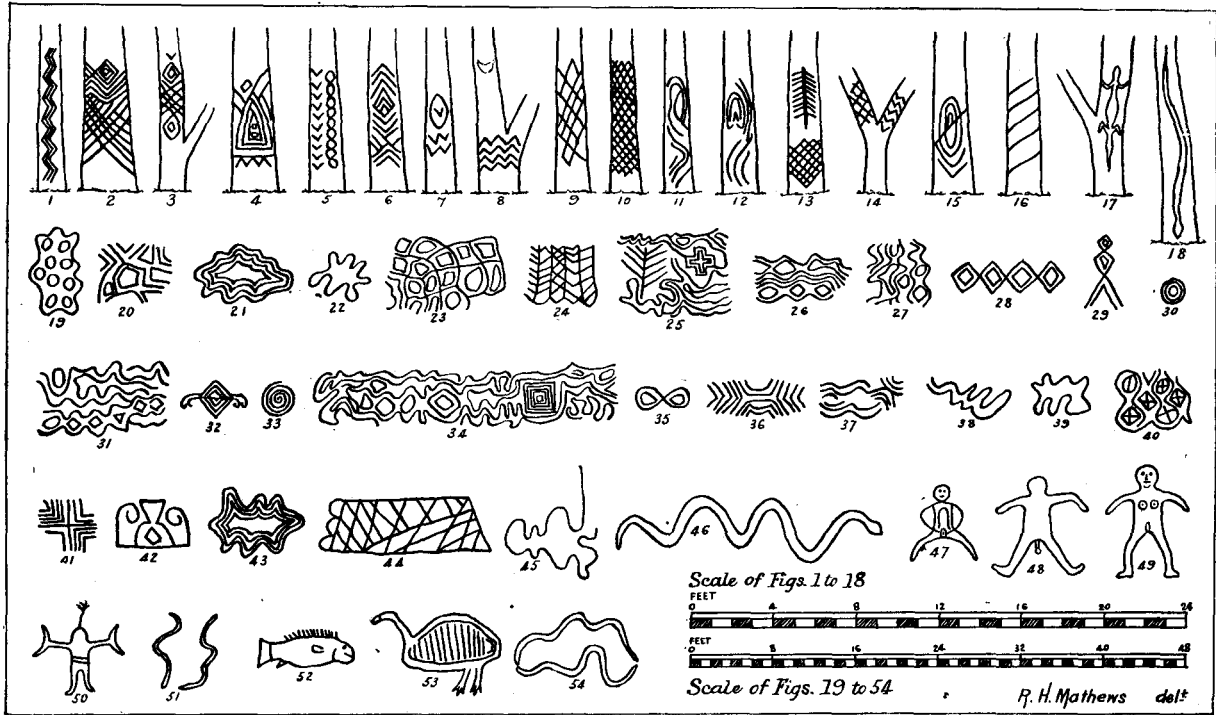


PLATE X.—DRAWINGS BY NATIVES ON THE GROUND.

Having elsewhere given tolerably full descriptions of the bullroarers used by several tribes,* I shall not occupy any further space in this article. The Rev. Louis Schulze,† referring to the initiatory rites of the tribes on the Upper Finke river, which rises in the McDonnell Ranges, South Australia, states that the *tjurunga*, or bullroarer, in use there is sometimes made of slate, as well as of wood. The natives assert that the bullroarers are not made by the hand of man, thus leaving us to infer that they are produced in some supernatural way. Mr. Schulze also states that during the ceremonies, the men paint their bodies with fish-like figures, and other patterns.

DISCUSSION.

The CHAIRMAN.—I am sure we owe a debt to Mr. Mathews for having written this paper, and we are also under a debt to Dr. Walker for having read it.

I suppose the object of a paper of this class is to illustrate two things. First, the nature of aboriginal man and his tendency to art together with his power of illustrating things he has observed. The second object I suppose is to see if we can find out more about the different relationships of mankind. Take, for example, the curious story of these caves, which are almost entirely occupied with pictures of hands. It would seem as if the artist who took these caves as his study went in for a speciality in hands. One would like to know whether, in other parts of the world, anything similar has ever been discovered.

So far as I can see, the different departments of this paper are not much related one to another. The things drawn on trees are of a wholly different character from the things drawn on the walls of the caves, and so with the images inscribed on the ground. There was probably more of imagination than of skill, and that is

* "Bullroarers used by the Australian Aborigines," *Journ. Anthropol. Inst.*, xxvii, 52-60, Plate VI.

† "The Aborigines of the Upper and Middle Finke River," *Trans. Roy. Soc. South Australia*, xiv, 210-246.

very natural, and it leads us, of course, to the consideration of aboriginal man. He was evidently imaginative, but of an imagination more primitive in its nature, I should suppose, than their skill would be.

The reference to serpent worship towards the end of the paper is very interesting, because we know that there have been in many countries, far distant from one another, tendencies towards serpent worship and so towards the imitation of serpents and reptiles connected with serpents.

Then the "talking sticks" remind us of the North American Indians, who have samples of peculiar language, sometimes on sticks and sometimes on slugs of wood. We would like to know the relative dates of these different classes of objects and works of art.

I was rather surprised to see that Mr. Mathews had had a conversation with the native artist, the very person who apparently had produced some of these objects. We should like to know a little more about the date and the object which led the various persons to make those things—whether it was a mere freak or religious superstition, about which there is such uncommon reserve.

The Rev. W. S. LACH-SZYRMA.—With regard to the subject of native art I fancy that it is much higher than one would suppose. The illustrations in Mrs. Langham Parker's book on Folklore are reproductions of native art, and I believe with regard to pictorial representations they are of a much higher stage than one would anticipate—indeed there is a realism, in some of the work which is represented, which certainly is striking. It gives one an idea of Australia in a rough way, and the natives; and being black they are fair representations of them, and they throw a light on the early stages of culture which even the people of Britain must have passed through. But the confusion of ideas of animals and men is remarkable. In some of their stories you hardly know whether they are referring to men, women or animals. In some of their sentences the idea seems to be rather confused, and I suppose is taken from the transmigration of souls and of metamorphoses and such expressions of thought as we find in the *Arabian Nights* and the transmigration into animals there represented. The subject of these Australians throws light on the matter, for they are one of the few people

existing on earth, at the end of the nineteenth century, who are really in that state in which we suppose Europeans were, probably, on this island, say a thousand years before Christ. The Tasmanians were, I believe, still more antique and belonged to the paleolithic stage. They, of course, have passed away; but the Australians are extremely interesting and still linger on in their early stage.

The Rev. F. A. WALKER, D.D.—There are one or two points which I think are of great interest in this paper.

I fancy it is a moot point whether one nation derives its arts and customs from a distant one, or whether, as human nature is much the same in all places, two nations that cannot communicate with each other have arrived at the same state of civilization.

The talking stick, mentioned by the author of the paper, appears to differ in its use from that adopted in other parts of the world, such as the scytale in Greece, where a cipher was used for writing a message lengthwise on paper. When it was rolled it was unintelligible, the man who received it could decipher the message; but the herald who carried it could not. Therefore there is a slight difference between what he carried and that carried by the Australians; because the messenger in the Australian case had to remember the heads of the message; but the Greek messenger on the contrary could not understand it, and I think in some cases the message was to put to death the man who conveyed the message.

I quite agree with what the Chairman has said—that serpent worship is a relic or observance found not only in many lands but in every land of which we have knowledge, and I do not, therefore, think that the serpent worship of India need only be quoted, for I have seen so many instances of ancient effigies of the serpent in my travels in Italy. Evidently the idea of every race was to propitiate the principle of evil, which idea ultimately gave way to those who possessed the greater and vital power of the Gospel.

Mr. MARTIN ROUSE.—I should like to add, as the trend of the discussion is towards serpent worship, that the kings of Egypt decorated their heads with a serpent, as shown on the monuments. John Paton the missionary, when living in the New Hebrides, was called out one day by a man who said, "I have killed the Tebil!" "What do you mean?" Paton asked. "Matshiktshiki,"

he answered, giving the native name, "the one who does all the mischief in the world, and causes all the wars." He took him round to his hut and showed him a huge sea-snake which he had slain. "That is not the devil," said Paton; but the man maintained that it was the creature which had brought all evil into the world.*

I do not agree with the speaker (if indeed it is his opinion) who said that these men had risen from a much ruder state. A very remarkable fact was brought to light at the British Association meeting at Oxford in 1894. Mr. Basil H. Thomson, who, while surveying the Fijian island Levuka, had studied its traditions, told the natives' story that their ancestors had come from the west in eight canoes, and that seven out of the eight were lost. The chief of the whole party was however saved; but seeing what had happened in the terrible storm, he exclaimed, "Oh, my writings, my writings! I have lost my writings through that storm; and I am not able to transmit to my children the history of our people." So that nation had once possessed a means of exactly recording events which they had utterly lost when the missionaries reached the island.

In 1893 or '94 Mr. George O'Brien wrote a pamphlet for the Civil Engineers Institution, on the conditions of climate in the desert of Atacama, in the course of which he stated that at a point on the Inca road near to the desert there is a large inscription in Quichra, the language of the ancient people of Peru; whereas the Spanish historians tell us that at the conquest they had no writing; but there stands that great slab with writing upon it.

But just as nations and tribes through degrading superstitions lost the intelligent knowledge of their Creator, so through constant wars did they lose many industrial and refining arts; and the more they moved away from one another into remote islands and peninsulas, while continuing their idolatries and giving free rein to jealousy and revenge, the more completely did they forget true religion and noble handicraft. It used to be said that the Australians had no religion, I daresay that is within the memory of everyone here. That false accusation was utterly dispelled by John Paton of the New Hebrides. When crossing

* John J. Paton, ii, 156.

over to Australia he took with him a bag of charms which were worshipped as gods by his islanders. He showed them to the black natives of Australia upon several occasions, and they admitted that they had "gods" like them used by their "doctors." He then twice in the presence of European witnesses bought for a handsome price several gods from an Australian doctor and caused terror to other blacks by showing them.

Numerous witnesses themselves formally narrate these events, one deposition being signed by a Victorian magistrate, Mr. Robert Hood of Hexham. Upon the latter's asking why he had never seen or heard of these things before, the answer came, "Long ago white men laughed at black fellows praying to their idols. Black fellows said, white men never see them again. . . . No white men alive now have seen what you have seen."

Professor LOGAN LOBLEY.—In the Jermyn Street Museum there are some remarkable illustrations of aboriginal art. Along with a portion of the floor of a cave in the south of France there are exhibited bones with the representation of a reindeer, which were therefore contemporaneous with man in that part of Europe, and that reminds us of the Neolithic Period of that part of Europe long years ago.

It is also noteworthy in connection with the paper that all the indigenous animals of Australia are of a very early type, and also the vegetation. We also see now that these have remained practically unchanged for a long period.

The Rev. G. F. WHIDBORNE, M.A.—I should like to say a word upon what has fallen from the last speaker.

We have not any distinct indication as to whether the writer of the paper regards these as recent drawings or old drawings.

It strikes me they must represent a very high state of intellectual advance, and one would like to know whether the present natives can achieve such things, or whether there is any reason to suppose that they are remains of lost civilization. We know that sometimes, even those very old drawings referred to as of the stone age, are really very clever and, perhaps, show us much greater advance in human culture than one is apt to suppose they do. I remember once hearing a lecture, long ago, by a gentleman on the rude drawings of ancient days on bone. The lecturer was a man of high culture, and he not only gave us facsimiles of those rude drawings, but he wanted to illustrate some points in regard to

them; so he got a blackboard and made some drawings of his own, and the drawings of his own were even ruder than those shown us of the stone era.

The CHAIRMAN.—Perhaps I had better now close the meeting. I will only say that I am fully in accord with what has been said by one of the speakers as to the human race. I think man, when he came forth from the hand of his Creator, was by no means in a state quite savage. On the contrary, if he had been a savage I do not think he would have got any further, but I think the essence of humanity of the best type was within him, though his higher powers and the actual thoughts of his mind would be, naturally, developed at a later stage.

The meeting then adjourned.

ORDINARY MEETING.*

THEOPHILUS G. PINCHES, ESQ., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections took place :—

ASSOCIATES :—Rev. Charles Estcourt Boucher, M.A. ; Rev. Albert Henry Hodges.

The following paper was read by the Secretary in the absence of the Author :—

THE WAHĀBĪS: THEIR ORIGIN, HISTORY, TENETS, AND INFLUENCE. By Rev. S. M. ZWEMER, F.R.G.S.

THE rise of innumerable heresies as the result of philosophical speculation, the spread of mysticism among the learned classes, and the return to many heathen superstitions on the part of the masses made Islam ripe for reform at the middle of the last century.† Add to this that there was a general decadence of morals under the Ottoman caliphate and that there had been a lull in the period of Moslem conquest. Except for a temporary revival of missionary activity on the part of the Moslems in China and the spread of Islam among the Baraba Tartars, the eighteenth century saw little advance for the Crescent. Instead of conquest there was controversy. Over one hundred and fifty heretical Moslem sects are enumerated by writers of that period. Each of them agreed with the words of Mohammed, ascribed to him in the tradition : “ My people will be divided into seventy-three sects ; every one of which will go to hell except *one sect* ” (*Mishkat*, book i,

* Monday, February 18th, 1901.

† The 18th century.

chap. vi, part 2). All these sects differed either in their ideas of Allah and his prophet's revelation or split hairs on free-will and destiny. The Abadiyah held that Ali was divine. The Safatites taught the grossest anthropomorphism. While Sufism, which arose in Persia, was so thoroughly pantheistic that it seems incredible to find monotheists carried away by its teaching. The four orthodox imams were at agreement concerning most doctrines and differed chiefly in their genuflections and more or less lax interpretation of moral precepts. The germs of idolatry left by Mohammed in his system bore fruit. Saint-worship in some form or other was common all over Arabia, as well as in other Moslem lands. The Shiah had made Kerbela the rival of Mecca and Medinah as a place of pilgrimage. There were local shrines of "holy men" near every village. The whole world of thought was honeycombed with superstitions borrowed from every conceivable source; even Buddhism gave its rosary to Islam, and they had already passed it on to the West. The old-time simplicity of life and morals had given way to pride of life and sensuality. Burckhardt testifies regarding Mecca itself (which has always been to the pious Moslem the cynosure of his faith) that, just before the time of the Wahābī reformation, debauchery was fearfully common, harlotry and even unnatural vices were perpetrated openly in the sacred city. Almsgiving had grown obsolete: justice was neither swift nor impartial; effeminacy had displaced the martial spirit; and the conduct of the pilgrim caravans was scandalous in the extreme.

Such was the condition of Arabia when Mohammed bin Abd el Wahab bin Musssherif was born at Wasit* in Nejd, 1691 A.D. Before his death this great reformer, earnest as Luther and zealous as Cromwell, saw his doctrines accepted and his laws obeyed from the Persian Gulf to the Yemen frontier. As the result of his teaching, there sprang up, in the course of half a century, not only a new, widely extended, and important Moslem sect, but an independent and powerful state. Abd el Wahab was an incarnate

* Palgrave says he was born at *Horemelah* (in his *Travels*) while in the article on Arabia (9th ed. *Encyclop. Britannica*) he mentions *Ayinah*. This place is also given by Burckhardt, but he adds that it is uncertain. From a direct descendant of Abd el Wahab, an Arab at Bahrein, I learn that there is not the least doubt that he was born at neither of these places, but at *Wasit*; some maps give *Waseit*.

whirlwind of Puritanism against the prevailing apostacy of the Moslem world. The sect which he founded and which took its popular name from him was a protest against Moslem idolatry and superstition. It stood for no new doctrine, but called back to the original Islam. Wahābīism was an attempt at an Arabian reformation. "Yet so far from giving any progressive impulse to the Mohammedan cult, it has proved the most reactionary element in the history of Islam."* This purely Semitic and unique movement, with all its energy, has produced nothing new; it has been directed exclusively toward the repristination of pure monotheism. Our purpose is to sketch (*a*) the origin and history of the Wahābīs; (*b*) give an account of the Wahābī doctrine; and (*c*) of their present condition and influence. The sequel will show that a reformation of the Moslem world by a return to primitive Islam (in theory and practice) is an impossibility, even when aided by the sword. *Back to Christ*, not back to Mohammed—that is the only hope for the Moslem world.

I. ORIGIN AND HISTORY OF THE WAHĀBĪS.—Mohammed bin Abd ul Wahab was instructed from his youth by his father in the religion of Islam according to the strictest sect of the orthodox Sunnis, namely, that of the Imam Abu Abdullah Ahmed bin Hanbal. Arrived at manhood, the serious student of Islam determined to visit other schools than those of Nejd. He went to Mecca, and afterward also to Busrah and Bagdad. He made the pilgrimage to Mecca and visited El Medina, but in neither place did he find the ideal Islam for which his heart was longing. He felt that there was a distinction between the essential elements of Islam and the recent admixtures of dogma and practice. At Ayinah he first posed as a teacher of the truth. He affirmed the right of private judgment in interpreting the Koran and the traditions by boldly rejecting the old-time leading-strings of the four orthodox commentators. His teaching met with opposition from the outset, but there were also those who accepted his bold position. He fled from his native town and sought refuge at Deraiah under the protection of Mohammed bin Saood, a chief of considerable influence and great ambition. The reformer and the chief found that they could be mutually helpful in furthering each

* Rev. F. F. Ellinwood, D.D., in his article, "Has Islam been a Religion of Progress?" (*Missionary Review of the World*, Oct., 1897).

the interest of the other. A marriage alliance, by which the daughter of Abd ul Wahab became the wife of Mohammed bin Saood, sealed their covenant. The preacher with his book and the warrior with his sword now stood on the same platform and were ready to begin conquest. Without Mohammed bin Saood and his powerful dynasty there would have been no Wahābī conquest. It is in the very nature of Islam and all its sects to grasp the sword which the prophet himself received from the hand of Allah.

To give the history in detail of the rise of the Wahābī state and its bloody conflicts, first with the Arabs and afterward against the Turks and Egyptians, as well as the history of the two British campaigns from India against the Wahābī pirates of Oman, is impossible in the narrow limits of this paper. By comparing various authorities I have prepared a genealogical table of the Saood dynasty and a brief chronology of the most important dates. Burckhardt's notes for the history of the Wahābīs are most interesting and valuable, but his account does not go beyond the year 1817. After that date we are dependent on Palgrave, who is not renowned for accuracy and frequently contradicts himself. As far as I can learn there is no *Arabic* history extant. The two accounts of the Wahābīs in the French language are, according to Burckhardt, unreliable. But for the later history of the Wahābīs, and the final collapse of their power, Doughty in his *Arabia Deserta* gives important data.

The following is a brief account of the spread of the Wahābīs and their conquests in Arabia:—Their conquests outside of Arabia were not by the sword, but by the cheap lithographic literature of Indian disciples. The reform started on its march of conquest soon after the arrival of Abd ul Wahab at Deraiah. Partly by persuasion and partly by force Saood gained victories over the neighbouring tribes, and even the province of Hassa. Before his death, in 1765, the whole of Nejd was one Wahābī state. Abd-ul-Aziz, his son, and successor, a more able warrior than his father and of equal ambition, assumed the titles of Imam and Sultan. The provinces of Areesh and Nejran, to the south of Mecca, were added to the Wahābī dominions. Ghalib, the Shereef of Mecca, was filled with alarm, and, on his complaint, the Turkish Government sent an army of 5,000 to lay siege to Hofhoof, the capital of Hassa. They were repulsed, and the Wahābīs now took the initiative by advancing toward Bagdad and laying siege to Kerbela. The town was stormed,

the inhabitants massacred, and spoils of immense value were taken from the shrine and put into the Wahābī treasury.

Flushed with the success of this campaign against the idolatrous Moslems of the north, the Wahābīs now turned toward Mecca. Taif, the fertile garden-city near to Mecca, was subdued with great bloodshed, and in a few months Mecca itself came into Wahābī hands. Ghalib fled to Jiddah, which was the only place in all Hejaz that held out against their invasions. To Saood, the son of Abd-ul-Aziz, was given the governorship of Mecca, and in a noteworthy letter he dictated to the Porte the terms on which alone the annual pilgrimage would be permitted. In 1804 Saood conquered Medinah, treating the inhabitants with great severity and plundering all the riches which had accumulated for centuries around the prophet's tomb. The tomb itself barely escaped being utterly demolished by the desert iconoclasts, who preached a thorough reformation and butchered all Turks as idolaters. From that time until 1811 the Wahābī armies made incursions into Turkish territory as far as Damascus and Anah on the Euphrates. The Wahābīs on the Persian Gulf began to use their new religion as a cloak for piracy, and two expeditions sent from Bombay broke up the robber-nest of Ras-el-Kheyimah, and taught the zealots a lesson never since forgotten. The so-called pirate-coast is now under British protection, and the inhabitants, although still Wahābīs, are friendly to Great Britain.

Meanwhile (since the pilgrimage to the holy cities was limited to those who embraced the Wahābī reform), many complaints reached the Sultan of Turkey. After some futile efforts of his own, he entrusted the task of conquering the Wahābīs and re-taking Mecca to Mohammed Ali Pasha, his already over-powerful Egyptian vassal.

Tousson Beg, the son of Mohammed Ali, commanded the first expedition, landing at Yenbo, the port of Medina, in 1811. By the end of the following year Medina was taken. The troops made a fearful massacre of the Wahābī garrison and the inhabitants, and treacherously murdered even those 1,500 to whom they had promised safe conduct. The intrigues of Mohammed Ali had meanwhile detached the Shereef Ghalib from the Wahābī cause; and Jiddah was occupied by the Turks in 1813. Mohammed Ali now came over in person, collected a large army, and in 1815 advanced toward Yemen. Shortly after Gunfidah, a small town on the Red Sea, was taken by the army, discontent broke out

among the troops. In 1814 Saood, the second of that name and the greatest of the dynasty, died and was succeeded by his son Abdullah. The power of the Wahābī state had already suffered serious loss during Saood's life by the taking of the holy cities. After his death other losses followed. The Wahābī forces were utterly defeated by the Turks in the battle of Bessel. This battle, fought on the 26th of Moharram, 1230 A.H. (January 7th, 1815), was the deciding blow. The Wahābī force numbered 25,000 men—camel-riders, infantry, and a few horsemen. The Turks had artillery and with it drove the enemy out of their mountain position into the open plain. "As soon as Mohammed saw the enemy running, he proclaimed among his troops that six dollars should be given for every Wahābī's head. In a few hours five thousand were piled up before him; in one narrow valley fifteen hundred Wahābīs had been surrounded and cut to pieces" (Burckhardt). Of three hundred prisoners taken, fifty were impaled before the gates of Mecca; twelve suffered a like horrible death at every one of the ten coffee-houses from Mecca to Jiddah; and the rest were impaled at Jiddah! "The Turks delighted in this display of disgusting cruelty, but all their Bedouin allies expressed aloud their utmost indignation" (Burckhardt). Mohammed Ali Pasha returned to Egypt; Toussoun Pasha, left to complete the war, concluded a peace with the Wahābīs, but the treaty was disavowed both at Cairo and Constantinople. Ibrahim Pasha landed at Yenbo in 1816, and commenced the final campaign. He subdued the entire province of Kasim, entered Nejd, and in April, 1818, appeared before the walls of the Wahābī capital, Deraiah. The city was taken and razed to the ground; Abdullah was carried off to Constantinople and publicly executed in front of St. Sophia. The Egyptian occupation of the Wahābī provinces was rather for vengeance and destruction than for the purpose of government. Executions, massacres, and ruined villages marked the progress of Ibrahim Pasha through Nejd. It was no wonder that on the departure of the commander revolt broke out against his garrisons. Harik and Hassa were the first to rebel. Riadh became the centre of the movement, and Turki, a younger son of Abdullah, became the new sultan of the Wahābī state. Feysul bin Turki succeeded to power when his father fell by the hand of an assassin, and was as able as he was popular and powerful. For his character and method of

government we can go to the pages of Palgrave and Sir Lewis Pelly; the Wahābīs still remember their distinguished visitors.

In their day the boundaries of the Wahābī state embraced Hassa Harik, the whole of Nejd, Asir, and Kasim—one broad belt of zealots from the Persian Gulf to the Red Sea. But in 1870 the aged and blind Feysul was assassinated. Dissension broke out regarding his successor. And the result was Turkish interference and loss to the Wahābī state. Hassa became a Turkish province, at least nominally, and Hofhoof, the capital, has since been occupied by a Turkish garrison. From the Yemen side also Asir was annexed to Turkey and the rebellious Arabs crushed under the yoke of taxation.

Meanwhile, a new Arabian kingdom of a different and more liberal character sprang up in northern Nejd under Telal. Gradually but surely it became independent and at last superior in power to the Wahābī state. Saood, the last of the Wahābī dynasty, finally paid tribute to the ruler at Ha'il, and Mohammed bin Rashid so strongly established himself and so far extended his influence that as a political power the Wahābī state has ceased to exist. Abd-ul-Aziz, the nephew of Ibn Rashid, and his old-time favourite, now rules Nejd and its dependent provinces. Even Riadh is under his green and purple banner. There is little probability that a new Wahābī revolt will take place, or be successful if it should.

II. THE WAHĀBĪ DOCTRINES.—The name of Wahābīs was given to the followers of Mohammed bin Abd ul Wahab by their opponents; since they would not call them Mohammedis, they used the patronymic. But that name always was and still is displeasing to them. In India they generally call themselves *Ahl-i-Hadith* or the People of Tradition. In Nejd their earliest name was *Firket-el-Najiet*, i.e., the sect of those who are saved. They also sometimes took the name of *Muwahidin*, i.e., Unitarians. In the eastern Punjaub districts they call themselves *Mujahidin*, i.e., those who believe in the jihad or war-for-Islam.

In considering the distinctive religious tenets and practices of the Wahābīs we must never lose sight of the fact that they themselves claim (and claim rightly) to possess all the doctrines of primitive Islam in their original purity; and that Abd ul Wahab contended not for new views but for first principles. It was his aim to demolish utterly everything

that had been superadded to the original revelation of Allah. This revelation the Wahābīs, together with all other Moslems, consider a twofold revelation—first, the Koran or revelation of God's will *in writing*; and second, the Tradition, or the written record of God's will as revealed *in every act of the life of Mohammed*, and faithfully handed down by his companions. "Wahābīism has sometimes been designated the Protestantism of Islam, and so it really is, although with this remarkable difference, that while Christian Protestantism is the assertion of the paramount authority of sacred Scripture and the rejection of traditional teachings, Wahābīism is the assertion of the paramount authority of the Koran with the Traditions. . . Tradition in Islam occupies a totally different place from that which it does in the Christian system, being nothing less than the supposed inspired sayings [and also *doings*] of the Prophet and being absolutely necessary to complete the structure of the faith" (Hughes, *Dict. of Islam*, p. 661).

This firm stand taken by the Wahābī leaders on the original foundation of Islam has ever been their strongest argument against their opponents. Burckhardt writes:—"If further proof were required that the Wahābys are very orthodox Musselmans, their catechism would furnish it. When Saood took possession of Mecca he distributed copies of this catechism among the inhabitants, and ordered that the pupils in public schools learn it by heart. Its contents are nothing more than what the most orthodox Turk must admit to be true, . . . and nothing was contained in this catechism which the Meccans had not already learned" (*Notes on the Bedouins and Wahābys*, Vol. II, p. 104). This catechism or creed of the Wahābīs, given by Burckhardt, in his appendix to the second volume, opens with the usual Unitarian formula coupled with a motto from Bochari, the great traditionist: "First learn, then speak, then act." The questions and answers are in no way remarkable, except that each answer is accompanied by a proof-text from the Koran. The division of the little tract is threefold—on the knowledge of God, the knowledge of Islam, and the knowledge of our prophet Mohammed. Concerning Mohammed, the catechism answer reads: "Mohammed, may God's mercy be with him! is a delegate whom we dare not adore and a prophet whom we dare not belie; but we must obey and follow him, for it has been ordained to spirits and to mortals to be his followers. He was born and appointed a prophet at Mecca; his flight and death were at Medina. If it be asked, is he

mortal? answer, yes, he is mortal. In proof of which we read, 'Say I am but a mortal like yourselves, to whom it is revealed that your God is but one God.'" Burekhardt also states that in 1815 a book had been received at Cairo containing various treatises on religious subjects written by Abd ul Wahab himself; it was read by the theologians of orthodox Islam, and they declared unanimously that if such were the opinions of the Wahābīs, they themselves belonged altogether to that creed! Nevertheless, Moslems to-day do not look upon the Wahābīs otherwise than as a pestilent sect, for however much they may agree *technically* with the average Moslem and with the Koran as taught in the schools, *practically* they are widely at variance with orthodox beliefs, and bitterly at war against many orthodox practices. Here are some of these points of difference:—

1. They do not receive the dogmatic decisions of the four imams (founders of the chief systems of interpretation), but say that any man who can read and understand the Koran has the right of private judgment, and can interpret the Koran and the Tradition for himself. They therefore reject *Ijmaa*, i.e., "the unanimous consent of the fathers," after the death of the companions of the prophet.

2. Their monotheism is *absolute*. Prayers should not be offered to any prophet, wali, or saint. Palgrave's matchless description of Allah, as "the pantheism of force," in all its remarkable analytical detail applies rather to the Wahābīs than to Moslems in general (see *Travels in Central and Eastern Arabia*, p. 365, Vol. I).

3. Together with this absolute monotheism they are accused, not without cause, of having crude and anthropomorphic ideas of deity. They understand the terms "sitting of God" (Arabic استوى) and hand of God (يد الله), etc., in their literal sense. This most of all is the rock of offence to other Moslems, many of whom designate the doctrine as *kuf*' (infidelity).

4. Regarding Mohammed's intercession, they differ from other Moslems in holding that it is impossible *now*, although it will be possible on the day of judgment.

5. They think it wrong to build cupolas over graves or to honour the dead in any way, such as by illuminations or by perambulating their tombs. Even the tomb of Mohammed is no exception.

6. They are accused, rightly or wrongly, of holding that

certain portions of the original Koran were abstracted by Othman out of envy when he made his recension superseding all other copies extant (*Hist. of Imams and Seyyids of Oman*, by Saif bin Razik, pp. 252, 253).

7. They observe four festivals only, namely, 'Id el Fitr, after the fast month; 'Id el Azha or feast of sacrifice at the Haj; 'Ashura, the tenth day of Moharram, on which God created Adam and Eve; and Lailat el Mubarakat, the night on which the Koran descended. The anniversary of the Prophet's birth they do not observe, nor any of the other feasts and holy days of Islam.

8. They forbid the use of prayer-beads or rosaries, and instead count prayers and the names of God on the knuckles of their hand with the thumb.

9. In the matter of dress they advocate a return to early Arabian simplicity. All silk, jewels, silver or gold ornaments, and other than *Arabian* dress are an abomination to God and to His prophet.

10. Even in food and drink they are distinguished from other Moslems. The lawfulness of tobacco has always been a disputed point among Moslem theologians, but the Wahābī reformer puts tobacco-smoking under the category of greater sins, and the weed is known by the name of "the shameful," or by a still worse and untranslatable epithet which implies a purely Satanic origin for the plant. All intoxicants not only, but all drugs that stupefy or benumb, are under the ban. Even the Kaat-plant of Yemen (*catha edulis*) is forbidden food.

11. Wahābī mosques are built with the greatest simplicity. No minarets are allowed, and nothing but bare walls ornament the place of prayer.

12. The Spanish renegade, Ali Bey, details another interesting point of difference. Moslems are accustomed to leave a lock of hair on the crown of their head when shaving it. As this is based on a superstitious belief that they will be caught up by this lock of hair to heaven on the last day, Abd ul Wahab forbade the practice sternly.

13. The Wahābīs lay great stress on the doctrine of *jihād*. To fight for the faith once delivered with sword and spear and matchlock was to them a divinely imposed duty and a command of God never to be abrogated. In all their bloody warfare they never were known to grant quarter to a Turk (Burckhardt). They keep this precept of their

prophet diligently, "Kill the unbelievers wherever ye find them."

Other points of difference there are of less importance, and some of such trivial character as to be ridiculous. But enough have been enumerated to show that the Wahābīs are not altogether like "orthodox" Moslems. It is scarcely evident from these teachings why some European writers have called the Wahābī movement the Eastern Reformation. It did indeed resemble the Reformation under Luther in three respects. It was iconoclastic and waged war against every form of saint-worship. It acknowledged the right of private judgment and demanded a return to primitive beliefs. It was fruitful in results beyond its own horizon. "Just as the Lutheran Reformation in Europe, although it failed to convert the Christian Church, caused its real reform, so Wahābīism has produced a real desire for reform, if not reform itself, in Mussulmans. Islam is no longer asleep, and were another and a wiser Abd ul Wahab to appear, not as a heretic, but in the body of the orthodox sect, he might play the part of Loyola or Borromeo with success" (Blunt's *Future of Islam*).

But in spite of these points of resemblance the Wahābī movement differed utterly from the Reformation in that it was from the outset antagonistic to modern thought and the progress of civilization. It was an advance backward and progress toward an *impasse*. Luther emancipated the intellect; Abd ul Wahab enchained it, even though he gave it the right to think. The European Reformation was accompanied by a revival of learning. The Arabian reformation was a retrogression to "the time of ignorance." The one used the "Sword of the Spirit," the other the sword of steel. The one was eminently practical, the other fanatical. And above and beyond all this, the results of the Lutheran Reformation were incalculably greater and more blessed than the efforts at reform made by the Arabian Moslems.

Before we dismiss this division of our subject, a few words regarding the character of the Wahābī government are necessary. Their ideal state was founded on the old method of the Koran and the sword. In not passing over this element of Islam they were truly consistent with the teaching and example of their prophet. This we have already referred to in enumerating their teachings, but it is worthy of emphasis, and therefore we repeat it. The Wahābīs believed in *jihad*. Modern apologists for Islam try

to eliminate all idea of warfare or killing from this word,* but the Wahābīs knew Arabic better and understood the spirit of their prophet and his book perfectly.

We have already seen in our sketch of the Saood dynasty how vigorously they used the sword in Arabia to found their new state. Once firmly established, the Wahābī rule was after all an improvement on the lawless state of nomad Arabia previous to this. Palgrave never writes in a friendly way concerning these Arabian Puritans, but even his remarks sum up the fact "that the Wahābī empire is a compact and well-organized government where centralization is fully understood and effectually carried out," although "the mainsprings and connecting links are force and fanaticism." And he who has read the pages of Burckhardt will hardly agree that Palgrave is just in saying that "the order and calm which the Wahābīs sometimes spread over the lands of their conquest are described in the oft-cited *Ubi solitudinem faciunt pacem appellant* of the Roman annalist." Saood, the founder of the Wahābī state, was a great man. Though at the head of a powerful military government, he appears never (outside the laws of religion) to have encroached upon the legitimate freedom of his subjects. The great principle of separating the judicial from the executive branch of government he understood not only, but faithfully carried out. The Wahābī judges were noteworthy for their impartiality; they were so well paid from the public treasury that they did not need bribes for bread. Robbery and theft were everywhere suppressed, and vengeance was swift on every transgressor. "The people lay down to sleep at night with no fear that their cattle would be stolen in the morning; and a single merchant with his camel load of merchandise could travel in safety from the Persian Gulf to the Red Sea" (Clark's *The Arabs and the Turks*, p. 294). To-day even a well armed caravan dares to travel only by daylight through Turkish

* T. W. Arnold, in his *Preaching of Islam*, is the latest to attempt this impossibility. Following the lead of Manlavi Cheragh Ali (Calcutta, 1885), he tries to show that all the wars of Mohammed were defensive, and that aggressive war or compulsory conversion is not allowed in the Koran. He gives all the passages in which the word *jihad* occurs and carefully omits the passages where *katala* (to kill) is used to enjoin the same duty. It is a sorry attempt to prove that which is contradicted not only by all Arabic lexicographers, but by the history of Islam from the days of Bedr to the late Armenian massacres. Not to speak of the interpretation given of *jihad* by Abd ul Wahab and his fiery warriors, who professed primitive Islam.

Hassa and Yemen. The Wahābî state strictly enforced the Koran precept concerning the duty of military service. The strictest police regulations were observed in camp; after the surrender of Mecca soldiers were seen running about with lost articles seeking for their owners! Public education had no mean place in the Wahābî state. Schools were everywhere established and teachers sent even to the Bedouin tribes; although, as a matter of course, the instruction was elementary, its widespread results are yet apparent in many districts of Central Arabia. The Wahābî government also endeavoured to improve the status of Bedouin society by abolishing the system of blood-revenge and tried to make the Arabs content with a money payment for the blood of a relation. The right of *dukheil* or refuge was abolished in every case where it might be used to screen a criminal from the hand of justice. Wealthy individuals and those in moderate circumstances paid proportionately in the taxes, and the Wahābî state is perhaps the only Oriental despotism that ever granted security to the rich from the rapacity of government (Burckhardt, p. 142). Many of the Wahābî laws are given by Burckhardt in detail, but they are all founded upon the early practice of the prophet and the caliphs, and consist of a list of graded penalties for various crimes against God and the state. The revenue for the public exchequer was derived from four sources. First, according to the old law of Mohammed, one-fifth of all the booty taken from heretics belonged to the state. Second, the tribute or legal alms (سك), amounting to one-tenth, or in some cases one-twentieth, of land income and $2\frac{1}{2}$ per cent. on merchant profit. Third, proceeds of government lands, and lands, flocks, etc., wrested from rebellious Arabs. And, lastly, fines levied for trespass against the law. The revenue during the reign of Saood II must have been enormous. Some Mecca merchants estimated the total at two million Arabian dollars annually, which is a sum beyond the ken of the half-starved Bedouin in the Arab waste.

All of the above particulars refer to the Wahābî state when in its glory. We have seen how it fell into decay. Yet, although the great hall of justice at Riadh has fallen into ruins, and the Saood dynasty is for ever at an end, the idea of a purely Moslem state founded on the sword lived on; and it will always continue the inspiration of every restless fanatic who desires power for himself by reforming Islam and butchering unbelievers.

III. PRESENT CONDITION AND INFLUENCE.—Our knowledge of the exact numbers and condition of the Wahābī sect is necessarily imperfect, and that for two reasons. Their old centres of power in Arabia have not been visited by European travellers for the last twenty years, and statistics of population are mere guesswork for all of the countries where there is no European government. Secondly, in India, where otherwise statistics would be valuable, the name of Wahābī received such a bad odour at the time of their *jihad* on the Sikhs, and in other frontier rebellions, that adherents of the sect have adopted other names to conceal their creed. According to the report of the census of India (1881, Vol. I, p. 27), Wahābīs are found to some extent in every part of India; they are most numerous in the Patna district, and in the city of Umballa alone, according to Hubert Jansen, there are over 6,000 Wahābīs. Yet the census of 1881 gives the total Wahābī population of all India as only 9,296! It seems to be the fact that not only are the Wahābīs of India to some extent followers of Ibn Hanbal,* but that even in Arabia they no longer call themselves by their old name. I have just spoken with a Wahābī from Deraiah whom I met in the bazaar at Moharrek. He emphatically denied that the Wahābīs were a sect at all, and said that he was a Sunnite of the Hanbali school, *but followed the teaching of the great reformer Abd ul Wahab!* Even the author of our MSS. on the Wahābī faith calls himself a Hanbali (see List of Authorities, p. 329). If this view has become general, it is evident that statistics of the Wahābīs are out of question.

According to Arnold (*Preaching of Salem*, p. 230), the remarkable revival of the Moslem faith in Bengal was due to Wahābī influence. "Nineteen years ago in Bengal proper Hindus numbered nearly half a million more than Moslems did, and in the space of less than two decades, the Moslems have not only overtaken the Hindus, but have surpassed them by a million and a half."

In Arabia the chief strongholds of the Wahābīs are along the Oman coast of the Persian Gulf, especially Sharka, Abu

* The Imam Ahmed bin Hanbal, founder of the fourth orthodox sect of Sunnis, was born at Bagdad A.D. 780. He died A.D. 855, and such was his reputed sanctity that 860,000 people are said to have attended his funeral, and on the same day 20,000 Jews and Christians embraced Islam. His teaching was not different in any important matter from the other sects, only more austere in its morals. (*Cf. Hughes's Dict. of Islam.*)

Thabi and Rus el Kheyma. Also in 'Ajman and the Wady Dowasir district. In the latter place, according to Doughty, they still preserve all their old-time beliefs and fanaticism, so as to be a proverb among the Arabs. In the rest of Arabia their numbers have greatly diminished, their zeal has waxed cold, and many of the precepts of their leader are disregarded. Western life (through trade and passing caravans of pilgrims) has reached even here with its urbane influence. Many of the Wahābis have again begun to smoke "the shameful" and wear silk head-dress; for Epicureanism was ever more congenial to the Arab mind than Puritanism. The Nejd, which was once a stronghold of Wahābī doctrine, now harbours even Shiāhs, and the government is, in a Moslem sense, liberal. Hassa and Bahrein once had hundreds of Wahābī mosques, but most of them have passed into the hands of other sects for want of worshippers.

Most remarkable is the story of Wahābī missionary zeal in the Sudan under Sheikh Othman Donfodio, as told by Arnold. Making a pilgrimage to Mecca at the time of the Wahābī occupation, this man was converted to their views and returned to the Sudan to inaugurate reform. He united the scattered clans of the Fulahs into one Moslem army and marched against the heathen tribes of Hausa. He also sent letters (*à la* Mohammed) to the kings of Timbuctu and Bornu commanding them to reform their lives or receive the punishment of Allah at his hands. The army enforced his demands, and Sokoto became the capital of a Moslem state. In 1837 Adaman was founded on the ruins of several pagan settlements. To-day the most zealous propagandists of Islam are the Fulah missionaries.*

In Egypt and Turkey the number of Wahābis is not large. In Persia, as far as I can learn, there is only one place where they are found—a small colony of Arabs from Nejd live north of Lingah, on the Persian Gulf. Central Asia (with the exception of parts of Afghanistan) and China were never much influenced by the Wahābī reform.

As an indirect result of the Wahābī movement we may count many of the Moslem brotherhoods, or the so-called religious orders of Islam. The Sanusiyah Dervishes especially seem to have borrowed many of their distinctive

* See also S. W. Koelle's *Polyglotta Africana*, p. 18. (London, 1854.)

marks from the Wahābīs. With them, too, tobacco is strictly forbidden; they prohibit pilgrimage to the tombs of saints; luxuries of dress are forbidden, and the war against infidels is a duty; intercourse with Jews or Christians is not permitted, and the ideal state is one of Moslems only. This Sanusiyah order is very numerous and powerful from Morocco to the Malay Archipelago. Its secret agents are everywhere. At Mecca they have a strong branch and twelve other centres of power in other parts of Asia.*

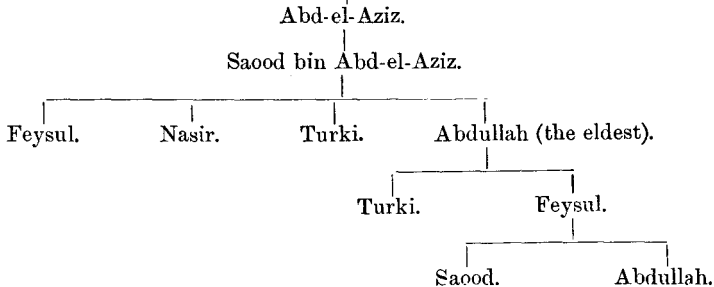
In conclusion, what is the relation of the Wahābī reformation and its results to Christian missions among Moslems? The most unfavourable result has been in Arabia itself, by practically building a wall of fanaticism around the old Wahābī state, and postponing the opening of doors to commerce and Christianity in that part of the peninsula. On the other hand, the positive and negative results of the Wahābī movement on Moslem thought have, I think, had favourable effect on Christian missions. Islam in its primitive state is nearer the truth than Islam with all its added superstitions and additions of later date. The Koran can more easily be made our ally in the battle for the Gospel than the interpretations of the four Imams. According to Hughes, "the Christian doctrines of the Trinity and the Sonship of Christ do not present the same difficulties to the mind of a Wahābī which they do to that of a Sunni."

Negatively, Wahābiism is a strong argument that Islam, *even when reformed to its original purity*, has no power to save a people. There is no better polemic against Islam than a presentation of the present intellectual, social, and moral condition of Arabia. Cradled at Mecca, fostered at Medina, and reformed at Deraiah, the creed of Islam has had undisputed possession of the entire peninsula almost since its birth. In other lands, such as Syria and Egypt, it remained in contact with a corrupt form of Christianity, or, as in India and China, in conflict with cultured paganism, and there is no doubt that in both cases there were (and are to-day) mutual concessions and influences. But in its native Arabian soil the tree planted by the prophet has grown with wild freedom, and brought forth fruit after its kind. "By their fruits ye shall know them" is Christ's criterion in the study of comparative religions. As regards morality, Arabia is on

* See an article on the Religious Orders of Islam in the *Indian Witness*, March 11th, 1898, by Rev. E. Sell, B.D., M.R.A.S.

a low plane. Slavery and concubinage exists everywhere; polygamy and divorce are common. The conscience is petrified; legality is the highest form of worship; virtue is to be like the prophet. The Arabic language has no everyday word for conscience, and the present book-term does not even occur in the Koran. Intellectually, there has been little progress since "the time of ignorance," when all the tribes gathered at Okatz to compete in poetry and eloquence. The Bedouins are all illiterate; their only writing is the brand-mark on camels. Book-learning in the towns is compressed into the narrow mould of Koran philosophy. Kufa, which was once the Oxford of Arabia, now has one day-school with twelve pupils! Fatalism, the philosophy of the masses, has paralysed progress. Hope perishes under the weight of this iron bondage. Injustice is stoically accepted. The bulk of the people are passive. No man bears another's burden, and there is no public spirit. Treachery and murder are the steps to petty thrones in free Arabia, and in the Turkish provinces justice is sold to the highest bidder. Cruelty is common. Lying is a fine art, and robbery a science. Islam and the Wahābīs have made the hospitable Arabs hostile to Christians and wary of strangers. Over all this hangs a cloak of self-righteousness and formal observances. There is no soporific like the Koran; nothing so well designed to hush all the heart's questionings as a religion that denies the need of an atonement, and promises Paradise to those who accept the *creed* of eight words, no matter what their life may be. There is no hope for Arabia in Islam. It has been tried for thirteen hundred years, and piteously failed. The Wahābīs and their history only emphasize this fact.

GENEALOGICAL TABLE OF THE SAOOD FAMILY.
 MOHAMMED BIN SAOOD + *Daughter of Mohammed
 bin Abd ul Wahab.*



LENGTH OF REIGN.

MOHAMMED BIN SAOOD	....	1740-1765	A.D.
Abd-el-Aziz....	....	1765-1803	A.D.
Saood II	....	1803-1814	A.D.
Abdullah	....	1814-1818	A.D.
Turki	....	1820-1832	A.D.
Feysul	....	1832-1866	A.D.
{ Abdullah	....	1866-1867	A.D.
{ Saood	....	1867-1874	A.D.

CHRONOLOGY OF THE WAHĀBĪ DYNASTY.

1691. Mohammed bin Abd ul Wahab, born at Wasit, Nejd.
1731. Mohammed bin Abd ul Wahab begins to preach reform.
1740. Mohammed bin Abd ul Wahab takes refuge at Deriah with the powerful Arab chief Mohammed bin Saood.
- 1740-1764. Wahābī reform spreads over all Southern Arabia with the exception of Oman.
1765. Mohammed bin Saood dies; succeeded by Abd-ul-Aziz.
1787. Mohammed bin Abd ul Wahab dies at age of 96 years.
1766. Abd-ul-Aziz assumes the titles of Imam and Sultan and pushes his conquest toward Mecca.
1797. A Turkish army enters Hassa and lays siege to Hofhoof, but is compelled to retire.
1801. The Wahābīs invade the vilayet of Bagdad and lay siege to Kerbela, taking and sacking the town.
1802. Taif, near Mecca, subdued with great bloodshed.
1803. April 27. Mecca taken by the Wahābīs; the Shereef Ghalib flees to Jiddah.
1803. Abd-el-Aziz assassinated by a Persian in the mosque at Deriah.
1804. Saood II succeeds his father Abd-el-Aziz and conquers Medinah.
1810. British expedition against Wahābī pirates of Oman.
1811. Mohammed Ali Pasha, governor of Egypt, begins his campaign against the Wahābīs, landing troops at Jiddah.
1812. The Egyptian army under Tousson Beg takes Yenbo.
1813. Jiddah treacherously surrendered to the Turks.
1814. Saood II died at Deriah; succeeded by his son Abdullah.

1815. Battle of Bessel; Wahābis defeated.
1816. Ibrahim Pasha lands at Yenbo to continue war.
1818. Ibrahim Pasha after a siege of five months takes Deriah, the Wahābi capital, and demolishes it; Abdullah executed at Constantinople, December 19th.
1819. Second English expedition against pirate Wahābis.
1820. Turki, the younger son of Abdullah, raises the Wahābi standard in revolt against the Turks.
1821. Riadh becomes the new capital.
1826. Wahābi Jihad under Seyyid Ahmed in Northern India against the Sikhs.
1832. Feysul, brother of Turki, succeeds to the sultanate.
1842. Khursid Pasha, the last representative of Egyptian rule, compelled to quit his frontier residence at Kaseem; Asir returns to independence and Wahābīsm.
1863. Palgrave visits Feysul at his capital.
1865. Sir Lewis Pelly visits Feysul.
- 1866 [?]. Feysul assassinated. His two sons, Saood and Abdullah, rival claimants for the rulership.
1868. Saood battles with the Ateyba tribe and loses heavily. He returns to Riadh. But the Wahābi power is broken. The Shammar dynasty of Ibn Rashid becomes paramount in all Central Arabia.

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DISCUSSION.

The CHAIRMAN.—Is there any lady or gentleman who would like to make any remarks on the paper that has just been read?

The SECRETARY.—I may mention that the author of this paper is a Christian missionary in the Persian Gulf. He has written this paper and sent it to us, having a great knowledge of the subject and having actual contact with these various Mohammedan sects, and I think we are much indebted to him for this voluminous statement of the history of the Wahābis.

The CHAIRMAN.—I think this is a very interesting account of this Mohammedan sect. They may, it seems to me, be regarded as Puritans in their having effected a certain amount of reform by their austerity and so forth in regard to the habits of Oriental nations. On this point their fanaticism is probably even more pronounced than that of the true Mohammedans.

I went last Wednesday and heard Professor Margoliouth comparing the Bible with other religious books; and in the course of his remarks he spoke of the Mohammedans and their book, the Koran, and one of the things he pointed out, which seemed to me to be a very sensible and just remark to make, was that in Mohammedanism there is this one thing, which was also the case in certain other sects, that the religion seems to have been instituted for the glorification of one man, viz., Mohammed. Christianity, on the other hand, and in fact the writers of the books of the Bible in general, cannot be said by any means to have gained

in a worldly way, or in any unworthy way, by the religion which they put forward, and which we believe to be the true one.

Rev. G. F. WHIDBORNE, M.A., etc.—I suppose this paper was written last year, Mr. Chairman?

The SECRETARY.—Yes.

Rev. G. F. WHIDBORNE.—Because in the fifth line on the first page the author refers to “the middle of the last century,” which looks like an anachronism. I suppose he means the middle of the eighteenth century.

The SECRETARY.—Yes.

Dr. H. W. HUBBARD.—Some years ago I was travelling in the wild districts of North Africa, and I came in contact with a large caravan of pilgrims to Mecca, and amongst them I remember hearing there were Wahābīs, and I chatted with them, but I must tell you that they were in a very low social state. They were not allowed to change their clothes for the term of pilgrimage. I was afraid at first to go amongst them. I went over with Colonel Pakenham from Gibraltar to North Africa. They were very lightly clothed. It was very hot weather, and they only had vessels containing water made out of bullocks’ skins; each I do not suppose contained more than two or three gallons of water. Every man had a skin of water, his only possession, and they were not allowed to wash until they arrived at Mecca. We bought two or three daggers and some steel beads of them; so they were inclined to be sociable and were very peaceable.

The SECRETARY.—I should like to mention, Mr. Chairman, that although I have not been in Mecca myself, I have been not very far from it. I was associated with an expedition to the Arabian Peninsula, and when we were encamped at Akabah we were startled, one day, by an extraordinary noise of drums and loud shouting, and on looking out from our tents we saw a large party of pilgrims just returning from Mecca. We did not feel very comfortable, for they were known not to be celebrated for their extreme honesty, or even for leaving the property of the native Arabs of the district untouched when they were found in a sufficiently helpless condition not to resist. The condition of Mecca, the shrine of these pilgrims, appears by all accounts to be deplorable.

I think we may consider that Mohammedanism is the greatest impediment on the face of the globe to progress of any kind,

either religious, moral, social, or intellectual. The only advantage it has been to the world is that it is a monotheistic religion. "There is one God and Mohammed is His prophet." That is something that we owe to Mohammedanism, and it is that which gives to it a great force against idolatry of all kinds—in fact, it has been believed to have been a scourge sent by God to purge idolatrous Christendom as well as other idolatrous peoples; but the state of it, morally, socially, and intellectually, is most deplorable; and it is generally supposed that cholera, which is the annual scourge of Egypt and other Eastern countries, has its source in Mecca, where thousands of pilgrims from Northern Africa assemble every year, and where the sanitary arrangements are absolutely *nil*. The wells are choked with filth; and is it any wonder that it is the centre and seat of perpetual cholera and plagues, such as arise from filth and insanitary conditions? This is the state in which uncontrolled Mohammedanism has left these countries; and it would be the greatest blessing to society in that part of the world if the Christian countries (including Egypt under its present *régime*) were to combine and say that these pilgrimages have been going on too long; they are a danger to society and ought to be put down with a strong hand.

Mr. MARTIN L. ROUSE.—I quite agree with Professor Hull that these pilgrimages ought to be put down. Three or four years ago there was such a terrible outbreak of cholera at Mecca, and such a vast number of pilgrims died there, that the corpses tainted the air too terribly for anyone to dare go near to bury them. The people went on dying and poisoning one another until a large body of Turkish soldiery was sent and compelled to bury the dead.

I think it is a very remarkable fact that whereas Christianity is taunted by sceptics with having split itself up into so many sects, we find just the same process of the human mind going on in the false religion of Mohammed; for here we are told that in the eighteenth century "over one hundred and fifty heretical Moslem sects are enumerated by writers of that period." Again, whereas it is charged against the denominations of Christianity, falsely, save in the case of the Roman Catholics, that they all think that their own sect alone can be saved, it is here stated that one of the traditional sayings of Mohammed authenticated by the Wahābis was, "My people will be divided into seventy-three sects, every one of which will go to hell except one sect." And

this sect the Wahābīs thought was their own, by the name they actually used in India—"The Sect of the Converted."

The SECRETARY.—I thought that was a quotation from Mohammed himself.

Mr. ROUSE.—Yes ; a traditional quotation.

Another remarkable thing is that just as Christianity became corrupted by getting into high places, and men of rank and wealth were admitted into it, whether they were truly converted persons or not, and many lesser divinities were worshipped in the shape of saints, so was it with Mohammedanism ; for we find that the Wahābīs protested against the worship of holy men who had long previously had shrines erected to them. And lastly we find that that particular mechanical instrument of prayer, the rosary, which Roman Catholics took to many years ago, is declared by this writer to have been adopted from Mohammedans, who in turn got it from the Buddhists. I can testify to the fact that the Buddhists use it, and "holy water" also, from personal observation among a caravan of Buddhist Kuhnucks.

[A vote of thanks has been proposed to the author and duly carried. The meeting adjourned.]

ORDINARY GENERAL MEETING.*

EDWARD S. M. PEROWNE, ESQ., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following elections took place :—

MEMBERS :—Edmund C. P. Hull, Esq., J.P., Surrey ; Ernest Romney Matthews, Esq., C.E., F.G.S., Bridlington.

The following paper was read by the Author :—

THE ARAB IMMIGRATION INTO SOUTH-EAST MADAGASCAR. By Rev. GEORGE A. SHAW, F.Z.S.

THE SACRED BOOKS, CUSTOMS, AND TRADITIONS OF THE
TAIMORO TRIBE.

WHILE all writers on the ethnology of Madagascar are fairly in accord as to the origin of the principal tribes, the Hóva and Bétsiléó, the proximity of Africa has always caused an element of uncertainty to creep into the mind regarding the source from which the many darker-skinned tribes have sprung. Many contend that the coast tribes, the Sàkalàva on the one coast, and the Bétsimisàraka on the other, have a decidedly African cast of feature and formation of cranium ; and this has apparently been borne out by measurements and investigations made by Dr. Hildebrandt in the somewhat limited tract of country through which he travelled. But against this has to be put the fact, that the more perfectly the island is explored, the more convinced are those who are in a position to give an opinion of any value, that the language of the various tribes is one and the same, and that the many varieties in pronunciation and syntax are simply dialectic, and do not represent radically different languages. That an African element is present in the island no one can deny, but it has

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never been strong enough to materially influence the social distinctions; nor has there yet been discovered any tribe which is so completely African, either in language or physique, as to leave no doubt in the minds of those who have studied them closely as to this theory of their western origin.

But, strange to say, while the African element has been merged completely into the other tribes, because of the small amount of immigration, and this mostly of slaves, and so wanting the power to make their individuality felt as a separate and distinct community, the Arab is a powerful and unique factor in Malagasy sociology. His influence has been felt in the language strongly enough to dictate the names for the days of the week, the months, and, where such exist, the names of the years, not to mention other words unmistakably Arabic in origin.* He has been, and still is in a more limited degree, the importer of slave labour into the island, his form of boat being the most common in such places as are inhabited by those bold and daring enough to venture out to sea. He has been met with in many outlying and unfrequented spots settled down as a trader, thriving upon the dulness and inertness of the coast tribes, and

* Days of the week :—

Sunday	...	Alahady	...	Al-âhadu.
Monday	...	Alatsinainy	...	Al-itznâni.
Tuesday	...	Talata	...	Atz-tzâlatzatù (El-t'lâte) Mod-Ar.
Wednesday	...	Alarobia	...	Al-arbâ'atu.
Thursday	...	Alakamisý	...	Al-chamisú.
Friday	...	Zoma	...	Al-dschum'atu.
Saturday	...	Asabotsy	...	As-sâbtu.

Months of the year, derived from the names of the constellation of the Zodiac :—

Mr. Dahle's identifications.

1.	Alahamady	...	Al-hamalu = Aries.
2.	Adaoro	...	Atz-tzauru = Taurus.
3.	Adizaoza	...	Al-dshehanza'u = Gemini.
4.	Asorotany	...	As-saratanu = Cancer.
5.	Alahasaty	...	Al-asadu = Leo major.
6.	Asombola	...	As-sunbulu = Spica in Virgo.
7.	Adimizana	...	Al-mizanu = Libra.
8.	Alakarabo	...	Al-aqrabu = Scorpio.
9.	Alakaosy	...	Al-gausu = Arcus and Sagittarius.
10.	Adijady	...	Al-dshehadiu = Capricornus.
11.	Adalo	...	Ad-dalvu = Aquarius.
12.	Alohotsy	...	Al-hutu = Pisces.

flourishing by his superior knowledge and acuteness, not to mention his superabundant cupidity. And in the district watered by the River Mâtitanana, in the south-east, he has maintained an independence of, and isolation from, other tribes, while he has developed into a large and powerful community, with traditions, laws, and sympathies distinctly Arabic.

This tribe, called the Taimòro,* from their first settlement *amòrona* ("on the banks of") the Mâtitanana, has a history, with customs and traditions that make them peculiarly interesting to the foreigner; and their influence, from causes that will be explained later on, is widespread and powerful among the neighbouring tribes.

The Taimoro at the present day occupy that political division of the country which is under the Governor of Vóhipèno, extending from Andákana in the south to Tapólo in the north. It is bounded on the west by the River Rianánana (a tributary of the Mâtitanana), and stretches as far as Békàtra on the north-west, beyond which is the country of the Tanàla and Tambódihárana, as the various sub-tribes occupying the mountainous slopes of the tableland are called by the coast people. Portions of other tribes are to be found within this boundary, but they are the descendants of those who have come as visitors, in the first instance, or of families that have been driven into this country, as a refuge from enemies, in some of the intertribal wars. In this way the small communities of Taifàsy, Záfisòro, and Bètsimisàraka within the province of the Taimoro are to be accounted for. These have in the course of years or generations acquired ricefields and plantations, grazing lands and villages, entirely distinct and independent of the Taimoro, and acknowledging no fealty to the Taimoro chiefs.

The Taimoro proper are divided into several sub-tribes or sections, each being apparently the descendants of the individual leaders of the original immigration, and of their slaves or dependents; the former section being called the Mpànombily or Tómpoménakèly, and the latter the Mènakèly or common people.

* Various spelt Taimora, Teimoro, Ntemoro, Antemoro, Antaimoro, and Taimorona, the most common pronunciation being as in the first and the last forms. Literally, the words mean, "There by the side," or "On the banks."

The Mpanombily, the chiefs or lords of the manor and descendants of the old kings, are subdivided into:—

(a) Anakàra. (b) Taiòny or Antsiòny. (c) Talaotra or Antalaotra (this, which is the name applied by the Malagasy generally to the Arabs proper, is a name assumed by all the Tompomenakely occasionally). (d) Taisambo. (e) Taitsimaito. (f) Taimahàzo.

The Menakely are divided into castes or sub-tribes as follows:—

(a) Onjatsy; these are said to have originally come from the north, when the tribe settled in the neighbourhood of Mâtitanana. On their arrival, they had the office of Mpanombily, but afterwards the dignity passed from them, because, when called upon to officiate, that is, to kill the cattle or fowls, etc., for the people, they put the tribe to all kinds of inconvenience, and the animals sometimes to unnecessary hardship or torture, by going about their own private work before attending to the duties of their office. (b) Taimainty; the fishermen, those who fished with nets. (c) Taimanàja or Antrémanàja; these are said by some to have been the first arrivals in Mâtitanana; they are the potters. (d) Taibé or Anteibé. (e) Taimasiry. (f) Taivo-hitrindy. (g) Zànateràna; people conquered by the Zafisoro, and given land in this district. (h) Taimanasàra. (i) Taivato; these were originally from the south, where there is still a large tribe of this name; they are doubtless not pure Taimoro, but one of the immigrant tribes. (j) Taitsimatra. (k) Tambàhivè. (l) Taimànanàno. (m) Tailàvakàra.

These names represent simply the largest divisions of the tribe, many of them being derived from the districts they inhabit, or else the districts have received their titles from the name of these sub-tribes; the former I think the most probable. Of them all, the Talaotra appear not only to be the most interesting, but also to have an authority or influence arising from the superstitious reverence for their ancestry accorded to them by the other tribes.

Very little and but uncertain tradition exists among most of the different tribes in Madagascar as to their origin; and even the direction from which their ancestors came is so uncertain that some of the tribes say their forefathers came from the east, and some that they came from the west; and so contradictory are the traditions on this subject, that no reliance can be placed on any account. But all this is other-

wise with the Taimoro, where, although much of their so-called history bears the impress of a folk-lore tale, yet there is no uncertainty in the minds of the people as to their origin; and the accounts I have heard in different sections of the tribe correspond in a remarkable degree. All agree in certain particulars: that their ancestors emigrated from Arabia; that they inhabited a district near Mecca; and that, living in troublous times, they were driven out of their country by enemies.* The usually accepted account of this emigration, which, as I have said, savours strongly of a folk-lore tale, is as follows:—

One day a girl had left the town to fetch water and, while at the well, was surprised and captured by the enemy's scouts, who took her as spoil. (Hereditary enemies are indicated here, not that any war had been declared, or any quarrel existed.) She asked them the object of their visit, and what they were in search of, to which they replied—

“We have come with the intention of making war on this town, so tell us where the road is by which we can enter the town and overcome its defenders.”

“No!” she said, “I will not tell you. You may kill me or torture me, but I will not show you now.”

They threatened her and cajoled her, but all to no purpose. At last she said:

“If you go up to fight against this town with sword or spear, you will not overcome it; but return whence you came, and I will there tell you how you may become masters of the place.”

So they returned and carried this captive maid with them. And when called upon, this was her counsel:—

“Collect together a great number of dogs, take them with you, surround the town, and urge on the dogs to the walls, and you will find that it will be easy to take the town without any fighting.”

* It is known that several tribes of Arabs, as for instance the Emosais, were in the disturbed time of the eighth century obliged to leave Arabia and seek a new home across the sea. And as Arab traders had found their way down the east coast of Africa and to some of the adjacent islands, there is little doubt that they ventured across the Mozambique Channel, and finding such a fertile land as is presented by the south-east of Madagascar, would eventually make it a home. The historian Masadi, who lived in the tenth century, speaks of an expedition to Cambalu, which, as they started from the neighbourhood of Mozambique, was doubtless Madagascar.

The people were divided for a long time as to what to do, whether to act according to the girl's advice, or not. And when they decided to act as she had said, a difference arose as to the disposal of the maid. Some were for killing her as an incumbrance, others were for sparing her; but at last they agreed to let her live. They caught the dogs, took them with them, surrounded the walls, and urged on the dogs. The inhabitants were so frightened at the unwonted noise and curious on-rush, that they lost their wits. Some threw themselves into the sea; some got into canoes and made off; while the remainder fell panic-stricken into the hands of the enemy. Those who escaped in the canoes were the ancestors of the Talaotra, who made their way to the Mâtitanana. It is because of this incident, or supposed incident, that the dog is a tabooed animal with the Talaotra.*

The sub-tribes represented by those in the canoe were the Anakara, Taiony, Taitsimaito, and Taivândrika. The king who was at the head of the expedition was Andriamàrohàla. But it ought to be mentioned that the Taimoro use the word "king" in a very broad sense, and in the use of the name make no distinction between an hereditary king, an elected tribal chief, or a leader or commander chosen for a single expedition. I may mention, by way of illustrating the broad signification of this word, an incident that came under my notice a short time ago. In the course of an itinerating journey, I met a small company of our school-children enjoying a holiday at Nòsikély, a village some hours' journey from their home. They had made up a party for a few days, and had taken a house for themselves; and when I asked them who had accompanied them to take care of them and see to their food, they told me that before starting they had chosen one of their number, the biggest boy, about 13 years of age as "king," and they did as he commanded them, and he was

* In connection with this subject, it may be mentioned that even now, if a dog rubs against one of these people, it renders that person unclean. He must go immediately to the river and bathe, and whatever clothes he is wearing next the skin are thrown away, or given to the slaves. If by chance a dog jumps over or passes over the rice, when it is spread in the sun to dry previously to being husked, it is at once thrown away, r given to the slaves. But intercourse with the Hova and other tribes is gradually lessening the hold which these and other customs and *fady* have upon the Taimoro.

responsible to their parents for their well-being. There are very few *children* in Madagascar out of their mothers' arms.

To return to the fugitives in the canoes. After they had started, it is said that there were so many, that they were afraid the canoes would be swamped. But they struggled on, hoping to reach safety; but at last, owing to the weather and darkness, fear took possession of them; a hasty united council was held, and a suggestion was made that all the children should be thrown overboard. A good deal of excitement seems to have arisen on this suggestion; but eventually they agreed to throw away the children, sacrificing them to the general good. This was, on the part of some, not made in good faith, for although the Taivandrika threw overboard their children, all the others simply made a feint of doing so, or dropped stones into the water, so that when they came to land, it was found that although the children of the Taivandrika were all lost, the children of the others were still there. This account is said to be the origin of the proverbial saying among those in the Mâtitanana district: "Taivandrika crossing by canoe."

When the Taivandrika discovered how they had been imposed on, they were filled with wrath, and cursed and reviled those who had come with them; and the curse or imprecation they are said to have used is employed still by their descendants when vexed with any of the other tribes. Their curses, however, seem to have rebounded on their own heads, for the Taivandrika are a scattered and wandering people, having no settled territory, and spread over the country of the other tribes. They are also very few in number.

These fugitives in the canoes are said to have landed at a part of the coast near to the spot now occupied by Vangaindrano, in the south; but after making acquaintance with the country and the inhabitants, they said: "We are not able to remain here, for although the country is pleasant and fruitful, yet the people love war; their spears are in constant use, and we shall find no secure place for our wives and children. Let us leave this part at once." Hence they again embarked, and making their way along the coast northward, eventually landed at Mâtitanana.

As there were many more men in the expedition than women, they asked for wives from the Onjatsy, who live a short distance up the Mâtitanana, on the south bank. But

doubtless through fear, the Onjatsy not only would not agree, but in order to frighten them from the district, told them that, among other dangers that awaited them, there was a monster which lived in the river Matitanana, a man-eating creature, that would eventually destroy them all. In no way disconcerted, the Talaotra, the new-comers, got a bullock and poisoned it—filling it with poison, the account says—and then threw it into the river. The creature ate the carcase and died, the new-comers gaining thereby security for themselves and a certain respect from the Onjatsy, who admired their cleverness, and acknowledged their superior skill and learning, as shown by their possession of some powerful drug or charm unknown to themselves.

Irotra, a spot about three miles from the mouth of the Matitanana, on the north bank of the river, was the first settlement of these people; and there councils were held with a view to the future disposal of the families. It was agreed that the king should live at a place now occupied by the town of Ivato, in a central position in relation to the other families; the Anakara were to pass to the west, and the Taitsimaito to remain on the east. "For," said they, "the Anakara are so much given to cursing and quarrelling, that we cannot have them on the east of the king; so let them go away to the west, to be easily seen, being between us and the sun." Notwithstanding this division, Andriamarohala never lived at Ivato, but made his home at Ambôabé, when he and his family removed from Irotra. There he lived and died, and is buried in the wood, a little to the south of Mr. Desjardin's trading-post.

Such is the generally accepted account of the immigration of the Talaotra. It doubtless contains a modicum of truth, but around a central fact is woven such a mass of improbability, that its value as authentic history is very much lessened. Beside which, it only accounts for one or two branches of the tribe; and the narrative admits the presence of the Onjatsy, from whom wives were sought for by the immigrants; and the Onjatsy are not only equally allied with the Talaotra, Anakara, and Taitsimaito to the Arabs, but have the honour of being the custodians of one of the only two remaining original copies of their sacred book. Hence it is difficult to say whether the immigration spoken of is really the original immigration of the Arab race, or only that of a part, a former company having landed and settled in the same part of the country. Onjatsy is also the name of a

town on the south bank of the Mâtitanana, about two miles from the mouth of the river.

The people at any rate showed a considerable amount of acuteness in their choice of territory, for the district of Mâtitanana must be one of the richest, from an agricultural point of view, in this remarkably fertile island. Well watered by the Mâtitanana river, the many tributaries of which flow through an extensive and gently undulating country containing about 600 square miles, and also by the Mânanano river, to the north, not to mention the many small streams which flow into the sea or the lagoons along the coast, there is every facility for rice-growing, one of the most extensive and lucrative employments of the people. Very little of the engineering skill exhibited by the Betsileo in the formation of their rice plantations is required here. The low plains are easily flooded with water, and nothing more is required than little banks to mark the boundaries of each man's possession, and to assist in confining the water necessary for the growth of the rice-plant. The soil is alluvial, and is constantly added to and enriched by the frequent overflowings of the rivers. Even the higher lands are so fertile that a lazy style of cultivation has become the custom. Little if any attempt at manuring is adopted; the ground is simply weeded, the weeds burnt, and without any further digging, the beans or earth-nuts or manioc are planted and left until ripe enough to be gathered. The rice-fields are of two kinds: firstly, those planted in June and July, which resemble the fields in the interior of the island. In the preparation of these, the cattle are made to trample the clods of earth which have been roughly turned over by a spade, until, by the united action of their hoofs and the water retained between the little banks already referred to, a soft smooth mud has been produced. Into this the rice is thrown, and when about six or seven inches high, it is thinned out. All the young plants removed in the course of this process are transplanted into other fields similarly prepared. In these respects, the plan adopted by the Taimoro, and that by the people in the interior, differ. Among the Hova and Betsileo, the rice is sown as thickly as possible in a small patch, and the whole is transplanted, when of the requisite size. In the Mâtitanana district it is sown thinly in large plots, and only the superabundance is taken up, the remainder being left *in situ* to ripen.

The other kind of rice-field is made by first burning down

a tract of bush or forest; and then, with a pointed stick, holes are made in the cleared ground, and one or two grains of rice are dropped in each hole. This sowing takes place in January or February, and produces rice having a large and beautifully white grain, but softer and much less nourishing than that grown under water; and although fetching a better price in the market for export, it is less esteemed as a food supply by the natives than the redder grained rice of the marshes.

The productiveness of the soil, assisted by the greater heat and heavier rainfall, is seen in the fact that the manioc, which takes a couple of years at least to come to perfection in Imérina, is ripe in Mâtitanana three months after the slips have been planted.

A plentiful supply of fruit of good quality is produced in the district, and many introduced fruits flourish. Beside the bananas, mangoes, pineapples, and guavas that grow in abundance along the road-sides, grapes, oranges, lemons, and limes, large and luscious, are to be found in several parts of the province, and cocoa-nuts thrive on the coast. The *rofia* palm in the forests, and the *harèfo* rush in the swamps, supply the materials for dress and sleeping mats, while the traveller's-trees, the bamboo, and the pandanus furnish all that is necessary for their unsubstantial houses, and for their plates and spoons.

The rivers abound in fish, and an additional large supply is obtained by the people from the sea, which they navigate in boats of a peculiar construction, which effectually surmount the difficulties of the surf and high rollers, although to an English eye they appear most flimsy and unsafe. The keel is made very deep and long, ending in a high and peculiarly shaped prow, which extends some distance beyond the boat itself. No ribs are used, but the planks, after being bent into the requisite shape by the heat of the sun, are tied in position with withes or creepers. A few thwarts are introduced, also tied into their places; a step is made for a mast; a square sail is formed of plaited rushes or strips of pandanus leaves; and this crazy craft is rendered fit for sea by having its large seams caulked with fibre from the bark of one of the forest trees. The boat, which is about 14 feet long, carries a crew of eight: six men paddle, one steers, and one, whose office is no sinecure, bales out. When a sufficient offing is obtained, the paddlers let down their lines, and the fish caught, generally a fairly good

haul, is divided equally among the eight, as the services of the steersman and baler-out cannot be dispensed with to allow of their fishing. The one must keep the head of the craft to the seas, and unless the other continues his employment a catastrophe would result.

On the extensive prairie land large herds of cattle are kept. These are not, on the average, so good or so large as those in the interior, probably owing to the less nourishing nature of the grass, which is ranker on the coast; and cattle from the interior invariably lose flesh after a short stay on these plains. Sheep and goats do not thrive in the Mâtitanana district, and pigs are *fady* (tabooed). The Taimoro will neither keep pigs nor eat pork, unlike in one respect the Taifasy and other south-east tribes, who, though making it *fady* to keep pigs, do not object to buying pork in the market and eating it, provided some one else has kept the pig, and killed and prepared it for sale.

Although the Taimoro do not reach the great forest to the west of their territory, there are several by no means insignificant forest tracts within the limits of their district, containing many valuable woods: rosewood, ebony, a species of teak (*hîntsy*), and other hard building timber, besides the *nâto*, a red dye-wood, and the *rofia* palm; but no india-rubber is now found in the forests of the Mâtitanana.

There are indications that iron, and perhaps other metals, are to be found in this part of the island, but none are worked. All the iron used by these people is brought already smelted and, generally speaking, manufactured into spades, knives, hatchets, etc., from Betsileo, where a great number of the people make a good living by working iron for the Taimoro market. The country is in places covered with volcanic rock, large quantities of lava protruding from the surface, or lying in boulder-like masses on the hill-sides. No gold has been found, although once or twice I have heard rumours of its existence in some of the rivers; but these have turned out to be incorrect.

Trading-posts have for many years been in existence on this coast; but, like the greater part of the coast-line on the east of Madagascar, it is wanting in harbours. The rivers are all entirely or partially blocked up with sand, and vessels are obliged to anchor at a considerable distance from land and work their cargo by decked lighters, which bring the goods through the surf to the beach, where they are landed by hand and carried up to the traders' warehouses.

The river mouth of the Mâtitanana is fairly wide and deep, and large boats could, it is believed, be worked through into the quiet water of the river, which is here like a large lake; but it is *fady* for any boat to enter. Foreigners would, if they dared, disregard this *fady*, only that as they are dependent upon the natives here for labour, the latter would no doubt take no care of the boat in entering the passage; and then, if any accident occurred, they would simply disclaim all responsibility. The breaking of the *fady* would, in their minds, account for any mishap, and be a just retribution upon the venturesome foreigner in not regarding with reverence, equal to their own, the taboo of the tribe.

The climate of the Taimoro province is hot and damp, the average monthly maximum temperature in the shade of a Stevensen screen being 87° , with an absolute maximum of 102° , and a direct sun-light register of 164° ; the average monthly minimum of the temperature at night for the year being 65° . There can scarcely be said to be a rainy and dry season, except in the sense that heavy thunderstorms are confined to that part of the year corresponding with the rainy season in the interior, from November to April, and that during those months the heaviest rainfall is registered. In February and March the greatest amount of rainfall is registered, amounting in some years from 20 to 24 inches. The annual total rainfall gives over 100 inches. This, with a large preponderance of north-easterly winds, which are warm, and blow along the coast over the lagoons and swamps, render the district very unhealthy both for foreigners and for natives who come from other parts of the country. The flat nature of the country helps the evil, as large swamps, beside the well-known lagoons, exist all along the coast, and in many parts entirely surround the towns. These make fertile rice-plantations, but are hotbeds for the rapid generation of malarial fever, which often assumes a very virulent form on this part of the coast.

Notwithstanding this, the native population is large, indeed it may be said to be dense for Madagascar. I know of no other spot, outside the plain immediately surrounding Antananarivo, where there is a larger population than in the Taimoro valleys. The villages are not only near together, but are above the average in number of houses; while the families of the Taimoro are larger than those of the majority of Malagasy. This doubtless arises from the higher state of morality existing among these people even before Christianity

was brought to them. All travellers with whom I have had the opportunity of speaking are forcibly impressed with the way the children seem to swarm in the Taimoro villages. The people have intermarried very little with other tribes, and each branch of the tribe has kept itself, to a very great extent, distinct. This, together with the clannish, almost superstitious, reverence for their ancestors and their writings, has kept from the Taimoro many of those evils which have seriously affected the growth of population in other tribes.

The writings just referred to are unique in Madagascar. Called by the people the *Sóra-bè* (or "Great writings"), they constitute, as far as we know, the only books used in the island until Christianity was introduced by the English missionaries. These writings are said to have been brought from Mecca by their ancestors (in the canoe already referred to), who carefully preserved them and handed them down to their children, with the power to read them. This accomplishment is now, whatever it may have been in the early settlement of these people in Madagascar, simply instruction in the Arabic characters, and the mode of forming the characters into words. None of them have now the power of accurately translating or understanding what they read, although many of the passages are committed to memory, and are used on certain occasions as incantations or prayers to God and Mohammed. I have known Taimoro men travel several days' journey, upon hearing of the location of an Arab trader, so as to secure a translation of a passage in some of their books, in order to add to their own importance by an exhibition to their neighbours of their superior knowledge.

A superstitious sacredness is attached to the writing itself, and passages from it are copied on to small pieces of native paper and worn as amulets round the neck. Nearly every child in the tribe has one of these small charms attached to a string round its neck, and carefully preserved from wet or injury by being wrapped in bark and thickly plastered with wax, till it looks something like the long agate beads affected so much by the women of the coast tribes.

The one great desire of all Malagasy women is to become mothers. If any woman of the Taimoro fears that she is likely to be an exception to the general rule—for the majority have large families—she has recourse to one of the scribes and diviners, or priests, as they call them. A portion of the sacred writing is copied upon a piece of white paper

and carefully wrapped in *rofia* fibre. This is held over the smoke of some burning gum used as incense, while a certain formula is recited by the wise men, which takes the form of a blessing and assurance of the consummation desired, rather than of a prayer; after this the document and its covering are enveloped in wax and ornamented with beads; a string is attached, and it is worn like a bead. "Sometimes," naively said my informant, "the woman has her wish, and she becomes a mother, and sometimes she does not." In either case, the money or its equivalent has been paid to the diviner, and he at any rate is perfectly satisfied.

In the same fashion almost all the circumstances of life are made to be in some way or other dependent upon the *Sora-be*; and a spurious but most effective sacredness is given to them by the *fady* or taboo which is invariably connected with them. No original copy is ever parted with, though cunning, craft, and avarice have led the keepers to bamboozle some foreigners with ancient-looking copies. It is only with difficulty that a sight of the original books (only two, some say three, are in existence) can be obtained; and they are smoke-dried, dirty, torn, and rat-eaten to such an extent as to render them almost useless. There are, however, some very good copies, so it is said, over which great care has been taken to secure accuracy, and almost fabulous amounts are demanded for single copies, which are even then only secured by favour.

They are written upon large sheets of a kind of vegetable parchment made from the bark of one of the forest trees. The bark is stripped from the tree, and after being denuded of the rough outer bark, it is steeped in water until saturated and softened. It is then beaten with mallets or flattened pieces of wood until it is reduced to the proper thickness, It is then firmly pegged on a board and exposed to the sun, which not only dries the bark, but bleaches it. In order to make it ready for the pen, it is washed with a fairly thick size, made of manioc root reduced to powder and boiled in water. After this has dried, the surface of the bark is tolerably smooth, and can be written upon with their pens or a quill with comparative facility. These sheets of bark are then cut into convenient sizes (about quarto) and stitched together into book form, but not rolled.

The pen used is made from a piece of bamboo, treated very much as we do quills, and cut in the same fashion. Quills, however, seem never to have been used by these

people. The ink is a gummy solution of lamp-black and, judging by some of the specimens I have seen, is very durable, as well as of a brilliant blackness.

The utmost care seems to have been taken both with the instruction of the male children in the art of reading and writing the characters, and in the endeavour to secure accurate transcripts of the original books. The scholars are required to rigorously observe the various *fady*, on pain of expulsion from their families and tribe. They are required to abstain from certain foods, such as eels, certain sea fish, pork, etc., and an absolute moral purity is enjoined.

In case of war, or fire, or hurricane, or other event likely to imperil the safety of the *Sora-be*, the keepers answer for their preservation with their lives; if they are able to escape the calamity, whatever it may be, they are considered as able to save the sacred books. These must come before considerations of money, property, or family; and hence, through all the disturbances and unrest of a semi-savage state of society, the books have been preserved.

The books, besides being called the *Sora-be*, are also called by the educated (the readers of them), the *Karàna*, evidently a corruption of "Koran." But in the course of generations the actual meaning of the word—as applied to one book—has been to a great extent lost, and is used to represent the various stages or standards through which the students pass. For instance: the normal character or sign of the consonants is called the *Karana vòaldhany*, *i.e.*, the first *Karana*; the pointing of these consonants with some of the simplest vowels is called the second *Karana*; while those who are able to read any of the books are said to have mastered the third *Karana*.

The possession of these books, together with the natural acuteness and exclusiveness of the Taimoro, has secured for them a certain kind of reverence from other tribes, which they have not been slow to turn to their own profit. It is said that the vast majority of the *òdy* (charms) and idols used in the country came from the Taimoro. Even the noted *Kèlimalàza*, one of the Hova idols destroyed by the late Queen in 1869, came originally from this part of the country, having been captured in one of the wars and taken to Imerina as legitimate spoil. At the present day men travel about the country with reputed *ody*, and secure a good living through the gullibility of the villagers. The mode of operating may be varied to suit different cases, but

here is one method which I can vouch for. A Taimoro, with a design of this sort upon a certain village, goes there disguised as a traveller of some other tribe, and enters, as all travellers are welcome to do, one of the houses he finds occupied, for his mid-day meal. In the course of conversation with his host whom he can easily induce to believe that he has arrived from a place remote from the Mâtitanana, he draws from him a few leading particulars relating to the past life of the owner of a house he indicates. Then, having finished his meal, he resumes his journey. But, after getting a sufficient distance, he washes his face, which has been stained, changes his dress, putting on the peculiar long dressing-gown style of robe worn by the Talaotra, and returns to the village, making no secret of his profession, and makes his way to the house indicated to his host of the morning. He takes care that there is a look of comfort and prosperity about the house and owner. He asks and readily obtains quarters for the night, as travellers are always welcome for the sake of their news, which is retailed round the evening fire. The Taimoro takes care to make it be believed that he has never been in that part of the country before, and has seen no one from the district. Then, when the time is ripe, he tells the man all he knows about him, in a careless way:—"Let's see, you lost your father two years ago in the rice-planting time; he was gored by a bull at such and such a place," and so on, till the man, in wonder, asks how he knows all that. It is of course put down to divination, and a good price is secured for the *ody*, which the rascal makes him believe will be just the thing for his household. The fame spreads with morning light, even his host of the previous mid-day is astounded by some pieces of information which he forgets he told the traveller of the previous day; and the end of it is that the cunning fellow leaves, driving before him several cattle, and with money in his loin-cloth in place of the worthless dirty bits of wood he leaves behind him.

I have been able to obtain, through a converted Taimoro, an ancient copy of the sacred book, which, from the difficult, almost secret, way I got possession of it, is peculiarly interesting. It was evidently looked upon by its possessors as authentic and sacred, and they were actuated by no small fear when they were induced to part with it. I have taken considerable trouble to ascertain its actual contents, and after submitting it to several authorities, I at last obtained, at the

British Museum, the information I required. I have been assured that the book is a copy of some portions of the Koran, badly done, as though written from dictation, not transcription, by one who, though familiar with the Arabic characters and their equivalent sounds, yet did not know the language nor the meaning of the words. Said my informant: "Had I not known the original text, I should not have been able to read or translate it; and it is so full of mistakes and repetitions that it would occupy a long time to reduce it to a readable form." The invocation to Allah and Mohammed which precedes the various chapters of the Koran is repeated *ad nauseam*, with but a verse or two intervening; while in the centre of the book are a set of cabalistic signs for use in case of sickness, etc., to be copied on to pieces of paper and then washed off into the water to be drunk by the person who is ill.

It seems strange that these people, who, when they first arrived in the island, were without doubt Mohammedans and in possession of the Koran, should have degenerated into the idol and charm manufacturers they have now become, and that their influence in this direction should be so universally felt throughout the island. For the Taimoro, in small bands, travel the whole length of the land from Fort Dauphin to Anórontsanga, and over to the west to Mènabè. Into every part of the country these idol-makers and charm consecrators make their way, and return with herds of cattle and a good store of money and goods, engaging men *en route* to drive their herds home, when they contemplate a longer stay or a more extended excursion. These absences from home have been known to continue for two or three years, the party bringing or sending home more than a hundred head of cattle and a good round sum in dollars.

Parties of the Taimoro not only migrate for the purpose of selling their *ôdy* (charms), but they appear to enjoy the novelty of working for the foreign trader. They have no objection to earning wages from foreigners away from their own country, although they look upon it as derogatory to their pride to labour in the same way for their more wealthy clansmen, or for the traders in their immediate vicinity. Perhaps, as being hired regularly by the month implied under the Hova *régime* freedom from *fanompòana* (unpaid government service), this was another element which induced the Taimoro to prefer to work for the foreigner.

A curious idea of being defiled by contact with other tribes

seems to have a firm hold on these people, so that when they return from having hired themselves to foreigners, they are very particular about bathing and washing their clothes before reaching the Matitanana. Coming from the north (the usual direction taken by bands of labourers), the last water they pass before arriving at Vohipéno or its neighbourhood is the River Mangatsihotra. Here they stay for a complete purification, ostentatiously washing their mouths and tongues, if they have indulged in food which is at home considered *fady* (tabooed). They also rub their tongues with an *ody* (said to be poisonous) to take away the effect of any evil words they may have spoken, or any curses they may have uttered against their household or fellow-townsmen.

The manner of a husband's return after a six or nine months' absence is characteristic, and sheds a flood of light upon the usual estimate of conjugal faithfulness. The man does not make for his own house, but enters his father's, until the fact of his return is made known through the village, and in due course to his wife. She then comes to him. There is no particular warmth of welcome or gladness expressed on either side, but the man proceeds, in the presence of the neighbours, to put his wife on oath regarding her fidelity to him during his absence. He then says: "If you have done no evil, then you will submit to the usual ordeal, out of which you will come unhurt and receive our blessing; but if you have been unfaithful, may the crocodiles devour you in the water."

If the woman is willing to submit to the ordeal, she is taken to the river bank, from which she throws herself into the water, and swims ashore. If she comes out unhurt, the man makes her a present of the things he has brought for her from the far country and receives her with gladness and feasting, in which, unfortunately, the rum bottle occupies a conspicuous place. If she either refuses the ordeal, or is bitten during the ceremony never so slightly, the man repudiates her, gives her no present, and she is gazetted throughout the tribe as "a wicked woman, whom no one is to wed for ever."

Unchastity among the young women is said to be almost unknown among the Taimoro, for the fact of unchastity of a young woman becoming known would at once preclude her from obtaining a husband. This is precisely the reverse of the state of things among the unchristianised tribes in the interior, where the possession of a child, though it may be

illegitimate, is looked upon as a strong recommendation to any woman seeking a husband. Unfortunately the same strictness is not exercised towards the young men, and there is a very loose code of morals for them, although they look for the utmost purity in their wives.

The marriage customs of the Taimoro are different in many respects from those of the Hova, both in the initiation and in the ceremonies connected with the wedding. Unlike the Hova, a Taimoro youth chooses his own bride, and tries to win her, in the first instance, without any consultation with parents or relatives on either side. There is also a sense of shame-facedness incident to lovers in other parts of the world, and a dread of being laughed at that leads a youth in making his first onslaught on the heart of the girl upon whom he has set his choice to pay his first visits secretly. He seems to dread the pointed finger and the sneering: "Ah! So-and-so has gone to try and obtain the consent of Miss ——," the salutation which always assails the ear of any young fellow who is caught making this first call. And the Taimoro lasses know how to coquet with their suitors, so that it is seldom that consent is given in less than a month. This consent at last gained, the bridegroom comes at night and fetches home the bride, who remains in his house a week, before they go formally to ask the consent of the father and mother. This is called the "showing of the woman." Two or three bottles of rum, a half-measure of white rice, and one fowl, are taken as a present to the father and mother of the bride, and, their consent gained, the young couple return home to the house that he has been building during the time the damsel has kept him waiting for his answer. After another week, a further present of money, either a shilling, two shillings, two dollars, or three dollars, with rice, a fowl, and two bottles of rum, are taken to the parents and presented in the presence of two or three witnesses taken by the bridegroom. This they call the "*hamaky vodana*" or the home-coming. Then once again rice, fowls, and rum are presented, and the marriage ceremonies are complete. The woman is supposed to furnish towards the housekeeping 20 or 30 mats for the floor, a stock of sleeping-mats, 4 or 5 baskets of white rice, one cock, a looking-glass, a calabash of grease, a big cooking-spoon, a tin dipper, and a wooden sifter.

A procession of damsels is formed to bring home the bride and these belongings. When she arrives, she and her atten-

dants circumambulate the house three times before she appears at the east door and salutes those inside with, "Salutations to those who possess separate households!" The man comes out of the house, turns out any of his friends who may be present, and leaves the field clear for the woman and her friends to put the house in order. For two days rum is *fady*, and feasting goes on for a week.

Unfortunately the custom, though elaborate, does not appear to be wonderfully binding, as it is very easy for the woman within a week of her marriage to leave the newly-made husband. But if she stays more than a week, he presents her with two or three dollars, a yard of cotton cloth for a jacket, and a *lamba*, either the striped native cotton one (*arindràno*), or one made of *rofia*. These are hers if she stays with her husband, but if she leaves him, they revert to him. But although it is so easy to leave her husband, it is not so easy to get another, if the first husband is annoyed at the separation, as she is unable to marry again without his consent.

There is another way in which haphazard marriages are contracted when there are a great number of marriageable girls in the tribe. The parents or nearest relatives of the girls take them to the nearest village in which there are some marriageable men, and tell them they are to choose whom they would like for husbands. There appears to be little objection on the part of the young men, and though usually the case, it is not the invariable outcome, that the girl chooses a bachelor. Some appear to prefer those whose reputation as husbands has been tried, and lay claim to the widowers; and it is not out of the question that the girl may choose one who has already one or more wives. There is no feeling of disgrace in being one of several wives. A week is allowed for these newly made couples to ascertain whether or not they can mutually agree to live together for life; and according to their finding at the end of that time, they either separate, or go through the ceremonies mentioned above.

Divorce is terribly easy, as a man simply *misaotra* (= wishes a blessing upon) the woman, and tells her she is no longer his wife, and the deed is done. But by a strange perversity, a woman who is divorced, easy as the process is, remains unmarried, "waiting for the man," as it is called, for even four and five years, and although he may have been married three or four times meanwhile, she is often willing to go back to him as his wife.

Every effort is made by the heads of the tribe to prevent intermarriage with other tribes. If a Taimoro of the Antalaotra division marries into another tribe, or even with a Hova, the one so doing is excommunicated, and is treated as a perfect stranger. The parents refuse to acknowledge them or their children, and they are entirely cut off from the tribe. They are mourned for as dead, and *are* as dead to their parents and kinsfolk. This is said to be the reason why none of the Taimoro women dress in the gay *lamba* affected by the other tribes, or in the soft white *lamba* of the Hova, but only in the rougher and coarser *rofia lamba*. They think that there is more danger of their wives and daughters being carried off by the Hova for their wives if thus dressed, than if their charms are dulled by a common-looking dress. So it is made *fady* for a Taimoro woman or big girl to dress in a calico skirt or *lamba*. The upper part of the body may be covered with a calico jacket, as this is presumably hidden beneath the *lamba*, but the belles seem to make up for the other restriction by wearing the brightest-coloured jackets procurable. But whether the desired end is gained by the *fady* or not, it is certain that there are but few Taimoro women married to men of other tribes, and hence the distinctive peculiarities of the Taimoro have been preserved in a way not found in any other peoples in the island.

If a woman does marry a man of another tribe, or of a branch of her own tribe which is considered beneath her family, a great assembly is called of all the heads of families. Cattle are killed to add importance to the function, and the woman is advised in the public assembly to repudiate her husband. If she does, well and good; but if, after persuasion and threat, she declines, she is advertised as not of them, she is forthwith an outcast and is boycotted. No one will allow her to fetch from their hearths fire to kindle her own; no one will fetch fire from her hearth. If she has a child, no one visits her to congratulate her; no one commiserates with her in case of illness or death. And—the worst thing of all in their estimation—no one will help to bury her when she dies. In no tribe with which I have become acquainted in Madagascar is so much effort made to preserve the tribal distinctions and to keep themselves pure from contamination with other tribes. It is doubtless owing to this that the Taimoro are so peculiarly different from all the other peoples in the island.

Like the Taifasy and other south-east tribes, the Taimoro

bury their dead in a great house built of logs and surrounded by a palisade. The corpses are wrapped in a native *lamba* and laid side by side, and layer upon layer, the women and children on one side of the doorway (which is in the centre of the long side of the house), and the men on the other side. No one is allowed in or near this house or *kibory*, as it is called, except those appointed by the tribe.

Little or no difference is made in the ceremonies observed at the burial of a king from those at the interment of one of his subjects. But the feasting and number of mourners may be greater, according to the wealth of the individual. One exception, however, is made. When the corpse of a king is carried to the *kibory*, it is not carried on the shoulders, but by the hands and below the knees of the bearers, to show that, although a king when alive, he has no honour above other men when dead. (It is curious that while alive, kings are never dressed in shirt or coat, nor do they wear any kind of headgear, as kings, they say, should not be covered.)

When a Taimoro is approaching death, a number of old women are appointed to perform the last offices, and this they are said to do by hurrying the dying into death, and at once preparing the corpse for burial, and cutting off all the hair over the forehead. Then the scribes of the village assemble in the house, and each of them writes four passages from the sacred books upon separate pieces of bark paper. One of these slips from each scribe is taken and attached to the forehead of the corpse, and one from each on the breast and on each leg. They are then bound on with proper wrappings, that there may be no danger of displacement when the corpse is conveyed for burial. In explanation of this custom they say: "Much evil has been done while here on the earth, so we confess this to the Great Spirit and make supplication for forgiveness." It is also believed to have some power as a charm to preserve the body from decay and annihilation after burial.

The body is carried to its last resting-place, and one of the young men, who has been trained to read and remember some of the words in the books of sacred writings, repeats some passages which are considered suitable for the occasion, although, as with very much of the erudition of the tribe at present as regards their sacred writings, he may not have the remotest idea what the words mean. But they are supposed to contain a prayer to God and his prophet Mohammed for the dead.

At the entrance to the *kibory* a halt is made, and the women and children return home, with the exception of the old women already referred to as performing the last sad rites. These carry fat from the kidney of an ox and fire, and as they enter the gateway a chant* is repeated seven times by a few of the attendants and followers, after which they all advance into the burial-house and deposit the corpse in its appointed place.

A general mourning is observed in the village for a week, during which time no bathing or cleansing of garments takes place; but on the eighth day all bathe, and the time and appearance of mourning is past, except for the widow, whose time of mourning (and what usually amounts to the same thing—widowhood) is regulated by the relatives of the dead husband, who can, at will, make the time extremely short, or indefinitely prolong the time during which she is unable to become the wife of another.

When a wife dies, the widower remains secluded for a week or perhaps even a fortnight, by which time the relatives of the late wife bring to him his deceased wife's sister or other near female relative of hers as his future wife. This is evidently done as a matter of worldly prudence on the part of the relatives to prevent both the property and the children from passing into the keeping of others than those over whom they have some influence.

DISCUSSION.

The CHAIRMAN.—I think I should only be anticipating your wishes by expressing our very hearty and sincere thanks to the Rev. George Shaw for the interesting paper which he has given us. It deals with a subject that I think hardly any of us had much knowledge of before. It is a subject upon which the lecturer is well qualified to speak by his residence in Madagascar and upon which hardly any one could gain knowledge except by living in the place and doing missionary work, I venture to say, among the people.

* This chant sounds like: *Kibaralà, kibaralà, kilia, lalañolàlo, kibaralà, kibaralà, kibaralà, vòclàlamòndo.*

There are one or two points which seem thoroughly to corroborate what the lecturer said, though not referring actually to Madagascar, but to Arab immigration elsewhere.

It is a known fact that the Arabs seem to have had the power to practise some faculty of immigration, and to have adopted the same customs the lecturer spoke of.

In regard to the custom mentioned of suspected infidelity—"if you have been unfaithful, may the crocodiles devour you in the water"—it is a very curious fact, as stated in Flinders Petrie's *Tales of Madagascar*, that there is a similar tale told; and again, with regard to tearing up pieces of paper and throwing them into water and drinking it, to this day in Upper Egypt frequented by Egyptians you see, in the Temple of Isis, women, who hope to become mothers, scraping the dust out of the hollows and putting it in water and drinking it.

The SECRETARY (PROFESSOR E. HULL, LL.D.).—I was struck, on looking at the photographs, by the remarkable difference in the physiognomy of the Christian natives as compared with those of the Arabic natives—namely, the very great improvement in the type of feature of the former.

MR. MARTIN ROUSE.—Yes, decidedly—in the appearance of the face; there is a cheerful and benign expression in the faces of the Christians.

I think it is very remarkable that these people should abstain not only from eating pork, but also from eating eels and other fish. This must have come originally from the Israelites. I did not know until I read this, that it was an Arab custom according to the Koran (but perhaps some one may confirm this) that they were not only to eat no pork, but no fish that had not fins and scales. It looks as if the Taifäsý were also of Arabic or partially of Arabic origin, but coming at an earlier period into the country, inasmuch as they do not keep pigs; and that is in agreement with another fact that we have read earlier—that whereas the Onjätšý are treated in the legend as a tribe already there, when these immigrants came from Arabia, the Onjätšý themselves possess one of the only two remaining copies of the Koran. So there seem to have been Arabian immigrants there prior to the arrival of the Taimoro.

The custom of one set of people in a tribe killing animals for the rest is very curious. The lecturer remarked in the course of

reading his paper that the people so employed resemble the *kosher* butchers of the Jews; but I do not know that such butchers have to belong to a certain family. Is that so? Perhaps some one can inform us. It seems to me, rather, to come down from the most ancient times, when the killing of animals was probably always accompanied by sacrifice: whenever an animal was killed, its blood was poured out on the ground in sacrifice to God. I gather that from several ancient passages in the Scriptures; and I think this is in keeping with it. A certain set of people probably acted as semi-priests; and they alone killed for all the rest, and poured out the blood on their behalf.

It is very remarkable that these people who came from Arabia and professed to worship only the one God should have become the manufacturers of idols for the Malagasy; but we heard in a paper on the Moslems of Arabia how their worship of the one God became blended with the worshipping of holy men, or saints; and with many of their ancient pagan customs; how the Wahābīs determined to put this down and did so for some time; but how they have themselves returned to the same kind of observances.

Professor ORCHARD, M.A.—There are some points brought before us in the paper which tend to show that some of the customs of these curious tribes are of Israelitish origin; for instance, the prohibition of marriage with other kinds of people and the chant repeated seven times. That seems to convey the idea of number, the Israelites regarding seven as a perfect number. Then on the eighth day the time of mourning is suspended. We know that the Israelites regard the eighth day as the inauguration of a new state of things. So in the New Testament it becomes the first day—the day of the resurrection.

I should like to ask Mr. Shaw whether these names for the days of the week and days of the month have any translatable meaning, or whether they are only mere sounds as far as he is aware.

If they have any meaning it would be interesting to know what they are; and, also, with regard to the chant.

I was much struck with what the author says—"It seems strange that these people who, when they first arrived in the island, were without doubt Mohammedans and in possession of the Koran, should have degenerated into the idol and charm

manufacturers they have now become." It seems to be but another illustration of the fact of the essential depravity of human nature—a depravity which nothing but a new birth, through faith in Christ, has power to cure.

I am sure those of us who have seen the photographs of these people must admit that they by no means lack the appearance of natural intelligence.

THE CHAIRMAN.—Before Mr. Shaw answers the questions put to him there are one or two other points which I think we should like to get information on.

I presume the Taimoro were kept in subjection by the Hova; but I do not know how it is now that the Hova supremacy has been, so to speak, knocked on the head, and I believe local disturbances have been created.

Then again with regard to the chant of hired mourners as recorded in Scripture, we know that is a very monotonous thing, and it is the same sharp thin cry emitted by the women simultaneously with slapping their faces and then their breasts and hips, and a stamping sound in rapid succession and the monotony of this magic chant which seem to be very similar. This chant appears to be delivered by the attendants as they deposit the corpse in its appointed resting place.

REV. G. A. SHAW.—In two or three words I will try to reply to the questions that have been brought forward. I certainly did not mean that the Mpanombily amongst the Taimoro were in exactly the same position as the *kosher* butchers amongst the Jews. I simply referred to that as indicating a separation—that they were the only ones that could kill the animals in such a way as that the tribe would accept, as food, the animals so killed. As I said in the beginning of the paper the highest class, or chiefs, or lords, were called the Mpanombily, which translated into English means those who killed for the rest of the tribe, and inasmuch as the king was very frequently in old times, the priest, it is not at all unlikely that these Mpanombily were also the priests.

Then with regard to the rice, I think it is a matter of notoriety that the redder it is the harder it is. It is a much smaller grain. It is not so pleasant looking, and certainly is not pleasant looking when it is cooked, and in proportion to its hardness, it is so much the more indigestible. When the natives eat a certain portion of

red rice it sustains their strength and prevents their becoming hungry for a longer time.

Then as to the houses—nearly all the houses in the country are built on piles, so as to get as far as possible above the mists and malaria. None of them are built on the ground that I know of; but they all have a flooring of split bamboos put on rafters about 3 ft. 6 in. or 4 ft. from the ground, and in a few instances, if they are chiefs' houses, they may have a second floor above.

As to the Jewish origin of these people I have not made a point of that, though I could have brought forward a great number of points to show in what respects the Malagasy customs resemble the Jewish; but it has always struck me that they came into the country in the same way as the Arabic element came in—that the Arabic element has brought in the Jewish customs; for instance, in killing animals at their feasts, it is a curious thing that at their annual feasts they should always take a wisp of grass and sprinkle the lintel and door-post with the blood of the animals. That is one point, and I could bring forward many others.

With regard to the names of the days of the week and the months of the year, I am not a Malagasy, or able to translate them—my Arabic knowledge does not go far enough. I have given in the second column (the months of the year) the derivations furnished by Mr. Dahle, one of the missionaries in those parts; but so far as the days of the week are concerned I am not sure that they can be translated into English. There is a Malagasy scholar in the room, I believe, who, perhaps, can tell us whether that is so or not.

Then with regard to the sign in the book, I think this mark is on all fours with the marks on the other side. I asked a native teacher the meaning of these and he said he was not sure; but these things serve one of two purposes—they were either put in as marks in order that those who were able to read the characters and words, though not understanding them, or that they might know in what part of the book to look for words suitable to certain occasions. The gentleman to whom I showed this at the British Museum said that some of these were purely cabalistic signs.

In regard to French influence, it would take too long to explain what French influence now means; but I can say whatever it has been in the past, in the present it is having a soothing influence

on the native mind, and things are certainly quieting down in Madagascar both with the tribes, socially amongst themselves and with regard to the government, and Christianizing work is certainly making progress in the island even under the French government, and they are putting no hindrances in the way whatever.

The thanks of those present having been accorded to the author, the meeting adjourned.

ORDINARY MEETING.*

LIEUT.-GENERAL SIR H. L. GEARY, K.C.B., IN THE CHAIR.

The following elections took place :—

MEMBERS :—Harry Seymour Foster, D.L., F.G.S. ; Martin L. Rousset ;
Rev. R. Ashington Bullen, F.G.S.†

ASSOCIATES :—F. W. Harmer, Esq., J.P., F.G.S. ; Capt. Charles H.
Versturme-Bunbury, R.E.

The following paper was read by the Author :—

HORNETS: BRITISH AND FOREIGN (illustrated by
specimens from the Author's collection). By Rev. F. A.
WALKER, D.D., F.L.S.

IT may almost be regarded as a subject for regret that the name of "hornet" should be employed at all to designate several species of the genus of hymenopterous insects known as *Vespa* which constitutes one tribe of the more comprehensive order *Vespidæ*.

Of the so-called "hornet" there only exists one British representative, namely, *Vespa crabro*. Hornets, wasps, and bees have accordingly been considered by outsiders to constitute three distinct tribes, whereas the real fact is that the hornet and the different species of ground wasp, of which *Vespa vulgaris* and *V. germanica* serve as the commonest examples, are far more closely allied in almost every particular than are such widely differing genera as *Vespa*, *Nomada*, *Odynerus*, *Cerceris*, *Eumenes*, *Philanthus*, *Pemphredon*, and many more. Yet, by public consent, all the above-named genera are termed indifferently and indiscriminately wasps, owing to one only mark of similarity, namely, their yellow and black banding. In like manner, such various tribes as *Andrena*, *Melecta*, *Osmia*, *Haliectus*, *Apis*, etc., the majority of which are of a dark and dusky tint, are known as bees.

* January 7th, 1901.

† Trans. from Associates.

Yet hive bees, which belong to genus *Apis* among the *Apidae*, are assuredly not more removed in structure and from a scientific point of view from genus *Vespa* among the *Vespidæ*, which genus of wasps comprises such species as are gregarious and live in communities, than they are from humble-bees, which serve as the genus *Bombus*, and also as other genera of *Bombidæ*. The truth is *Vespa crabro* has received the distinct appellation of "hornet" because it is quite the largest British species of *Vespa*, and is also larger than all the *Vespidæ* inhabiting our island, and because the black ground colour and markings of all other British *Vespidæ* are in it replaced by a chestnut brown.

But if our synopsis of species be enlarged, so as to include a survey of foreign and exotic kinds, it will be found to comprise many more sorts of a chestnut brown, some of them about the same size as, and some of them far larger than, our British solitary species. Any review and comparison that regards exclusively only such species as occur in Britain must obviously be very partial and incomplete; and later on in this paper occasion will be taken to refer to one or more foreign kinds. Colour and size, however, serve as only superficial discrepancies. What is more to the point is that the physical structure of *Vespa crabro* and that of our common ground wasps, to wit, *V. vulgaris* and *V. germanica*, is one and the same; also that all the three above-named species alike construct their cells of wood taken from hollow trees, palings, etc., and which is masticated by them for the purpose; that all alike commit depredations on fruit; that all alike become frequently intoxicated by the juice of ripe apples or pears, or by the honey of certain blossoms, and then drop helplessly from the trees; that all have the abdomen similarly spotted and banded; that all alike place their cells on the upper side of the comb only, leaving the under side a flat surface, whereas the hive bee constructs her waxen cells on both upper and under surfaces of the comb; that the sting of the common wasp, and, *a fortiori*, that of the hornet, is far more venomous and painful than that of sand wasps or mason wasps, or indeed, I might add, than that of any other British *Hymenoptera*; that all alike live in common, there being a large number of them in each nest; whereas sand wasps and mason wasps live singly and separately, even though the cells which they construct are situate near together, or at any rate a very short distance apart.

The habit which the hornet and the ground wasp have in

common may also be mentioned, namely, that of invading bee-hives, destroying the inmates, expelling them from their habitation, and plundering their stores.

The respective difference of size in the sexes is also the same in the case of the hornet and in that of the ground wasp, the queen in each instance being the largest, next the male, and the smallest consisting of the neuters or workers among the females. Some, however—*e.g.*, the male hornets—are reported to vary considerably in size. There are a few differences that may be noticed, but these are trivial and scanty indeed in comparison of the similarity—I had almost said absolute identity—of many other habits of the hornet and the ground wasp.

Some of the differences that may be quoted are as follows:—Hornets, I believe, continue to work by night. The common wasps do not, with the sole exception of a few ne'er-do-weels that contrive to knock in late, and even their absence is scarcely to be accounted for by their doing additional work.

Hornets, and most happily so, only number one or two hundred in a nest. The population of a strong nest of the common wasp may be reckoned at 4,000. Hornets will frequently make their nest in a deserted run of a rat, or other hole in the thatch of a cottage or outhouse, as well as in the ground. The common wasps confine themselves more to holes in the ground. Both hornets and ground wasps will make their nests in the roots and elsewhere in hollow trees, and also in the trunks of fallen trees, the hornets probably being more frequently addicted to the practice than the wasps. A correspondent of the *Entomologist* some time back, in a notice respecting hornets that he communicated to that periodical, queries whether hornets do make their nests in the ground and asks for information on the subject, and is replied to in a succeeding number of the same volume in the affirmative. I can myself recall, at the early age of eight, noticing a hornet's nest in the ground, and committing the very imprudent act, although I escaped with impunity, of laying my insect net over the entrance of the hole, which was in a field in my native village in North Middlesex, and to which I commonly resorted in pursuit of entomology.

It will be my object in the course of this present paper to collate the notices respecting the occurrence of hornets contributed by others from time to time to the pages of the

Entomologist, and also to relate such observations as I myself have been able to make.

Hornets are very susceptible of cold and wet. With regard to the range of distribution of this insect, it would appear to be much more restricted than that of the common wasp. Both tree wasps and common ground wasps have been recorded in the pages of the *Entomologist*, five or six species in all, to have occurred one season in a certain district in such astonishing numbers, and their nests to have proved so numerous in that particular part of Scotland, as to constitute a positive terror and serious danger to every passer-by. Speaking as a rule, ground wasps are generally distributed, tree wasps are probably more abundant in Scotland and in the North of England than in the South, and hornets are more confined to the southern counties.

Frederick Smith, the late able curator of the *Hymenoptera* in the British Museum, speaks of *Vespa crabro* as local, but generally distributed in the South of England. The counties in which I have observed the hornet are as follows:—Middlesex, Suffolk, Cambridgeshire, Herefordshire, and Monmouthshire. It is commonly reported to abound near Colchester, and the Suffolk parish of Assington, where I noticed it in numbers, is not far distant from that town.

On referring to Edward Saunders's able and standard work on the *Hymenoptera aculeata*, I find that in his account of that insect it has not been recorded from Ireland. There is a solitary instance of its having been observed in Scotland, as Mr. T. A. Chapman saw a specimen at Glencoe, in the West Highlands, in 1876.

According to Mr. Newstead, it has not been taken in Cheshire or North Wales. The observation of Frederick Smith that he has seen this species busily at work on a bright moonlight night is also quoted by Saunders, and with this statement my own experience concurs, as at the age of eleven on an autumn evening I accompanied the gardener in a well-known park in Monmouthshire that my father then rented for a twelvemonth, for the purpose of sawing off a fine specimen of boletus from a tree trunk. We were aware that there was a hornet's nest not far off, but had forgotten that it was in this particular tree, and the insects soon made us aware of their presence, as, aroused still more by the light, they flew swooping with sonorous hum round our lantern. My companion burnt the wings off one in the grass, and I fortunately escaped without injury, having discovered and

beaten off another just in time after it had crept between my coat and waistcoat and was resting on my shirt close to the arm-hole.

During that same autumn my father, who was himself a most eminent entomologist, told me he had got stung by one that was in his insect box while he was engaged either in setting out another insect or in setting out the hornet itself, supposing it to be dead. The creature turned round its tail and stung him; but he described the sting that he received as not worse than that of the common wasp, probably owing to the fact that it was then in a moribund condition.

The effects of a sting by hornet or by wasp no doubt vary in a great measure according to the physique, the condition of the blood, and general health of the person who experiences it. A cottager at Assington told me that her father many years since had lain insensible for two days, having been stung in the head by a hornet, and I read in the daily paper some years since that the mayor of a provincial town in North Wales succumbed to the sting of a hornet on the back of the neck, through failure of the heart's action. The suddenness of the attack and consequent shock may have had something to do with the fatal result in this instance, as he had not previously been aware of its presence.

To revert to Saunders's description of the hornet, he proceeds to cite Mr. V. R. Perkins, who says in his list of the *Hymenoptera aculeata* of Wotton-under-Edge, "that he had lost no less than three hives of bees by these insects, which found their way into the hives, and not only devoured the honey, but destroyed the bees. On removing the hives he discovered in one of them a hornet's nest as large as a good-sized turnip."

The following table of the British species of *Vespa* may perhaps conduce to a better comprehension:—

1.	<i>Vespa crabro</i>	...	Hornet.
2.	"	<i>vulgaris</i>	} Two commonest species of ground wasp (<i>germanica</i> possibly being rather the commoner of the two).
3.	"	<i>germanica</i>	
4.	"	<i>austriaca</i>	} Tree wasps. Only females of <i>austriaca</i> have occurred in Britain, building nests in fir trees near Wakefield, Yorkshire, in 1836, according to Smith. <i>Norvegica</i> generally builds in gooseberry, currant, or other bushes, but Mr. Bignell mentions in a letter a nest of this
5.	"	<i>norvegica</i>	

- species in a horse-chestnut tree, forty feet from the ground. Its abdomen may be said to be marked by yellow stripes on black ground, rather than by black ditto on yellow, as is the case with *V. vulgaris* and *V. germanica*.
6. *Vespa rufa* ... Ground wasp allied to *vulgaris* and *germanica*. Reported by Saunders to be common and generally distributed. First and second segments of abdomen have black markings margined with reddish brown, and hence its name of *rufa*. The solitary example of this species in my own collection was taken on the banks of the Frome at Wareham in May, 1893.
7. „ *sylvestris* ... Tree wasp. My own examples of this species are from Chorley Wood, Bucks; Tittensor, Staffordshire; and Assington, Suffolk; but in none of these instances did I find the nest. The wasps were either captured on the wing or (at Assington) found drowned in a bottle suspended from a cottage window, that its contents might allure that and other *Hymenoptera* given to depredations on the fruit. Frederick Smith says that he has once or twice found it inhabiting an underground nest. I have noticed this species as commoner in Switzerland than England—at Martigny, for example, and still more abundantly at Chartres, where it greatly affects an umbelliferous flower.

There are, according to Saunders, eleven species of *Vespa* in Europe, of which six are found in England. If we include *austriaca*, which, however, is rare here, and of which apparently only the female is found, that will make seven—to wit, *V. vulgaris*, *germanica*, and *rufa*, ground wasps; *V. austriaca*, *norvegica*, and *sylvestris*, tree wasps. *Vespa crabro*, the hornet, is to be reckoned a ground species also, for the true tree wasps do not, like the hornet, make their nests in hollow trees, but round the bough of a live tree and round a forked bough preferably as tending to give additional security to their habitation. Tree wasps have a more slender body than ground ditto, and their cells are consequently smaller.

As regards other observations on hornets that I was able to make in early days, I remember noticing when eight years old that it greatly affected the blossoms of *Angelica sylvestris*, as indeed wasps and bluebottles did also. A variety of insects, *Diptera* and *Coleoptera* included, are very partial to

Angelica. Hornets had also a nest in the thatched gables of the cottage where I first saw the light, and their presence gave considerable annoyance, as the insects used to fly in and out of the bedroom windows until a sheet of lead was nailed over their entrance hole by night and their egress effectually prevented for the future.

Another instance that I recall also about that date was that of a nest in the root of a tree on the bank of the New River, which was not only completely dead, but entirely denuded of its bark. *Vespa crabro* is rightly described as a local species, and many years of my life have passed by without my coming across one single specimen in England. In the month of August, 1897, however, while in temporary charge of the parish of Assington, near Colchester, owing to their great prevalence and the number of nests in the parish, I was enabled to tabulate the following observations more in detail, which were duly communicated to the *Entomologist* of that date.

“*Vespa Crabro*.—I should be greatly indebted for any information afforded respecting the numerical strength of a hornet’s nest. Though there must be many nests in this neighbourhood, I doubt whether any one nest contains more than one hundred or so. This formidable insect seems in such plenty here this season as to prove a positive source of danger, and the fruit crops, especially the apples, suffer accordingly. Only a few hundred yards from the vicarage, along the Stoke and Nayland road, are two cottages under one thatched roof, inhabited respectively by two families related to each other, and comprising jointly about fifteen children. In the side of the thatch of the first cottage there is a hornet’s nest, and in the thatch of a low outhouse, on the farther side of the second cottage, there is another. It goes without saying that the time-honoured, and as a rule the best, plan for suffocating the inmates by the application of a folded linen rag, alternating with layers of sulphur, and then set on fire, cannot be adopted here, as the thatch would speedily be in a blaze; and moreover, in the case of the nest in the outhouse, it is believed to be several feet distant from the only hole of entrance, at the far end possibly of the old run of a rat, as the booming sound made by the insects is distinctly heard close to the rear of the building.

“The suspension of wide-mouthed bottles containing a compound of sugar and beer to the sides of the cottage and outhouse has not been without the desired effect, as several

hornets have crawled in and got drowned. But this is only a partial remedy, and the wasps that have met a similar fate therein, many of them tree wasps, if I am not greatly mistaken, are far more numerous. Another method was for the father of one of the families, to whom I lent my insect net for the purpose, to catch them as they flew out and in; but this speedily had the natural effect of rendering them furious. I then suggested what seemed to me to be the only available method, namely, the insertion of a piece of lead piping in the hole, so that the hornets must pass through it on their way to the outer air, and the fixing at the same time of the other end of the said piping well into the neck of the aforesaid bottle, now suspended for the purpose close underneath. By this means many have been caught and drowned, including the queen, who may have only quitted the interior on the supposition, or intimation, that something was wrong. The nest in the outhouse has thus been considerably weakened, but the second nest still remains to be tackled. It cannot be seen to at present, as the cottagers are all so busily employed in getting in the harvest. There is also a third nest within the distance of a short half-mile, down another lane, in the tiled roof of a cottage opposite the short cut across the fields to Boxford, and here the hornets, to reach their hole, crawl along the leaden gutter under the eaves. A fourth nest, situate in the root of a tree in Assington Park, was taken and destroyed several days since. Owing to the number of hornets that fly in and out of the numerous oaks in the wood known here as Assington Thicks, I feel convinced that there are several more nests undiscovered as yet—probably in the hollows of some of the above-mentioned oaks. There is a little summer-house or shanty in this wood for the gamekeepers to shelter when it rains, and for several seasons past hornets have suspended a nest from the interior of its ceiling, flying in through the open pane of glass in its side. This year, however, they have not put in an appearance there. I believe one such nest in the shanty was cut down and presented to the museum at Colchester.

“During my short sojourn at this vicarage I have captured twelve hornets with my net as they came successively to regale themselves on the sap exuding from the trunk of an oak in the back shrubbery. I note that there is hardly ever more than one hornet at a time, either where the sap exudes, or on a partially devoured apple. Probably there is not

room for the operations of both. But if one be captured thereat, within a brief space (say ten minutes) another visitor, in brown and yellow jerkin, flies up with a sonorous hum to take his place. Sometimes, but more rarely, two may be seen together seated on one apple. Are these solitary visits due to some well understood and defined arrangement between themselves?

“The present unsettled state of the weather here (sunshine alternating with clouds and frequent showers) renders the hornets all the more dangerous, as apt to creep about noiselessly in a semi-torpid condition resulting from the heavy wet. Query, do the queens leave the nest at this period of the year? It would seem so, as when my wife was in the orchard here a few days since, on picking up a fallen apple, she heard a loud buzzing in the grass close to the fruit, and in a few moments a hornet ascended a blade of grass and flew away. Luckily for herself she did not touch it, as at first sight she mistook it for a dragon-fly, and from the size which she described it could only have been a queen.

“Of late years I have seen very few hornets in England, and during the whole of my residence in my Cambridgeshire parish I only recall the occurrence of one nest in the roof of a farmhouse or cottage three or four doors from the rectory, and taken by an elderly parishioner to whom various odd jobs were delegated, and commonly supposed to possess a very thick cuticle; at any rate, he went about his work fearlessly. ‘They do *hom* so,’ he said.

“One of the very few occasions on which I have seen a queen hornet alive was in the winter season on the drawing-room window-sill of the said Cambridgeshire rectory, when it was in an almost torpid state, and covered with soot, and I naturally dreaded its presence on account of my children, who were then very young. I remember in boyhood’s hour being greatly diverted at beholding a hornet sweep in its flight into a hole in the side of a large jargonelle pear, and no fewer than twenty wasps forthwith to tumble out therefrom in a state of the most abject terror to the ground. In those days also a relative observed a hornet seated on the bough of an apple tree, and tearing a hive bee to pieces for the sake of its honey-bag.

“The hornet does not always score, however, for while two English ladies were walking in the environs of Chartres (Lake of Geneva) in the month of July, 1893, while I held

the chaplaincy of that place, they recounted to me how a wasp and hornet dropped struggling together from an orchard tree in front of them, and how the wasp, being more agile, managed to dart about and sting his adversary here and there until the latter succumbed.—Assington Vicarage, near Colchester, August 24th, 1897.”

Extract from Ramie's "Insect Architecture," pp. 92-95.

“The nest of the hornet is nearly the same in structure with that of the wasp; but the materials are considerably coarser, and the columns to which the platforms of cells are suspended are larger and stronger, the middle one being twice as thick as any of the others. The hornet, also, does not build underground, but in the cavities of trees, or in the thatch or under the eaves of barns. Réaumur once found upon a wall a hornet's nest which had not been long begun, and had it transferred to the outside of his study window; but in consequence, as he imagined, of the absence of the foundress-hornet at the time it was removed, he could not get the other five hornets, of which the colony consisted, either to add to the building or repair the damages which it had sustained. M. Réaumur differs from our English naturalists, White, and Kirby and Spence, with respect to the materials employed by the hornet for building. The latter say that it employs decayed wood; the former, that it uses the bark of the ash tree, but takes less pains to split it into fine fibres than wasps do, not, however, because it is destitute of skill, for in constructing the suspensory columns of the platforms a paste is prepared little inferior to that made by wasps. We cannot, from our own observations, decide which of the above statements is correct, as we have only once seen a hornet procuring materials, at Compton-Bassett, in Wiltshire; and in that case it gnawed the inner bark of an elm which had been felled for several months, and was, consequently, dry and tough. Such materials as this would account for the common yellowish-brown colour of a hornet's nest. Hornets often choose for their home the space between the roof and the ceiling of summer-houses, and the nests that are made in such localities are mostly large and handsome. When hornets make choice of a tree for their domicile, they select one which is in a state of decay, and already partly hollowed; but they possess the means, in their sharp and strong mandibles, of extending the excavation

to suit their purposes; and Réaumur frequently witnessed their operations in mining into a decayed tree, and carrying off what they had gnawed. He observed, also, that in such cases they did not make use of the large hole of the tree for such an entrance, but went to the trouble of digging a gallery, sufficient for the passage of the largest hornet in the nest, through the living and undecayed portion of the tree. As this is perforated in a winding direction, it is no doubt intended for the purpose of protecting the nest from the intrusion of depredators, who could more easily effect an entrance if there were not such a tortuous way to pass through. Industrious as is this insect, it never takes needless trouble, and alters its nest according to circumstances. The courts are defended by a complete cover when the nest is placed in an open situation. But when it is built in the hollow of a tree, there is no cover at all, the insect evidently knowing that the wooden wall with which the cells are surrounded affords a sufficient protection. In cases where a cover is made, the hornets do not form only a single entrance, as is the case with the wasp, but have a large number of small entrances in different parts of the wall. Hornets are, in one sense, more industrious than wasps. But if the moon be up, the hornet is sure to work throughout the entire night, and will often do so even when no moon is visible."

Extract from Wood's "Natural History," p. 501.

"Many species of wasp inhabit England, the hornet (*Vespa crabro*) being the largest, and indeed being nearly equal in dimensions to any tropical species. This formidable insect makes a nest very similar to that of the wasp, but the cells are necessarily much larger. The nest is generally placed in hollow trees, but I have known a colony of these insects to establish themselves in an outhouse, and to cause great annoyance before they could be expelled."

Extract from Lyddeker's "Royal Natural History," vol. vi, p. 41.

"Of the better known forms, the common hornet (*Vespa crabro*) is readily distinguished from other species of wasps by its large size and prevailing tint on the anterior portions of the body. It is universally distributed throughout Europe and occurs as far north as Lapland. The solitary female,

after her hibernation, commences to build the first foundation of her nest in May, on some convenient beam in a loft or outhouse, or frequently in the holes made in the eaves of thatched cottages by sparrows. The food of the grubs consists of bodies of insects, bees, etc., which the workers chew up for their benefit. On the approach of autumn, the remaining larvæ, which have not yet been hatched out, are torn from their cells and left to perish."

"*Encyclopædia Britannica*," vol. xxiv, p. 392.

"The hornet (*V. crabro*) is the largest species occurring in Great Britain. They have a more distinctly red colour than the common wasp, and appear to be almost confined to the southern half of England. Their nests resemble those described above, but are larger; they are found in hollow trees or deserted outhouses. Their communities are smaller in number than those of wasps. The hornet, when it occurs in any number, does a considerable amount of damage to forest trees by gnawing the bark off the younger branches to obtain material for constructing its nest. It usually selects the ash or alder, but sometimes attacks the lime, birch, and willow. Like the wasp, it does much damage to fruit, upon the juices of which it lives."

Extract from Kirby's "Text Book of Entomology," p. 128.

"The hornet (*Vespa crabro*, Linn.) is nearly half as large again as the other species, from which it may be distinguished by its redder colour and the row of reddish spots on each side of the abdomen. Some species of wasps construct their nests in the ground, and others in trees; these nests are composed of a material resembling thin coarse brown paper. The hornet is less numerous than the smaller wasps; it lives in smaller communities, and is not only a much less abundant species, but appears to be almost confined to the South of England; on the continent it is much more generally abundant. But it is not a quarrelsome insect, though its powerful sting makes it formidable if molested. It generally constructs its nest in hollow trees, but will also build under the eaves of houses. The wasps construct their nests of rasped wood or bark; and I possess a beautiful hornets' nest which was found fixed to the rafter of a house at Colchester which was being rebuilt. It has every appearance of being constructed of deal shavings."

Extract from "Insects at Home," J. G. Wood, p. 354.

"Now we come to the largest and most formidable of the British wasps, the terrible hornet (*Vespa crabro*).^{*} The figure represents a perfect female of the natural size. The workers are much less, and indeed many worker hornets are no bigger than the common wasp, from which, however, they can at once be distinguished by the dark red-brown of their markings. The nest of the hornet is exactly similar in character to that of the common wasp, but the cells are very much larger. The nest is usually made in hollow trees; and within a few hundred yards of my house are several hornets' nests—a fact which I take care *not* to mention, lest any anxious parent should destroy them, fearing that they might injure his children, a fate that befel one of these nests last year. There is really not the least occasion for fear. The hornet has a great deal too much to do to spend its time in stinging children, and, unless its nest be attacked, it is peaceable enough. Mr. Stone kept many hornets' nests at work, and was no more stung by them than a bee-master is stung by his bees. Outhouses and similar places are favourite localities for hornets' nests. The successful capture of a hornets' nest is a very difficult business, and that of a wasps' is child's play to it. In the first place, it is much more difficult to cut a nest out of a hollow tree than to dig it out of the earth; and in the next place, the hornet works all night, provided the moon shines, whereas the wasp stays at home. The food of the hornet consists of other insects, and it has a special liking for wasps. My brother once saw a hornet in chase of some *Atalanta* butterflies, and the instinct exhibited by the insect was really wonderful. In the open air the short-winged, heavy-bodied hornet would have no chance of catching the ample-winged butterfly. So the hornet kept flying backwards and forwards in front of the butterfly, until the *Atalanta* thought to escape by flying through the branches of an elm

^{*} Scientific description of *Vespa crabro* (Saunders's *Aculeate Hymenoptera*, pp. 151, 152).—Red-brown, head punctured, yellow, clothed with long pale hairs, apical margin of mandibles, a line across the face, above the clypeus, and the region of the scalli, black or dark, antennæ brown, very long in the ♂, the joints bituberculate beneath, scape yellow in front, thorax punctured and hairy like the head, sides of the mesonotum and a narrow central line dark, wings smoky, nervures testaceous; abdomen rather remotely punctured, clothed with pale hairs, apex of the first segment very narrowly and regularly, of the second, broadly and irregularly, and the whole of the following segments, except two or three basal spots, yellow, beneath yellow, the segments more or less spotted with brown at the base; legs with projecting hairs, and also clothed with very fine, short, silky pubescence, femora in the ♂ densely fringed with long hairs beneath, anterior pair in both sexes strongly curved.

L. ♂ 23-25 mm., ♀ 25-30 mm., ♀ 18-23 mm.

tree. This was the object of the hornet's manœuvres, for it at once dashed among the foliage, where the wide wings of the butterfly were at a disadvantage, captured the unfortunate *Atalanta*, bit off its head and wings, and flew away with the body."

Report of Observations of Injurious Insects and Common Farm Pests in the Year 1893. By Miss ELEANOR ORMEROD.

Page 114.

"The *Vespa crabro*, or hornet, is easily distinguishable from the other species of wasps by its greater size and the large proportion of its rusty or reddish colouring. In the part of Gloucestershire mentioned above, where there was much woodland, it was not at all uncommon, but its range of habitat is given as not extending, as far as known, so far north as Yorkshire.

"In general habits it resembles the smaller *Vespidae*, commonly known as wasps, but by preference appears neither to build underground, nor where exposed to weather in trees or hedges, but to select the inside of hollow trees, or logs, or roofs of lofts or sheds; the individual colonies are less in number than those of the wasps, and the paper of which the nests are composed is much coarser. The nests sometimes run to a great size, the largest which I have seen, and assisted in securing when deserted in the winter, was taken from a cottage roof in Gloucestershire, and measured fifteen inches across and nineteen inches in height, although some of the lower part had been removed."

Page 124.

The following particulars were communicated to Miss Ormerod by Mr. Edward A. Atmore, F.E.S., of King's Lynn, Norfolk:—

"Hornets (*V. crabro*) have also been unusually plentiful here, the nests, as usual, occurring generally in hollow trees. These powerful insects seem to be as fond of destroying wasps as wasps themselves are of destroying flies. I have several times witnessed this habit of theirs."

Also on page 124.

"Worcestershire.—On applying to Mr. J. Hiam, The Wren's Nest, Astwood Bank, near Redditch, with regard

to what he might have observed of hornet presence in the past season, he informed me that 'hornets' had been more numerous than ever remembered in that locality, and also for a few miles round. Eight nests had come under his own observation, and he had heard of others being taken at a short distance beyond the extent of his own walks. Later on, on November 9th, Mr. Hiam favoured me with the results of his further inquiries as to amount of hornets' nests observed and damage done by the insects as follows:—"I find there were about a score of nests within a few miles that were known of, and doubtless others in woods and lonely places would escape observation. Considerable damage was done in gentlemen's gardens to wall fruits of the best sorts, and also to fruit in orchards, and in the fields to cider fruit; but the latter has been so plentiful and cheap that it is hardly worth taking into account.

"I have taken a large quantity of queen hornets from various nests, some of which I have alive now (November 9th). This will materially lessen the number of nests next season, but from what I know of several colonies in inaccessible positions, in roofs of houses and otherwise, a large increase may be expected.'

"Mr. Hiam further remarked with regard to the habit of the hornets of stripping young bark:—"Near one hornets' nest I noticed the young ash sticks had been stripped in pieces of the bark all round, or in other cases in patches, which is not unusual, but for the exact purpose I am not quite certain, because the combs, and paper covering on the outside of nests, appear to be composed entirely of dead rotten wood, nicely blended in coloured layers. Hornets also take the sap oozing from wounds, whether caused by hornets or otherwise, of the elm, and also tap dahlia stems, and suck the flowing sap."

Pages 124, 125.

"Some very good figures of shoots of ash and also of birch, injured by removal of bark by the hornets, will be found at page 405 of the valuable volume by Dr. J. Ritzema Bos on animals injurious and useful in agriculture, horticulture, etc. Dr. Ritzema Bos, speaking on the following page of the damage done by wasps (including in this, of course, hornets) in this way, notes that although the building material is chiefly of rotten wood, they will gnaw down to the sap

wood of young branches or stems for the purpose, apparently, not only of using the torn-off pieces of the bark for building purposes, but that they may suck the sap that flows from the wound. Ash is mentioned as preferred; after this willow, alder, birch, beech, lime, and elder.

“(In an instance where I had myself, together with my sister, the opportunity of watching hornets at their operations in removing patches of bark from some ash saplings by a pool in Gloucestershire, we were able to see them definitely sucking in the sap from the torn edge of the bark.—Ed.) Necessarily, where much bark is taken; or the young bough, or sapling, completely ringed, much damage is done.

“Mr. J. Masters, Hon. Sec. of the Evesham Fruit Growers' Experimental Committee, writing to me from Evesham on the 11th of September, in reply to my inquiries, observed:—‘It is singular, but here in our immediate locality we have had no more wasps than in ordinary years. This, my opinion, is confirmed by that of others. The men have taken the hornets' nests this year in my orchard. The nests were built in the cavities of two old trees. The powder-ball, that is, the paste made of wetted gunpowder, was applied to the hole; this ignited the pith or decayed wood, which gradually burned the interior of the tree and destroyed the nests. Of course it killed the tree. The usual method employed here in taking wasps' nests is by the fizzy or powder-ball.’”

Pages 133, 134.

Netherlands.

“State Agricultural College, Wageningen.—On the 20th of October, Dr. J. Ritzema Bos, Professor at the State Agricultural College, was good enough to tell me, in reply to my inquiries, that ‘wasps were also very inconveniently prevalent in the Netherlands, and also in Germany, at least in the Harz, where we were in August. *Vespa vulgaris*, *V. germanica*, and *V. media* were very prevalent here—indeed, the grapes were eaten by them on a large scale’; also, in one place, a little boy died in consequence of being stung by a great number of *Vespa crabro* (our English hornet).”

Norway.

Dr. Schoyen, State Entomologist, Christiania, writing to Miss Ormerod from that city on the 31st of October, 1893, mentions *Vespa crabro* as occurring in the south-east districts of Norway, in addition to eight other species of *Vespidæ*.

Page 113.

“Species of British Wasps.—The seven kinds of wasps are divided into two sections of ground wasps and tree wasps, according to whether their nests are customarily formed in a hollow in the ground, or suspended in the air from a bough, or in a hedge, or, as with our largest species, the *Vespa crabro*, the splendid species known as the ‘hornet,’ the nests may be found in decayed trees, in roots, under eaves, or, as I have myself found it, down in the ground by a small post of a field paling.”

Pages 135, 136.

“General Summary.

“(British observations.) The hornet (a true wasp, although not popularly considered as such) was ‘plentiful’ in some localities, but only reported from a few.

“Of hornets, in one locality nine nests were known of within the limits of ‘a ramble,’ and twenty in the more extended area of a few miles.”

Page 139.

“Also in the case of the large species, known as hornets, the juice flowing from young bark, which they have gnawed down to the quick, forms an additional article of diet given by an additional department of mischief.”

F. A. WALKER.

Extract from Rev. J. G. Wood's "Homes without Hands,"
pp. 436-439.

“The common hornet (*Vespa crabro*) is tolerably plentiful in many parts of England, but seems to be almost absent from others. The nest of the hornet is much like that of the wasp, except that it is proportionately larger and is almost invariably built in hollow trees, deserted outhouses, and places of a similar description. Whenever the hornet takes up its residence in an inhabited house, as is sometimes the case, the inmates are sure to be in arms against the insect, and with good reason. The hornet is much larger than the wasp, and its sting is proportionately venomous. It is popularly said that three hornets can kill a man; and

although in such a case the sufferer must previously have been in bad health, the poisonous properties of the hornet are sufficiently virulent to render such a saying popular. Moreover, the hornet is an irascible insect, and given to assault those whom it fancies are approaching its nest with evil intentions. It is not pleasant to be chased by wasps, but to be chased by hornets is still less agreeable, as I can personally testify. They are so persevering in their attacks that they will follow a man for a wonderfully long distance, and if they be struck away over and over again, they will return to the charge as soon as they recover from the shock. There is a deep, ominous menace in their hum, which speaks volumes to those who have some acquaintance with the language of insects; and no one who has ever been chased by these insects will willingly run the same risk again. Mr. S. Stone, whose interesting letter upon the wasp has already been mentioned, tells me that he has been successful in breeding hornets as well as wasps, and forcing them to build nests much more beautiful than they would have made if they had been at liberty. One nest, when of moderate size, was removed from the head of a tree and placed in a large glazed box similar to those which have been mentioned in connection with the wasp. Within the box the hornets continued their labours, and a most beautiful nest was produced, symmetrical in shape, and variegated with wonderfully rich colours. 'Such a nest as that,' writes Mr. Stone, 'is not produced by hornets in a general way. They do not trouble themselves to form much of a covering, especially when a small cavity in the head of a tree is selected, which is often the case. The walls of the chamber they consider a sufficient protection for the combs. If you expect them to form a substantial covering, the combs must be so placed as to have ample space around them, and if you expect them to fabricate a covering of great beauty, you must select the richest coloured woods, and such as form the most striking contrasts, and place them so that the insects shall be induced, nay, almost compelled, to use them in the construction of their nest. This is exactly what I did with reference to the nest in question.' Knowing from experience the difficulty of assaulting a hornets' nest, I asked Mr. Stone how he performed the task, and was told that his chief reliance was placed on chloroform. Approaching very cautiously to the nest, he twists some cotton-wool round the end of a stick, soaks it in chloroform, and pushes it into the aperture.

A mighty buzzing immediately arises, but is soon silenced by the chloroform, and as soon as this result has happened, mallet, chisel, and saw are at work, until the renewed buzzing tells that the warlike insects are recovering their senses, and will soon be able to use their formidable weapons. The chloroform is then reapplied until they are quieted, and the tools are again taken up. The extrication of a nest from a hollow tree is necessarily a long and tedious process, on account of the frequent interruptions. Even if the insects did not interfere with the work, the labour of cutting a nest out of a tree is much harder than could be imagined by those who have not tried it. Moreover, the habits of hornets are not quite like those of the wasps. At night, all the wasps retire into their nest, and in the dead of night, the nest may be approached with perfect safety, the last stragglers having come home. Hornets are apt to continue their work through the greater part of the night, and if the moon be up, they are nearly sure to do so. Therefore the nest hunters are obliged to detail one of their party as a sentinel, whose sole business it is to watch for the hornets that come dropping in at intervals, laden with building materials or food, and that would at once dash at the intruders upon their domains. Fortunately, the light from the lanterns seems to blind them, and they can be struck down as they fly to and fro in the glare. The nest that has just been mentioned was rather deeply embedded in the tree, and cost no less than six hours of continuous labour, the work of excavation having been begun at 8 P.M. and the nest extracted at 2 A.M. on the following morning."

Compare the following observations respecting the occurrence of *Vespa crabro* as contributed by correspondents on different occasions to the pages of the *Entomologist* :—

November 20th, 1893.

"*Birmingham Entomological Society.*

"Males, females, and neuters of *Vespa crabro* from Astwood Bank were exhibited by Mr. R. C. Bradley.

"On December 18th some fine specimens of *Vespa crabro* from Alvechurch, where it has been unusually abundant, were exhibited by Mr. H. J. Sands."

“ *Notes from Ringwood, 1893.* ”

“ *Vespa crabro* was very abundant everywhere around here. The females in March were very large, neuters during the summer, and males later.—J. HENRY FOWLER.”

“ *Collecting at Tunbridge Wells and Ashdown Forest.* ”

“ The hornets coming to sugar on some nights were a great nuisance, especially as they carried away insects.—R. A., Dallas Birching.”

“ *Hornets in Worcestershire.* ”

“ Hornets have appeared this season in a certain district in Worcestershire in unusual numbers, though for several years they have been on the decrease.—W. HARCOURT, Bath.”

1893.

“ On August 6th I went to Brockenhurst, and found everything over, and a remarkable scarcity of insects of any kind save hornets and wasps, which were a perfect nuisance. The treacle at night attracted more hornets than moths.—F. W. FREIR.”

1881.

“ *Hornets in Norfolk.* ”

“ My garden here has been full of them all the summer. They and the wasps between them devoured certainly one-half of a magnificent crop of plums. I find several hornets every night on my sugar, and one evening I discovered a handsome nest of them in a loft. It hangs suspended from a beam, and is about the size of a moderate pumpkin. If you or any of your correspondents can tell me how to destroy the insects without injuring the nest, I should be greatly obliged.—R. S. STANDEN, The White House Alley, Norwich.”

1872.

“ *The Common Hornet in Siberia.* ”

“ *Proceedings of Entomological Society, March 18th.*—Mr. Smith said that the discussion respecting Siberian insects of the common hornet type had induced him to examine specimens of the common hornet from Europe, Siberia, and North America, and he found that individuals from these districts

presented no appreciable difference, and their specific identity was proved by the genital organs being alike in all cases, whereas those of the Asiatic *V. orientalis* differed considerably."

"*Proceedings of the Entomological Society. March 6th to April 3rd, 1871.*

'*Hornet barking an Ash Branch.*—Mr. Smith exhibited portions of two small branches of ash, from which the bark had been neatly removed all round. He had received them from Mr. J. Hellins, of Exeter, accompanied by a note, in which Mr. Hellins stated that one day last summer he had observed a hornet busily engaged in removing the bark from these branches. Mr. Smith could not believe that the hornet was providing building materials for its nest, as he had invariably found this to be composed of friable paper, apparently formed from dead or decayed wood. Upon referring to Réaumur's *Mémoires*, he found that that keen observer had recorded a precisely similar circumstance, and he (Mr. Smith) was inclined to think the insect was endeavouring to extract the sap, from the inner wood, as food.

"*The Hornet gnawing the Smooth Bark of Elm.*—During the dry, hot weather in August and September, 1870, I frequently noticed hornets gnawing the young and smooth bark from wood of eight or nine years' growth of a variety of *Ulmus campestris* or *U. montana*. So busily were they engaged that they would allow me to draw the branch sufficiently near to minutely watch their operations, but in no instance could I see that they carried on their work systematically, or removed the bark in circles; they only appeared to cut it with their mandibles to suck out the sap.—HENRY REEKS."

"*Early Appearances, 1897.*

"Throughout the past month (February) the weather, as far as this part of the country is concerned, has been remarkably mild and light. On one especially light day a fine *V. crabro* (female) was noticed flying around a window, evidently enjoying its winter's flight.—AUGUSTUS D. IMMS, 'Linthurst,' Oxford Road, Moseley, Worcestershire, March 4th, 1897."

“*Death through the Sting of a Hornet.*—The deputy coroner for the Reading division of Berkshire has held an inquest at Mortimer, a village near Reading, touching the death, under extraordinary circumstances, of Mrs. Sarah Merrett, a labourer’s wife. Deceased was standing in the road near her house, when a hornet flew out from a nest in the bank and stung her on the right side of her neck. She went indoors, and a neighbour bathed her neck with water and vinegar. However, she fainted almost immediately, and expired in a few minutes, before a medical man could reach the house. Mr. G. H. Davis, surgeon, stated at the inquest that he knew Mrs. Merrett as a nervous, excitable woman, and he believed the immediate cause of her death was syncope, the result of a nervous shock caused by the sting of the hornet. The jury returned a verdict in accordance with that opinion. Deceased was fifty years of age.

“(This is one of the best authenticated instances of death from the sting of a hornet that I have ever met with, and I think admits of no doubt.)—EDWARD NEWMAN.”

“*Death from the Sting of a Hornet.*—You certainly have some entomological readers in the neighbourhood of Reading. Could you not get them to investigate this case more thoroughly? Not that I think it at all impossible that a nervous, excitable person may die through the sting of a hornet, wasp, or bee; in fact, if I remember rightly, the Hon. Grantley F. Berkeley some few years ago recorded in the *Field* newspaper the death of an old man from the sting of a bee. This occurred in the garden of Mr. Lovegrove, Waldron, near Lambourne, Berks, I think. What I want to know is this—was it a hornet or a wasp? I ask this because I never yet saw a hornet’s nest in the ground, and never heard of an authentic instance of one being found in that situation. But then, on the other hand, I have never resided anywhere where hornets may be said to be very common; and I have known of some dozen nests within a radius of two miles, but none of them were in or very near the ground, but in roofs of cottages, outhouses, and hollow trees, and these are decidedly the favourite resorts. Perhaps, however, Mr. T. Smith, or some other hymenopterist, will kindly say if I am wrong. Any one would think that even a child who had once had a hornet shown him could never again confound it with a wasp, or *vice versá*, but you would be surprised at the ignorance in this matter of many well

informed persons, who certainly ought to know a wasp from a hornet, there being quite as much difference in size as between a hive bee and a humble bee (*Bombus terrestris*). Some years ago, my friend the late Mr. S. Stone wrote to me to find out some hornets' nests, and I made several inquiries for him in the neighbourhood. One intelligent keeper said that he did not *then* know of a hornets' nest, but he had seen dozens of them in previous years, and he perfectly remembered one very strong colony that attacked every one who passed near the nest, which, he said, *was suspended from the under side of a fir bough*. This statement at once floored all my previous faith in his tales of hornets, their nests, and shape; and he likewise told me that on another occasion one crawled into his boot and stung his foot. That the hornet could raise a colony from a nest suspended in the open air is a simple impossibility; the first rough wind would blow its frail but beautiful nest, constructed of rotten wood, to atoms. Even when taken for the cabinet, it requires most careful handling, or it will crumble to pieces in the hand with only a very slight pressure.—HENRY REEKS, Thrupton, September 7th, 1874.”

“Do hornets ever build in the ground?” This question is asked by Mr. Henry Reeks in the last number of the *Entomologist* (*Entom.* vii, 232). I can, from personal observation, assure him that they do so. In the month of August, 1871, I found a hornets' nest in a bank at a wood-side near Sidmouth; it was at the latter part of the month, when the colony was numerous. I stood within two yards of the entrance to the nest for some time, the hornets passing in and out, but exhibiting no dislike to my close observation. I was anxious to ascertain whether hornets posted a sentinel within the mouth of the burrow; I failed, however, to detect one. In the fifth volume of the *Entomological Magazine*, p. 479, will be found a record of the hornet building in a perpendicular bank at the side of a river.—FREDERICK SMITH, 27, Richmond Crescent, Islington.”

Vespa Orientalis.

It is much to be wished that those who contributed the appendix “Insects of the Bible” to the Teachers' Bible, in making the statement that four species of hornets (resembling ours, but larger) have been found in Palestine, would also have given the place and date of their occurrences, and the

scientific names of all these four kinds. No opportunity is afforded to us of verifying the assertion, however correct, and why, if four species larger than our own do occur there, are their names not given? Whereas the name of our own British species, *Vespa crabro*, is given in the third column of the page devoted to the Latin scientific names of Bible insects, the first and second columns being devoted to the English and to the Hebrew and Greek appellations respectively. Again, what proof is given that our British hornet occurs in Palestine? I have never captured or even seen it there. But let us suppose that it does for the moment and admit that others have been more observant and fortunate. Why is the foreign species, *Vespa orientalis*, never so much as mentioned by those entrusted with the responsible duty of compiling the notes on Scripture for Sunday-school teachers in general. That it is widely distributed may be proved from my personal experience, as I caught it at the River Meles, Smyrna, and again at Philadelphia, and also at Lycopolis, Helwan, and Heliopolis, in Egypt, and saw it, moreover, at Cairo, Denderah, Minieh, and in the two former of these last-named three places in abundance.

The Rev. J. G. Wood hits the mark much more nearly when in page 616 of his work *Bible Animals* he states:—"The species of hornet represented in the illustration is *Vespa orientalis*, the insect and nest being drawn from specimens in the British Museum." His remark on page 615 is also perfectly accurate:—"The hornets of Palestine and the neighbouring countries are far more common than our own hornets in England, and they evidently infested some parts to such an extent that they gave their name to those spots. Thus the word *Zoreah*, which is mentioned in Joshua xv, 33, signifies 'The Place of Hornets.'" This word is evidently derived from the sound of their buzz, as is also *Tzireh*, the word used in these passages for hornets—Exodus xxxiii, 28, "And I will send hornets before thee, which shall drive out the Hivite, the Canaanite, and the Hittite, from before thee." A similar use of the word is made in Deut. vii, 20, "Moreover the Lord thy God will send the hornet among them, until they that are left, and hide themselves from thee, be destroyed." And again in Joshua xxiv, 12, "And I sent the hornet before you, which drove them out from before you, even the two kings of the Amorites; but not with thy sword, nor with thy bow." The Rev. J. G. Wood adds (also on page 615), "It is needless to say that the passages in question might be literal statements

of facts, and that the various nations were actually driven out of their countries by hornets. Let the insects be brought upon the land in sufficient numbers, and neither man nor beast could stay in it." But then, again, on page 613 he inclines to the contrary view and says, "It is most probable that in these passages the word is used rather as a metaphor than as the statement of a fact." As a corroboration of the circumstance of hornets proving an actual and a literal scourge, one has only to recall the prevalence of *Vespa orientalis* in and around the bakers' shops in Cairo, and flitting about the walls of sun-dried clay in the outskirts of that city, as I can bear witness, in December, 1883. Again, in the month of February, 1897, members of Perowne's party of tourists, I am credibly informed by one of the company, when in the plain of Jericho were forced to scatter precipitately while engaged in driving horizontal passages into the old mounds of the Canaanite and Perizzite on the westernmost side of the plain under the hills of Judæa in search of fragments of ancient pottery, as thereupon they encountered *Vespa orientalis*, and found the hornets very much "at home."

The following paragraph contains the record in detail of my own observation of *Vespa orientalis* in Egypt. Some account of this insect, as a species widely distributed in Bible lands, may possibly prove interesting. In the first place, though almost identical with its British congener, *Vespa crabro*, in point of colour, it may readily be distinguished from the latter insect in having a larger portion of chestnut-brown covering the whole of the upper portion of the abdomen, and only the two lower segments consisting of yellow spotted with brown instead of three or four, as is the case with *V. crabro*. Also, if there is any difference in shape, *V. orientalis* is rather the more slender of the two. Never having myself come across a nest of this species, I of course cannot judge as to its composition, but infer that it may be of clay instead of wood from paling or hollow tree, after the manner of *V. crabro*, *V. vulgaris*, *V. germanica*, etc., when engaged in sawing with their mandibles the requisite materials for the preparation of their cells; and indeed on the confines of the Egyptian desert, there are no timber trees, as a rule, with the sole exception of the date palm, for any such purpose; but these hymenoptera flit about the walls of sun-dried clay in the outskirts of Cairo, Heliopolis, etc., and also numerous frequent the bakers' shops in the bazaars. After my ascent by the southern staircase to the roof

of the time-honoured temple of Isis at Denderah (anciently Tentyra) on December 24th, 1883, I found myself in a somewhat uncomfortable position, as the summit of the wall was fenced by no parapet and there was a drop of probably 30 feet on the outer and possibly 20 feet on the inner side of the wall, and the hornets that were clustered on the patches of clay on the outer wall of the little chapel of Isis on the roof, being disturbed in their depredations by our advance, began to fly wildly about our heads. The said clay cells were the work of the little tawny-coloured bee scientifically known as *Calicodoma sicula*, and they have plastered not only the hieroglyphics, but the whole side of the exterior of the temple. I have three specimens of *V. orientalis* from the cliffs of Lycopolis that I visited on December 22nd, and doubtless the presence of *C. sicula* accounted for their being here also, as on p. 130 of my *Nine Hundred Miles up the Nile* the following passage occurs:—"Nor must the wonderful labours of hymenopterous insects be left unnoticed that have selected the western side of the cliff as doubtless the most sheltered for their abode, and completely covered it, in one particular spot, with masses of clay cells." Great interest attaches to the fact of the modern traveller finding *V. orientalis* and *C. sicula* side by side, as there can be little doubt but what these are the identical hornet and bee mentioned in Holy Writ. *V. orientalis* was also noticed at Minieh, Upper Egypt, in the outskirts of the town, and around its sugar factory on December 20th (*cf. Nine Hundred Miles up the Nile*, pp. 120 and 122):—"Hornets were very abundant. Five days only from Christmas, and the thermometer is 79° in the sun, and several hornets are settled on the ground outside the mill, to regale themselves on the mingled molasses and water that drips from the waste pipe." And p. 103, *apropos* of Helwán, "Hornets are abundant" (*Entomologist*, vol. xxxi, pp. 170, 171).

Apropos of *Vespa orientalis*, the Rev. J. G. Wood (p. 615 of his *Bible Animals*) says:—"They make their nests in various ways, some species placing them underground, and others disposing them as shown in the illustration (said illustration represents the nest as suspended from two forked branches of a tree) and merely sheltering them from the elements by a paper cover. Such nests as these would easily be disturbed by the animals which accompanied the Israelites on their journeys. In such a case, the irritated insects rush out at the intruders, and so great is the terror of their stings that

men and beasts fly promiscuously in every direction, each only anxious to escape from the winged foes.

“The Talmudical writers inclined to the literal view of the passage, and dilated on the terrible power of the hornet, four of which could destroy a horse, and one kill a boy nine years of age, or a man, provided he was stung in the forehead. The sting of the hornet is very severe indeed, exceeding in virulence that of the wasp, to which it is closely allied, and it is possible that a boy, or even a man, might be in so feeble a state of health, or be naturally so sensitive to poison, that the sting of a hornet would be fatal. As a rule, however, the sting of the hornet, although exceedingly painful, is scarcely more injurious than that of a bee or wasp. The Talmudists stated that the hornets mentioned in Joshua killed the people by stinging them in the eye.”

Vespa constitutes the only British tribe of wasps which is social and gregarious in its way of life. On the continent there are other genera that similarly live together in nests, e.g., those belonging to the family *Polistes*, of which *Polistes gallicus*, that I have taken in Switzerland, and also in Spain, and is common along the Mediterranean, is a well known example. Its cells are very small, as befitting such a slender-bodied insect, and it was possibly the forsaken fragment of a nest of this species that I discovered in 1882 on a bush in the neighbourhood of Tarsus and brought away with me.

For good illustrations of some of the exotic species of hornets, all who are interested in the subject are referred to Rev. J. G. Wood's work. *Insects Abroad* represents the neuter of the splendid Chinese wasp, which is appropriately called *Vespa mandarinia*. The female is shown on Plate IX, Fig. 3. This fine insect is found in China and Japan and throughout the whole of said countries. It is coloured very much like our common hornet, but is much richer in appearance, owing to the very broad and ample head and the amount of bright yellow upon it. The colours are rich dark brown, banded, striped, and marked profusely with “king's” yellow. The jaws are enormously powerful. The wings are yellow, darker at the base, and becoming lighter towards the tips (p. 499 of same work); the male has no spots on the abdominal band.

I possess several specimens of the male (believed to be from China) in my own collection.

I may remark that Wood's *Insects Abroad* contains two illustrations of *Vespa mandarinia*, one of the largest, and

doubtless most formidable, known species, and three ditto of *Vespa cincta*.

Vespa Cincta.

The species mentioned above is a native of Asia, and is spread over a very large tract of country. There are several Asiatic species of *Vespa* which are almost exactly similar in their habits, and this may safely be taken as the typical species. The head and thorax of *Vespa cincta* are dark brown, covered with a moderately thick grey down, and the abdomen is very dark brown, crossed with a bold band of bright yellow, whence is derived the specific name of *cincta* or "banded."

I will here quote *in extenso* from my note-book the notes which refer to Indian "hornets," by which term both *Vespa cincta* and *V. orientalis* are designated:—

August 15th, 1863.—"These insects are very abundant at Benares, but not generally spiteful. One may see hundreds of them flying about the sweetmeat stalls, like wasps in the fruit shops in England; and the vendor drives them away with a whisk—a piece of palm leaf in a cloth—and is very rarely stung. If one, however, be incautiously touched the sting is very suddenly given and very sharp; its pain is intense, and it induces considerable inflammation. They make their nests in the mud walls, and the form of these is just like that of the English hornet.

"Yesterday I was drying some sugar in the sun, and this attracted a large number of them. My man killed many, throwing down their bodies on the spot, when the ants appeared to carry off the carcasses; but not only did the ants so employ themselves, for the hornets also alighted, and carried off their dead brethren as food.

"The ants (*Ecophylla smaragdina*) appear to be naturally very destructive to these insects. I have seen the hornets trying to carry off their tiny tormentors. Again and again have they darted at them; but it invariably ended in the hornet quietly sitting down among his enemies to be bitten or stung to death, and then carried off in triumph to be eaten by them, or in his falling to the ground with two or three ants hanging on, when his fate was equally certain. One of these insects stung me on the thumb, but by sucking the place for about a quarter of an hour I drew out the poison, and the pain and swelling were afterwards very slight."

August 20th, 1863.—"This evening, having prepared two large squibs filled with damp gunpowder, I proceeded to take two nests, one of *Vespa orientalis*, and one of *Vespa cincta*, both in similar situations. Having lighted the touch-paper, the end was placed at the mouth of the hole, and wet clay was plastered around. The dense smoke and intense heat thus killed every perfect insect in the nest, which I shortly dug out for the purpose of examination. One nest was buried forthwith in a hole previously prepared, and the one taken to be set up was that of *Vespa orientalis*, to which all the succeeding remarks will refer.

"Both nests were constructed of earth tempered with water, and I could trace no sign of gluten of any kind in them. In the nest prepared by me were seven ranges of cells, and at the time of taking it from 400 to 500 hornets were at home. Although I took out every perfect insect, there were from 40 to 50 nearly hatched by 5 A.M. next morning, showing with what enormous rapidity they increase. The nest was placed under a large wire dish cover, and a nest of the yellow ant before referred to was placed with them, so that every young hornet was destroyed as soon as born."

July 1st, 1864.—"Benares. As a boy, when in England, I have seen a hornet carry off a fly sitting on a door handle, and to-day I saw one pounce on a small honey bee deep in the pollen of a flower, and taking him off, sit down and eat him quietly, and from the number hovering about flowers, this would seem to be a favourite food."

July 19th, 1864.—"Benares. Watched hornets catching and eating the workers of termites, whose galleries I had just destroyed on the bark of a tree, when, in consequence, the blind insects were running wildly about."

August 19th, 1864.—"Watched them more narrowly and carefully. Saw that one caught at least ten termites, one after the other, and made them all up into a ball with its jaws, when the said ball was taken away, evidently to feed the young larvæ with a rich and juicy morsel, which, however, would be strongly tinctured with acid."

APPENDIX.

SYNOPSIS OF SPECIES OF *Vespidæ* IN THE NATIONAL COLLECTION.

The accompanying table is a synopsis of most, if not all, of the species of *Vespidæ* in the national collection. There are, of course, many more genera of aculeate *Hymenoptera* represented there, but the following represent the true *Vespidæ* occurring both in the old and new world, but the larger proportion of species, especially as regards the hornets, would appear to be met with in the former. The distinction in colour and in size between so-called "hornets" and "wasps" would appear to hold good not only in England, but in most countries of the world wherever these insects occur. Some of the species of *Vespidæ* in the collection at the British Museum are still unnamed, and several specimens are overcrowded, the great number of those of *Vespa orientalis* having caused them to become mixed with those of *Vespa crabro*. I have been unable to discover that *Vespa crabro* occurs in Bible lands, or indeed in any part of Asia or Africa, though it is recorded in a catalogue of American *Hymenoptera*, and two specimens in the British Museum are labelled "New York."

OLD WORLD SPECIES.

WASPS.

1	<i>Vespa vulgaris</i>	} Europe, most of them also British.
2	" <i>germanica</i>	....	....	....
3	" <i>rufa</i>	....	....	....
4	" <i>arborea</i>	....	....	....
5	" <i>sylvestris</i>	....	....	....
6	" <i>saxonica</i>	....	....	....
7	" <i>norvegica</i>	....	....	....
8	" <i>media</i>	....	....	....
9	" <i>Lewisii</i>	Japan.
10	" <i>bellicosa</i>	Java.
11	" <i>flaviceps</i>	India.
12	" <i>structor</i>	"

Also three unnamed species of wasps from N. India and Persia (13, 14, 15). One or more of these may be the same as the named European kinds.

HORNETS.

1	<i>Vespa analis</i>	....	....	....	India, China.
2	" <i>auraria</i>	....	....	....	N. India.
3	" <i>basalis</i>	....	....	....	India.
4	" <i>tyrannica</i>	....	....	....	Singapore.
5	" <i>bicolor</i>	....	....	....	India, China.
6	" <i>velutina</i>	....	....	....	India, Java, China.
7	" <i>crabro</i>	....	....	....	Europe.
8	" <i>cincta</i>	....	....	....	Batavia, Bangkok, Ceylon.
9	" <i>orientalis</i>	....	....	....	{ Arabia, Gwalior, Persian Gulf, Muscat, Bible lands.
10	" <i>vivax</i>	....	....	....	North India.
11	" <i>obliterata</i>	....	....	....	"
12	" <i>deusta</i>	....	....	....	Philippine Islands.
13	" <i>mandarina</i>	....	....	....	N. China.
14	" <i>crabroniformis</i>	....	....	....	"
15	" <i>ducalis</i>	....	....	....	"
16	" <i>affinis</i>	....	....	....	E. Indies, Formosa.
17	" <i>luctuosu</i>	....	....	....	Philippine Islands.
18	" <i>nigripennis</i>	....	....	....	"
19	" <i>Philippinensis</i>	....	....	....	"
20	" <i>Bellona</i>	....	....	....	Yunan.
21	" <i>Japonica</i>	....	....	....	Hakodadi.
22	" <i>simillima</i>	....	....	....	"

NEW WORLD SPECIES.

WASPS.

1	<i>Vespa sulphurea</i>	....	....	....	California.
2	„ <i>arenaria</i>	....	....	....	New York, Vancouver.
3	„ <i>cuneata</i>	....	....	....	Mexico.
4	„ <i>diabolica</i>	....	....	....	S. America.
5	„ <i>vidua</i>	....	....	....	N. America.
6	„ <i>borealis</i>	....	....	....	Nova Scotia.
7	„ <i>Koreensis</i>	....	....	....	Korea.
8	„ <i>dorylloides</i>	....	....	....	Java, India.
9	„ <i>maculata</i>	....	....	....	} U. States, Canada, New- foundland, New York, Vancouver, Massachu- setts.

Also two unnamed species from Mexico, and two from British Columbia, one from Hudson's Bay, one from U. States (10, 11, 12, 13, 14, 15).

HORNETS.

1	<i>Vespa carolina</i>	....	....	....	N. America
2	„ <i>crabro</i>	....	....	....	New York.

November 26th, 1900.

F. A. W.

ORDINARY MEETING.*

THEOPHILUS G. PINCHES, ESQ., LL.D., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following elections took place :—

LIFE MEMBER :—Colonel A. W. C. Bell, India Staff Corps.

ASSOCIATE :—Rev. H. D. Griswold, Lahore, India.

The following paper was then read by the Secretary in the absence of the Author :—

TIME DIVISIONS OF THE ICE AGE. By WARREN UPHAM, Esq., M.A., F.G.S.A., Secretary of the Minnesota Historical Society, St. Paul, Minn.

IN a former paper, on the "Causes of the Ice Age," published in the *Journal of the Transactions of the Victoria Institute* (vol. xxix, 1897, pp. 201-223), my concluding words stated my belief that the Ice age was "essentially continuous and single, with important fluctuations, but not of epochal significance, both during its advance and decline." This view is consistent with recognition and emphasis of its time divisions, indicated by oscillations of the boundaries of glaciation and by diverse conditions of drift deposition; but these divisions seem to me to merit designation as stages, rather than as epochs, of geologic time. Numerous and well marked stages of the Glacial period have been distinguished, and may be correlated in the same succession, being therefore in all probability of nearly contemporaneous duration, in North America and Europe.

American glacialists have found it convenient to give to the comparatively short closing part of the Ice age a dis-

* 15th April, 1901.

tinctive name, "the Champlain epoch," referring to the occurrence of fossiliferous marine beds overlying the glacial drift in the basin of Lake Champlain. It was the time of land depression from the high epeirogenic uplift that had caused the snow and ice accumulation. Thereby a temperate climate, warm in the summers, was restored on the borders of the ice-sheet, which retreated rapidly, though waveringly. More vigorous glacial currents were then produced by the marginal melting and increased steepness of the ice-front, favouring the formation of many retreatal moraines of very hummocky and boulder-bearing drift.

The continuous Glacial period or Ice age may be therefore regarded as divisible into two chief parts or stages, which were of quite unequal length, the first being probably at least ten times as long as the second. The first or Glacial stage was marked by high elevation of the drift-bearing areas, alike in America and Europe, and by their envelopment beneath vast ice-sheets, which varied much in their extent during successive long periods of alternating advance and recession. The second or Champlain stage was distinguished by the subsidence of these areas and the departure of the ice with abundant deposition of both glacial and modified drift. Epeirogenic movements, first of great uplift and later of depression, were thus the basis of the chief time divisions of this period. One was the time mainly characterized by the extension and culmination of glaciation; the other included its wavering decline and end. Each of these periods, as they may be named (although merely noting the general growth and general wane of the ice-sheets) was divided into stages, marked in the glacial epoch by fluctuations of the predominant ice accumulation, and in the Champlain period by successively diminishing limits of glaciation, by retreatal moraines, and by glacial lakes temporarily held in basins that sloped toward the departing ice.

Exploration of the European glacial drift by two Americans, Professor H. Carvill Lewis in the British Isles and Professor R. D. Salisbury in Germany, laid the foundations for determining the geologic equivalency of the successive parts of the North American and European drift series. Salisbury especially noted that the marginal moraines of northern Germany lie, as in the United States, at some distance back from the limits of the drift.

Studies by many observers have shown that on both continents the border of the drift along the greater part

of its extent was laid down as a gradually attenuated sheet; that the ice retreated and the drift endured much subaerial erosion and denudation; that renewed accumulation and growth of the ice-sheet, but mostly without extending to its earlier limits, were followed by a general depression of these burdened lands, after which the ice again retreated, apparently at a much faster rate than before, with great supplies of loess from the waters given off during its melting; that moderate re-elevation ensued; and that during the farther retreat of the ice-sheet prominent moraines were amassed in many irregular, but roughly parallel, belts, where the front at successive times paused or readvanced under secular variations in the prevailing temperate and even warm climate, by which, between the times of formation of the moraines, the ice was rapidly melting away.

Such likeness in the sequence of glacial conditions undoubtedly implies contemporaneous stages in the glaciation of the two continents. It also seems to me more reasonably interpreted as a series of phases in the work of a single ice-sheet on each area than as records of several separated and independent epochs of glaciation, differing widely from one another in their methods of depositing drift. The latter view, however, is held by James Geikie, Penck, De Geer, and others in Europe; and it has been regarded as the more probable also for America by Chamberlin, Salisbury, McGee, and others.

Under this view Geikie has distinguished and named no less than eleven stages or epochs, glacial and interglacial.* These divisions of the Ice age are as follows: 1, The Scanian or first glacial epoch; 2, The Norfolkian or first interglacial epoch; 3, The Saxonian or second glacial epoch; 4, The Helvetian or second interglacial epoch; 5, The Polandian or third glacial epoch; 6, The Neudeckian or third interglacial epoch; 7, The Mecklenburgian or fourth glacial epoch; 8, The Lower Forestian or fourth interglacial epoch; 9, The Lower Turbarian or fifth glacial epoch; 10, The Upper Forestian or fifth interglacial epoch; and, 11, The Upper Turbarian or sixth glacial epoch.

The earliest application of such geographic names to the

* *Journal of Geology*, vol. iii, pp. 241-269, April-May, 1895. In the third edition of his *Great Ice Age*, the same time divisions had been recognized and fully described, but without distinctive names.

successive stages and formations of the Ice age was by Chamberlin in his two chapters contributed to the third edition of Geikie's *Great Ice Age*, in 1894, naming the Kansan, East Iowan, and East Wisconsin formations. For the second and third he afterwards adopted the shorter names, Iowan and Wisconsin. Chamberlin correlates, with a good degree of confidence, his Kansan stage of maximum North American glaciation with the maximum in Europe, which is Geikie's Saxonian epoch; the Iowan as the European Polandian; and the Wisconsin or moraine-forming stage of the United States as the Mecklenburgian, which was the stage of the "great Baltic glacier" and its similarly well developed moraines.* According to the law of priority, the names of the Kansan, Iowan, and Wisconsin formations and stages should also be applied to these European divisions of the Glacial series, for the studies of Geikie and Chamberlin show them to be in all probability correlative and contemporaneous.

Differing much from the opinions of Geikie, and less widely from those of Chamberlin, concerning the importance, magnitude, and duration of the interglacial stages, but agreeing with Dana, Hitchcock, Kendall, Falsan, Holst, Nikitin, and others, in regarding the Ice age as continuous, with fluctuations but not complete departure of the ice-sheets, my view of the history of the Glacial period, comprising the Glacial epoch of ice accumulation and the Champlain epoch of ice departure, may be concisely presented in the following somewhat tabular form. The order is that of the advancing sequence in time, opposite to the downward stratigraphic order of the glacial, fluvial, lacustrine, and marine deposits. It should be added that this tabulation, so far as it pertains to North America, is supplied mainly from the field work and correlations of Professor T. C. Chamberlin, in charge of the Glacial Division of the United States Geological Survey, of his assistant, Mr. Frank Leverett, of Professor Samuel Calvin, state geologist of Iowa, and of Dr. George M. Dawson, director of the Geological Survey of Canada. Their special studies and conclusions have been published at various times during the past five years, mostly in the *Journal of Geology* and the *American Geologist*.

* *Journal of Geology*, vol. iii, pp. 270-277, April-May, 1895.

EPOCHS AND STAGES OF THE GLACIAL PERIOD.

I. *The Glacial Epoch.*

1. THE CULMINATION OF THE OZARKIAN EPIIROGENIC UPLIFT, in the later part of the Lafayette period, the earliest of the Quaternary era, affecting both North America and Europe, raised the glaciated areas to so high altitudes that they received snow throughout the year, and became deeply ice-enveloped. Submerged valleys and fjords show that this elevation was 1,000 to 4,000 feet above the present height.*

Rudely chipped stone implements and human bones in the plateau gravel of southern England, 90 feet and higher above the Thames, and the similar traces of man in early Quaternary sand and gravel deposits of the Somme and other valleys in France, attest man's existence there before the maximum stages of the uplift and of the Ice age. America also had been already peopled, doubtless by preglacial migration from Asia across a land area in the place of the shallow Bering Sea.

The accumulation of the ice-sheets, due to snowfall on their entire areas, was attended by fluctuations of their gradually extending boundaries, giving the Scanian and Norfolkian stages in Europe, the Albertan formation of very early glacial drift and accompanying gravels, described by Dawson, in Alberta and the Saskatchewan district of western Canada, and an early glacial advance, recession, and re-advance, in the region of the Moose and Albany Rivers, south-west of Hudson Bay. In that region, and westward on the Canadian plains to the Rocky Mountains, there seem to thus have been three stages recognizable in the glacial results of the epeirogenic uplift, namely, the ALBERTAN STAGE of early ice accumulation, the SASKATCHEWAN STAGE of abundant melting and considerable retreat, and the ensuing great Kansan growth of the continental icefields.

A deposit of glacial drift, the lowest and oldest observed

* The amount of uplift as compared with the present level of the ocean was greater than above stated, as shown by Professor J. W. Spenser for the American side, and by Professor Edward Hull for the eastern side of the Atlantic, in the latter case amounting to 6,000-7,000 feet, at which depth the submerged river-valleys (such as the Loire, the Adour, the Tagus, and the Congo) open out on the floor of the abyssal ocean. See *Trans. Vict. Inst.*, vols. xxx, xxxi, and xxxii.—
EDITOR.

in the Mississippi river basin, probably of Albertan age, stretches south at least to southern Iowa, where it is overlain by interglacial beds, inclosing peat, well displayed in sections at Afton, Iowa. The Aftonian interglacial stage, especially notable for its extensive buried forest bed, containing trunks of hardy northern coniferous trees, has been ascertained to be earlier than the Kansan readvance of glaciation. It is therefore probably equivalent with the Saskatchewan stage of Canada, which name it should then displace according to the rule of priority.

2. **KANSAN STAGE.**—Farthest extent of the ice-sheet in the Missouri and Mississippi river basins, and in northern New Jersey. The Saxonian stage of maximum glaciation in Europe.

Area of the North American ice-sheet, with its development on the arctic archipelago, about 4,000,000 square miles; of the European ice-sheet, with its tracts now occupied by the White, Baltic, North, and Irish Seas, about 2,000,000 square miles.

Thickness of the ice in northern New England and in central British Columbia, about one mile; on the Laurentide highlands, probably two miles; in Greenland, as now, probably one mile or more, with its surface 8,000 to 10,000 feet above the sea; in portions of Scotland and Sweden, and over the basin of the Baltic Sea, half a mile to a mile.

3. **HELVETIAN STAGE.**—Recession of the ice-sheet from its Kansan boundary northward about 500 miles to Barnesville, Minnesota, in the Red River valley; 250 miles or more in Illinois, according to Leverett, but probably little between the Scioto River, in Ohio, and the Atlantic coast, the maximum retreat of that portion being 25 miles or more in New Jersey. Deposition of the Buchanan gravels and sands, as named by Calvin in Iowa, during the retreat of the Kansan icefields; and time of the Yarmouth weathered zone and erosion, noted by Leverett in Iowa and Illinois. A cool temperate climate and coniferous forests up to the receding ice border in the upper Mississippi region. Much erosion of the early drift.

The greater part of the drift area in Russia permanently relinquished by the much diminished ice-sheet, which also retreated considerably on all its sides.

During this stage the two continents probably retained mainly a large part of their preglacial altitude. The glacial recession may have been caused by the astronomic cycle

which brought our winters of the northern hemisphere in perihelion between 25,000 and 15,000 years ago.*

4. IOWAN STAGE.—Renewed ice accumulation, extending again from central Minnesota into Iowa, to a distance of 350 miles or more from its most northern indentation by the Helvetian retreat, and readvancing about 150 miles in Illinois, while its boundary eastward from Ohio probably remained with little change.

Previous to the farthest extension of this glaciation in Iowa, on the west side of the Wisconsin driftless area, the ice-lobe east of that area advanced from Illinois into the edge of south-eastern Iowa, giving an Illinoian stage of glaciation which somewhat antedated the maximum of the Iowan, though not probably by a wide difference of time. Between the retreat of the Illinoian ice-lobe and the deposition of the Iowan loess, Leverett notes interglacial deposits and a zone of weathering, the records of his Sangamon stage.

Iowan time seems correlative with the Polandian stage of renewed growth of the European ice-sheet, probably advancing its boundaries in some portions hundreds of miles from the Helvetian retreat.

II. *The Champlain Epoch.*

5. CHAMPLAIN SUBSIDENCE; NEUDECKIAN STAGE.—Depression of the ice-burdened areas mostly somewhat below their present heights, as shown by fossiliferous marine beds overlying the glacial drift up to 300 feet above the sea in Maine, 560 feet at Montreal, 300 to 400 feet from south to north in the basin of Lake Champlain, 300 to 500 feet southwest of Hudson and James Bays, and similar or greater altitudes on the coasts of British Columbia, the British Isles (1,200 feet maximum), Germany, Scandinavia, and Spitzbergen.

Glacial recession from the Iowan boundaries was rapid under the temperate (and in summers warm or hot) climate, belonging to the more southern parts of the drift-bearing areas when reduced from their great preglacial elevation to their present height or lower. The finer portion of the englacial drift, swept down from the icefields by the

* *American Geologist*, vol. xv, pp. 201, 255, and 293, March, April, and May, 1895.

abundant waters of their melting and of rains, was spread on the lower lands and along valleys in front of the departing ice, as the loess of the Missouri, the Mississippi, and the Rhine. Marine beds reaching to a maximum height of about 375 feet at Neudeck, in western Prussia, give the name of this stage.

6. WISCONSIN STAGE.—Moderate re-elevation of the land, in the northern United States and Canada advancing as a permanent wave from south to north and north-east; continued retreat of the ice along most of its extent, but its maximum advance in southern New England, with fluctuations and the formation of prominent marginal moraines; great glacial lakes on the northern borders of the United States.

The Mecklenburgian stage in Europe. Conspicuous moraine accumulations in Sweden, Denmark, Germany, and Finland on the southern and eastern margins of the great Baltic glacier. No extensive glacial readvance between the Iowan and Wisconsin stages, either in North America or Europe.

Later American stages, all of minor importance and duration in comparison with the preceding, cannot probably be shown to be equivalent with Geikie's European divisions in the same time.

During the general glacial recession, slight oscillations of the ice border occurred, with temperate climate nearly as now, at Toronto and Scarborough on the north shore of Lake Ontario, indicated by interbedded deposits of glacial drift and fossiliferous stratified gravel, sand, and clay.* Although the waning ice-sheet still occupied a vast area on the north-east, and twice readvanced, with deposition of much boulder clay or till, during the formation of this fossiliferous drift series, the climate then, determined by the Champlain low altitude of the land, by the proximity of the large glacial Lake Algonquin, succeeding the larger Lake Warren, and by the eastward and north-eastward surface atmospheric currents and courses of all storms, was not less mild than now. The trees of which the wood is found in the interglacial Toronto beds now have their most northern limits in the same region.

Full expansion of the glacial Lake Iroquois, in the basin of Lake Ontario and northward, ensued, with outflow at

* *American Geologist*, vol. xv, pp. 285-291, May, 1895.

Rome, New York, to the Mohawk and Hudson Rivers. In the meantime a gradual re-elevation of the Rome outlet from the Champlain subsidence lifted the surface of Lake Iroquois in its western part from near the present lake level at Toronto to a height there of about 200 feet, finally holding this height many years, with the formation of the well developed Iroquois beach. The glacial and lacustrine geology of the vicinity of Toronto is therefore perhaps of greater interest than of any other locality in America; but its remarkable features of alternating glacial and interglacial formations seem to me wholly referable to the Champlain epoch of wavering departure of the ice-sheet.

STAGES OF PROGRESS OF PRIMITIVE MAN CORRELATED WITH THE STAGES OF THE ICE AGE.

To many members of the Victoria Institute, the history of the Ice age derives its greatest interest from its relation to the earliest traces of man's existence. We are able now, as I believe, to discern a reliable parallelism of the stages of progress of Palæolithic men, using chipped stone implements, with the stages of the Glacial period which have been here reviewed. This correlation has come from my examination of the Somme river valley and its famous implement-bearing and fossiliferous sand and gravel beds, during the summer of 1897. There, between fifty and thirty years earlier, the great geologic antiquity of man had been first fully determined by Boucher de Perthes, Rigollot, Falconer and Prestwich, Evans, Lyell, Lubbock, Tylor, Gaudry, Andrews, and other archæologists and geologists.

The men of the Somme gravel deposits belonged, if I rightly interpret the geologic record, to the early part of the Glacial period, previous to its culmination; the inhabitants of the caverns of Dordogne, in south-western France, possessing greater skill in the manufacture of flint implements and adding others of bone and horn, hunting herds of wild horses and reindeer, seem correlative with the maximum stage of glaciation; and later these people spread northward, following the retreating ice-sheet to the boundary of its Mecklenburgian stage.

De Mortillet and Cartailhac, as archæologists, divide the Palæolithic period of France into four epochs or stages, succeeding one another as follows: 1, Acheulian, named from St. Acheul, a suburb of Amiens in the Somme valley

(or Chellean, from Chelles near Paris); 2, Mousterian, from Le Moustier in Dordogne; 3, Solutrian, from Solutré in Burgundy; and, 4, Magdalenian, from the caves of La Madeleine in Dordogne. These time divisions are characterized by increasing variety and excellence of the implements made, and by concomitant changes of the fauna. The implements found in the Somme valley are referable only to the earliest stage, which had at first a mild and moist climate, changing afterward to severe cold, with thick ice on the rivers in winter, broken and floating large blocks of rock in spring.

Let us now examine the geologic origin and deposits of this valley in their relation to these stages of archæologic development, comparing both records with the ascertained history of the Ice age in the British Isles and northern Europe, and with estimates of its duration and that of the Postglacial period.

Above Amiens the Somme basin has been eroded to an undulating surface of broad but low hills and ridges, and is drained by several streams which converge in and near that city, being the sources of the supply of the Pleistocene gravels extensively excavated at St. Acheul, St. Roch, and Montiers, which are situated respectively in the south-eastern, western, and north-western environs of the city. From Amiens to the sea, a distance of about forty miles, the valley is troughlike, with a bottomland from a half-mile to a mile and a half in width for nearly twenty-five miles, extending down to Abbeville, and thence widening to three or four miles at its mouth, inclosed usually by very gentle or moderately steep slopes, but in a few places bordered by a steeper or precipitous bluff formed through direct undermining by the river at some time during the slow process of the valley erosion.

The river at Amiens is about 65 feet above the mean tide sea level; at Montiers, 58 feet; and at Abbeville, about 15 feet, the high tides having formerly reached above the city, until held back by the engineering improvements of the river course which now restrict its once meandering and dividing waters to a single straight canal along its next nine miles. The bottomland is mostly no more than 2 to 5 feet, and in its highest parts about 10 feet, above the river in its ordinary low water stage. Along nearly all the distance below Amiens it has large tracts of peat, from 10 to 30 feet in depth, thus extending far beneath the level of the

river, or even, in the vicinity of Abbeville, beneath the sea level. During many centuries the peat has been excavated for fuel, and many small ponds occupy these hollows, and in other places mark abandoned parts of the earlier river channel. Since the close of the Glacial period, the Somme valley has received too little alluvium to keep pace with the slight epirogenic depression which has been in progress; but at the mouth it has been filled by the coastwise drift of sand from the marine shore erosion, and by the muddy sediments deposited from inflowing tides.

On each side of the valley the upland extends far away in a great plainlike expanse, as seen in any wide view, though everywhere somewhat undulating, with an elevation of 150 to 250 feet above the river and its bottomland. Rounded outlines descend to the Somme and to the ramifying tributary streams, betokening a prolonged period of subaerial denudation by rains, rills, brooks, and the main river. The Somme, lying south of the European glaciated area, has in its gravel deposits only materials derived from its own drainage basin, which consists of approximately horizontal Cretaceous strata of chalk, with concretionary flint nodules, and here and there overlying remnants of Eocene sand and clay, locally hardened to sandstone and shale. Residuary clay and loam, left in the process of denudation, covers the upland surface to a depth varying generally from 2 or 3 to 6 or 8 feet.

The erosion of the Somme valley to essentially its present width and depth seems to me attributable to the work of the river during the very long Miocene and Pliocene periods, and to have been completed nearly as now before the great epirogenic uplift causing the Ice age, which probably raised the British Isles and northern France at least 1,500 to 2,000 feet higher than now, while south-western France and the Spanish peninsula are known to have been elevated much more. The record of the Glacial period here appears, in my view, to be almost wholly represented by deposition of the gravel and sand on the lower flanks of the valley slopes, chiefly adjoining the mouths of tributaries; and it is in the older of these gravel beds that the flint implements occur, indicating the sojourn of men there at the beginning and through the early part of the Ice age.

In referring the valley erosion thus to middle and late Tertiary times, I agree with Alfred Tylor, whose careful discussions of this valley and those of southern Britain have

hitherto received less attention than they deserve, probably because they differ from the earlier published views of Prestwich, Lyell, Lubbock, Evans, and others, who ascribe the excavation of the lower part of the Somme valley to river action during the Palæolithic period, while the later gravel beds were being deposited, or in the intervals of such deposition and afterward.* The Tertiary erosion extended

* Without attempting reference to all of the multitude of papers and books relating to the evidences of primitive man in the Somme valley, citation of some which are more important or comprehensive may be noted as follows :—

- Boucher de Perthes, *Antiquités Celtiques et Antédiluviennes*, vol. i, p. 628, with 80 plates (1,600 figures), 1847 ; vol. ii, p. 511, with 26 plates (500 figures), 1857 ; vol. iii, p. 681, with 12 plates (104 figures), 1864.
- Sir Joseph Prestwich, *Proc. Roy. Soc.*, 1859 ; *Phil. Trans.*, 1860, 1864 ; many later papers, especially in *Quart. Jour. Geol. Soc.* ; and his *Geology*, vol. ii, 1888.
- Sir Charles Lyell, *Brit. Assoc. Report*, 1859, Part 2, pp. 93–95 ; *The Geological Evidences of the Antiquity of Man*, 1863, chapters vii and viii.
- Sir John Lubbock, numerous papers, 1861–1864 ; *Prehistoric Times*, 1865, 1869, chapter xi.
- Sir John Evans, *Archæologia*, 1862, p. 28, with four plates ; numerous other papers, and *Ancient Stone Implements, Weapons, and Ornaments of Great Britain*, 1872 (exceedingly useful in its fulness of bibliographic references).
- Professor W. Boyd Dawkins, numerous papers, 1862 and onward ; *Cave Hunting, Researches on the Evidence of Caves respecting the Early Inhabitants of Europe*, 1874.
- Alfred Tylor, *Quart. Jour. Geol. Soc.*, vol. xxii, 1866, pp. 463–468 ; vol. xxiv, 1868, pp. 103–125, with two plates (map of Amiens and vicinity and 13 sections), and 13 figures (sections, profiles, and a map), in the text ; and vol. xxv, 1869, pp. 57–100, with six plates (abstract and discussion of this paper in vol. xxiv, pp. 455, 456).
- Dr. Edmund Andrews, *Am. Jour. Sci.*, second series, vol. xlv, pp. 180–190, March, 1868.
- Professor James Geikie, *The Great Ice Age and its relation to the Antiquity of Man*, 1874, 1877, 1894 ; *Prehistoric Europe*, 1881.
- Professor Gabriel de Mortillet, *Matériaux pour l'Histoire Primitive et Naturelle de l'Homme*, 1865 and onward ; *Le Préhistorique*, 1883.
- Emile Cartailhac, *Matériaux*, 1865 and onward ; *La France Préhistorique*, 1889.
- J. Ladrrière, *Annales de la Société Géologique du Nord*, vols. xviii–xx (summarized in Geikie's *Great Ice Age*, third ed., 1894, pp. 629–637).
- Albert Falsan, *La Période Glaciaire étudiée principalement en France et en Suisse*, 1889.

through a duration of probably one or two million years, which would permit the valley to have its origin chiefly by rock solution, as the deepening of the excavation to 200 or 250 feet would be at an average rate of no more than an eighth or a third of an inch for each century.

When the more rainy and snowy climate of the Glacial period caused larger floods of the streams, especially during the spring months, the residuary loam and gravel mantling all the surface were subjected to exceptional denudation. Considerable material was swept down every stream course and ravine, until, on debouching into the main valley, the flood could expand more widely and so lose its velocity and transporting capacity. The gravel and sand were then deposited along the border of the broad bottomland and in alluvial fans upon the lower part of the inclosing slopes wherever tributary streams or the rills of rains and snow-melting descended.

Instead of forming continuous, level-topped terraces, at successive heights, up to nearly equal vertical limits on each side of the valley, like the terraces of modified drift on the Connecticut River along its upper half where it is the boundary between New Hampshire and Vermont, or like the usually less numerous terraces of this kind in most valleys of glaciated countries, the Somme gravel and sand are of less amount, and have gentle or steep slopes toward the centre of the valley, presenting a terrace escarpment only where marginal parts of these deposits have been later carried away by the undermining action of the streams which brought them, or of the main river. Along the Connecticut River a wide flood-plain of modified drift was built up, filling the valley to the level of the highest continuous terraces, 100 to 200 feet above the river; and the terraces are remnants of that flood-plain, and of the lower temporary levels occupied and abandoned by the river during its process of removal of the greater part of that original deposit of the modified drift. In the Somme valley, the supply of material was less than that set free from the melting North American ice-sheet, and it was insufficient to build up a flood-plain in any part of this valley below Amiens, though at many places it formed extensive deposits on either side, which sometimes reach, with slopes nearly like those inclosing the valley, from the bottomland up to heights of 50 to 100 feet; and patches of similar gravel and sand occasionally are observable also at greater heights, nearly to the verge of the uplands.

Levelling done for Mr. Alfred Tylor by the railway engineer, M. Guillom, gave the altitudes of the bottom and the original surface of the large St. Acheul gravel pits (two are each a quarter of a mile long), the richest in flint hatchets among the numerous excavations in and near Amiens, as respectively 140 and 160 feet above the sea, or about 75 and 95 feet above the river, which is a half-mile distant to the north. The pits are not at the upper limit of the gravels, for Tylor remarks, "The sections near Amiens show the valley gravel continuous from a height of 200 feet, at St. Acheul . . . to the River Somme (coated over by a nearly uniform warp of loess), and laid at a low gradient not exactly parallel to the surface of the chalk, but rather in its concavities." These higher gravel beds, however, having no excavation, it is not known whether they contain stone implements and fossil bones; but generally, according to Ladrière, these are absent or rare in the highest beds of the valley gravels throughout northern France. In the vicinity of Montiers, one to two miles north-west of Amiens, nine gravel pits, containing worked flints and bones of extinct animals nearly as at St. Acheul, are shown by Tylor's description and map to range in height from 77 to 155 feet above the sea, or from 17 to 95 feet above the Somme, the upper limit of the excavations being the same in relation to the river as near St. Acheul. The distinction of upper and lower gravel deposits, which Prestwich and Lyell made prominent in their writings, was pronounced by Tylor, as it seems to me with sufficient reasons, to be seldom definitely observable, the series, where developed at considerable heights, being usually continuous thence down nearly or quite to the bottomland and river.

Ladrière, who in 1875 and ensuing years has extensively examined and described the Pleistocene valley deposits of the Seine, Somme, and other river basins of a wide region extending northward into Belgium, divides these deposits into three somewhat similar series, successive in age and stratigraphic order, each of which can be traced from the bottoms of the valleys up to the plateaus, though not to their greatest heights. These series, each consisting of a regular sequence of gravel, sand, loam or loess, etc., representing three distinct stages of the Pleistocene period, are doubtless to be correlated with stages of advancing glaciation, interrupted by times of decrease and recession of the European ice-sheet. The researches of Ladrière thus

present a record of climatic changes south of the glaciated area, by which geologists may very satisfactorily connect the evidences of primitive man in France with the time divisions of the Glacial period. His detailed notes of each of the three Pleistocene series and stages recognizable in these valleys are fully quoted by Professor James Geikie in the third edition of the *Great Ice Age* (1894, pp. 630-632), from which it appears that flint implements of the Acheulian or Chellean type occur throughout the lower series; that such implements are also found in the middle series, but probably, as Ladrrière thinks, through derivation from the older and stratigraphically lower beds; and that the infrequent implements found in the upper series are of the later developed Mousterian type.

We may infer, additionally, that while the still later Solutrian and Magdalenian types of implements were being developed, in the progress of the Palæolithic period, more moderate climatic conditions prevailed in northern France, with no important contribution to the valley gravels. These threefold deposits therefore appear referable to three distinct parts of the Ice age, probably the Albertan, Kansan, and Iowan stages of glacial advance, or rather to the European representatives of these stages. During the interval that ensued, previous to the Champlain subsidence and general recession of the ice-sheet, the Palæolithic men of western Europe passed through their Solutrian and Magdalenian stages; and shortly afterward, about the time of formation of the Wisconsin or Mecklenburg moraines, those men, destitute of metals, of agriculture, or of domestic animals, were practically crowded off from Europe, famished by extinction of the large species of game, and driven out, exterminated, or absorbed, by the immigrating Neolithic people. The invaders, though ignorant of the most useful metals, brought wheat and barley, cattle, sheep, goats, and swine, and, most significant in linking them with later written history, the Indo-European or Aryan languages. Their arrival and settlement, and the end of the Palæolithic period, preceded the departure of the ice-sheet from Scotland and Scandinavia, where no Palæolithic types of stone implements are found, although Neolithic types abound and are collected in immense numbers.

Sections of the Somme gravels at Menchecourt, Mautort, and other localities near and below Abbeville carry back the Acheulian stage of Palæolithic time quite to the beginning

of the Ice age. The many other sections in this valley display ice-floated sandstone blocks and deformations of the strata attributable to the melting of masses of river ice; but these disturbed conditions were absent when human implements and the bones of the mammoth, the woolly rhinoceros, wild horse, urus, stag, reindeer, lion, and hyæna were mingled in the Menchecourt gravel and sand beds, which are about 20 to 30 feet above the sea level, under subsequent deposits of 20 feet of loam and clay, the surface being about 50 feet above the sea or 40 feet above the river. The sections of Menchecourt, Mautort, etc., are further distinguished from others at higher levels near Abbeville, and from all at both low and high levels along the upper part of the valley, by their containing marine shells. Lyell writes of their mode of occurrence at Menchecourt as follows:—

In the lowest beds of gravel sand and in contact with the chalk, flint hatchets, some perfect, others, much rolled, have been found; and in a sandy bed in this position some workmen, whom I employed to sink a pit, found four flint knives. Above this sand occur beds of white and siliceous sand, containing shells of the genera *Planorbis*, *Limnea*, *Paludina*, *Valvata*, *Cyclas*, *Cyrena*, *Helix*, and others, all now natives of the same part of France, [except *Cyrena* [*Corbicula*] *fluminalis*, which no longer lives in Europe, but inhabits the Nile and many parts of Asia, including Cashmere, where it abounds. No species of *Cyrena* is now met with in a living state in Europe. Mr. Prestwich first observed it fossil at Menchecourt, and it has since been found in two or three contiguous sand-pits, always in the fluvio-marine bed.

The following marine shells occur mixed with the fresh-water species above enumerated: *Buccinum undatum*, *Littorina littorea*, *Nassa reticulata*, *Purpura lapillus*, *Tellina solidula*, *Cardium edule*, and fragments of some others. Several of these I have myself collected entire, though in a state of great decomposition. . . . They are all littoral species now proper to the contiguous coast of France. Their occurrence in a fossil state associated with fresh-water shells at Menchecourt had been noticed as long ago as 1836 by M.M. Ravin and Baillon, before M. Boucher de Perthes commenced the researches which have since made the locality so celebrated. The numbers since collected preclude all idea of their having been brought inland as eatable shells by the fabricators of the flint hatchets found at the bottom of the fluvio-marine sands.

This part of western Europe was then slightly lower than now, indicating, with the absence of ice before noted, that the time represented by these sections preceded the great uplift of this region, which culminated in the maximum European glaciation. But earlier, and probably continuing with increased vertical and geographic extent during the early

part of the Ice age, the general epeirogenic uplift of the continental area bridged the Strait of Gibraltar and the centre of the Mediterranean Sea from Tunis to Sicily and Italy, as shown by Dawkins and Geikie, raising the land in both regions about 2,000 feet higher than now, and affording a passage to the great African mammals. They also crossed where the shallow strait of Dover now is, entering Britain; and during the oncoming and culmination of the Ice age the British Isles were united with the continent by a very broad land surface, reaching far west of the Channel and occupying the basin of the North Sea, and nearly all the area between Scotland and Norway, until the Scandinavian ice-sheet covered that land plain to north-eastern England.

LENGTH OF POSTGLACIAL TIME.

Our estimates of the duration of the Postglacial period are based on computations by Andrews from the shore erosion and beach sand accumulation of Lake Michigan; on his investigation of the age of the peat beds in the Somme valley and of the alluvial deposits of the Tinière, tributary to the Lake of Geneva, which latter had been differently interpreted by Morlot; on the study of the recession of the Falls of St. Anthony, by Professor N. H. Winchell; on that of Niagara Falls, by Gilbert and others; on Dr. Robert Bell's observations of the extent of subaerial erosion of limestone rocks in Canada; and on many other careful studies in both North America and Europe. These estimates concur so well that the duration which they give approximately as between 5,000 and 10,000 years may be confidently accepted as the measure of Postglacial time.

It may be otherwise and better stated that the departure of the ice-sheets on these continents probably occupied some 5,000 years, known as the Champlain epoch; and that it was completed, nearly as now about 5,000 years ago, with remnants of the old ice-sheets lingering ever since in Alaska and Greenland and on the mountainous plateaus of Norway. The incursion of the Neolithic men and the doom of their Palæolithic predecessors belong thus probably 6,000 or 7,000 years ago.

LENGTH OF GLACIAL AND PALÆOLITHIC TIME.

The duration of the Ice age cannot be so reliably determined, but the researches of Geikie, Chamberlin, and many others convince us that on both sides of the North Atlantic

glaciation was approximately synchronous, with parallelism in its beginning, fluctuations, and end, through a period ten to twenty times as long as that which has followed it, or of somewhat such ratio. In other words, the Glacial period, from the time of the Palæolithic men at Menchecourt and St. Acheul to the Neolithic immigration and the not widely later retreat of the ice-sheet in Scotland, Sweden, and Norway, measured probably 50,000 or 100,000 years.

It is therefore right that the Acheulian men should be termed primitive. They had not learned how to use God's gifts. The power of invention, ready to bestow dominion and utilization of animate and inanimate nature, lay dormant and was scarcely beginning to awaken.

The beginning of the human epoch, when our species gained such development of body and mind as to deserve its generic and specific name, *Homo sapiens*, we cannot well designate more closely than to say that it antedated the Ice age. But however long we may estimate the duration of the human species, geology confidently affirms that life began upon our globe in an antiquity a hundred or perhaps even a thousand times more remote, and the beginning of the existence of the earth and of the solar system was again vastly more ancient. The duration of the period of written history, or even of mankind, beginning tens or hundreds of thousands of years earlier, seems like the span of one's hand in comparison with geologic time, which was in the mind of the seer writing of the Creator's work, "Of old hast Thou laid the foundation of the earth."

DISCUSSION.

The CHAIRMAN.—Would any lady or gentleman like to make any remarks on this very interesting paper?

The SECRETARY (Professor HULL).—Mr. Chairman, I wish to move the best thanks of the meeting to the author of this paper, which I am sure you will all concur with me in considering of great interest, and showing a large amount of research and labour in preparation. In writing to me since this paper was in type, the author begged that I would not only read it but that I would also take part in the discussion. I thought it was rather cruel to put two such severe tasks upon me in one evening; but as the Chairman has kindly in part relieved me in the first matter I feel I may, and ought to, meet the wishes of the author.

The paper itself may be divided into three portions:—First, a description of the glacial phenomena of North America, with which he has become familiar both by study and examination in the field. Secondly, the correlation of the glacial deposits and divisions of time of North America with those of Europe and the British Isles; and, thirdly, the question which does not necessarily arise in connection with this subject, although probably too tempting to be resisted, viz., the relation of the appearance of man on the earth to the Glacial epoch itself.

Now as regards the first I have not a word of criticism to offer. I presume that Mr. Warren Upham is as competent an authority on the glacial phenomena of North America as is to be found in that country itself.

With regard to the correlation of the Pleistocene, or glacial deposits of North America with those of Europe and the British Islands, there is certainly room for considerable diversity of opinion.

While I was engaged in the geological survey of the centre and north-west of England—in Lancashire, Cheshire, and other neighbouring portions of England, for a good many years—I made glacial phenomena a special study, and I came to the conclusion that in that part of the British Islands the whole of the glacial deposits may be divided into three successive stages. I have written them down on that board. The British series, as it was developed in Lancashire, Cheshire, Shropshire and the Midlands, consists of three distinct divisions; and I may say they are laid open in a most beautiful section about 150 feet in height, on the banks of the River Ribble, some miles above Preston. The basement division consists of dark red boulder clay, with pebbles and boulders often glaciated; everyone who knows that part of England is familiar with the lower boulder clay. That is succeeded by a series, of perhaps 60 or 80 feet in thickness, of beautifully stratified sands and gravels as distinct as any formation could be from the underlying stiff boulder clay, and those gravels (forming the interglacial series) are again overlain by boulder clay which is more or less laminated, and contains small blocks of rock. This forms the upper boulder clay. [*The Secretary here explained the drawing on the board.*] Now what the relations of these divisions may be to those that Mr. Warren Upham has described is not perfectly clear. Still I think we may correlate them in this way—

first by putting the lower boulder clay as representing the great "Epeirogenic uplift," and the extension of the vast sheets of ice in North America and Europe; then the Champlain subsidence, with stratified and laminated beds which may correspond with our interglacial deposits in England, which also contain marine shells; and then the upper boulder clay, which represents a recurrence of semi-arctic conditions, when the lands were partly submerged so that the water surrounding them was blocked with floating ice and mud carried down by the rivers from the unsubmerged portions; this may be correlated with those upper stages in North America. This may be so. It is not a matter of great importance.

I agree with Mr. Warren Upham that the Glacial period was one great division of geological time; but in different districts there were diversities of climate from time to time, due to oscillations of the land, causing a recurrence of cold and warm climates which may have been very limited in their existence; and, of necessity, extending over considerable geographical areas.

So much with regard to the second part of Mr. Upham's paper.

But now I come to the question of the age of man; and you will have observed that the author assumes, as a sort of settled question, that man preceded the Glacial epoch. In several parts of his paper he makes that assertion, and he founds his view upon the character of the beds (plateau gravels) containing palæolithic implements and the remains of animals in the Ouse and the Somme. Now it might have been supposed that there was some stronger evidence of the pre-existence of man to the Glacial period than the evidence that Mr. Upham has furnished; but not in one single case, in the whole of Europe or America, has a trace of man's existence been found below the only deposits which we have a right to assume were developed and produced by the great ice-sheets of the early Glacial period. The beds of sand and gravel containing implements and extinct fossil remains of the elephant, the rhinoceros, cave bear, etc., are absolutely outside the range of the great boulder clay of the northern parts of Europe and portions of the British Islands. It (the boulder clay) does not come within miles of the places where these works of man are found, and therefore one cannot say what the relationship of the boulder clay is to these remains and accompanying deposits. You observe that all these remains that the author refers to are stated, and truly stated, as occurring in beds of gravel and sand, stratified

gravel and sand; but stratified gravel and sand is not a formation which has originated in great sheets of ice; on the contrary, such beds have been deposited in water. I repeat that evidence that man preceded the Glacial epoch is absolutely wanting. I may refer to the views of, I think, the greatest authority on that subject that perhaps the world has ever produced, the late Sir Charles Lyell. If you turn to his *Antiquity of Man*, published in 1873 (and the evidence he gives has not been materially added to since that period), you will find that he says:—

“One step at least we gain by the Bedford section, which those of Amiens and Abbeville had not enabled us to make. They teach us that the fabricators of the antique tools, and the extinct mammalia coeval with them, were all post-glacial, or in other words, posterior to the grand subsidence of Central England beneath the waters of the Glacial Sea.”*

Again he says, “The sections near Bedford and at Hoxne in Suffolk, and a general view of the Norfolk cliffs, have taught us that the earliest signs of man’s appearance in the British Isles hitherto detected, are of post-glacial date.”†

The valley of the Ouse has been scooped out of the boulder clay: so that whatever may be found in the gravel-beds and terraces of the valley is much more recent than the age of the boulder clay which extends over the surface of the country from the edge of the valley. Now, in the valley of the Ouse there are two beds of gravel. There is, first, one within reach of the present waters of the rivers; and another, a raised terrace, and in this upper gravel, in the valley, are these extinct remains and works of art.

Now, Mr. Upham founds his argument for the pre-existence of man to the Glacial period on page 5 of his paper, thus:— “Rudely chipped stone implements and human bones in the plateau gravel of southern England, 90 feet and higher above the Thames, and the similar traces of man in early Quaternary sand and gravel deposits of the Somme and other valleys in France, attest man’s existence there before the maximum stages of the uplift and of the Ice age.” They do not appear to

* *Antiquity of Man*, p. 166. It is to be noted that this subsidence took place *after* the disappearance of the great glaciers and sheets of ice by which the Glacial period was ushered in.

† *Ibid.*, p. 229.

me to bear this interpretation. I know these plateau gravels in the north, centre, and south of England, and have mapped and described them in the Memoirs of the Geological Survey. They are not all of one period, but those which represent the interglacial stage, or epoch of great submergence, contain no traces of man or his works*—while the gravel terraces of moderate elevation to which the author refers as containing these works are of much more recent age. I am, therefore, unable to accept Mr. Warren Upham's views as regards the age of the appearance of man. This I regret: at the same time I am glad to have had so favourable an opportunity for stating the conclusions at which I have arrived by many years of observation, and I heartily join in thanking the author for his paper.

I have been asked to endeavour to correlate the glacial divisions of time as they are represented in the British Isles with those of America as given by the author. There is a great difficulty in doing this with much prospect of success, but the following may be accepted as approximately correct:—

GLACIAL DIVISIONS.		
<i>British Isles.</i>		<i>North America.</i>
FINAL STAGE.	{ Slight re-elevation of land with increase of cold. Local glaciers in high lands. Submerged areas overspread by waters with icebergs and erratic blocks. (Upper boulder clay.)	{ Wisconsin Stage. (Moderate re-elevation of land and partial re-advance of glacial ice.)
MIDDLE STAGE. (Interglacial.)	{ Depression and submersion of land Climate moderate. Formation of raised beaches and shell beds. (Middle gravels.)	{ Champlain subsidence. (Fossiliferous marine beds.)
INITIAL STAGE. (Great Ice age.)	{ Great elevation of land. Maximum of cold and exten- sion of glaciers and ice- sheets. (Lower boulder clay or "till.")	{ Iowan Stage. Helvetian " Kansan " Ozarkian "

At the close of the Final and Wisconsin Stage—the relations of land and sea gradually approximated to those of the present day, with slight oscillations of sea-level and formation of raised

* Unless the "eolithic" flints of Mr. Bullen be of this period; but even so, they would be later than the epoch of the lower boulder clay (see *ante*, p. 223).

beaches. The Initial Stage (Ozarkian uplift) was probably coincident with the great elevation of the lands and ocean-bed, during which the submerged river channels were eroded down through the continental platform both in Europe and America.

Professor J. LOGAN LOBLEY, F.G.S.—The thanks of the Members of the Institute are, I am sure, due to Mr. Warren Upham for his interesting and suggestive paper, and we are also much indebted to Professor Hull for his very lucid additional exposition of the subject of the paper.

Although I can make no claim to be any authority on the great glacial question, I may perhaps be allowed to say a few words on some of the important points raised by Mr. Upham.

With Professor Hull's opinion that the Somme Valley has been cut since the glaciation of Northern France I am quite inclined to agree. The well-known Bedfordshire valley of the Ouse has been cited as evidence of an important valley formed subsequently to the age of the boulder clay, and of the advent of man not being pre-glacial. But may I not ask, have we not in the Thames Valley similar evidence? There is boulder clay at Finchley, but none in the lower levels of the great Thames Valley. No human implements have been found anywhere in this valley in beds older than the Pleistocene gravels and brick-earths which contain abundant mammalian remains, as at Acton, where human implements in considerable numbers occur, as shown by Mr. Allen Brown. The important discoveries of implements in the Somme Valley by Boucher de Perthes and Prestwich were in similar flint river gravels, indicating, I think, a similar period for the formation of that valley. The Miocene beds of the Alps, 5,000 feet above sea-level, and the Pliocenes of East Anglia, indicate a submergence of this part of the earth's surface in Pliocene times when instead of erosion there would be a deposition, but subsequently at the close of the Glacial epoch the conditions, from the great melting of ice and snow on higher ground, would be favourable to the rapid cutting of chalk valleys consequent upon the combined erosive and solvent action of water. Thus the evidence appears to be in favour of the view that man was not pre-glacial; that is, not before the glaciation of Mid-Europe; for a "Glacial period" may be said to be still in existence in Greenland and the Polar Regions, due to high latitudes, while the glaciation of regions further from the poles was due, I believe, to greater elevation of land

areas as indicated, among other things, by the sub-oceanic river-valleys.

With respect to the astronomical explanation of a presumed glacial recession to which reference is made in this paper, I may remark that the Southern Hemisphere is towards the sun, when the earth is in perihelion, and yet the climate of the Antarctic is quite as rigorous as that of the Arctic Regions. There is reason therefore to think that if the northern summers were brought into perihelion the climate of the Northern Hemisphere would be scarcely, if at all, affected.

Neither can I agree with the attribution of depression of land areas to the weight of accumulated ice, referred to as "burdened land," since I ascribe any such depression to contraction of vast thicknesses of terrestrial matter consequent upon a lowering of temperature, and elevation to expansion of similar enormous masses from a rise in temperature.

The palæontological evidence certainly seems to me to be strongly against the pre-glacial age of the Somme gravels. In addition to Lyell's statement of it I may mention that that interesting little fresh-water Lamellibranch the *Cyrena fluminalis*, is to be found in abundance as a fossil in the brick-earths of the Lower Thames Valley, as at Grays, Crayford, and Ilford, and that though not now living in European rivers, but abundant in the waters of the Nile. I have also found it in the gravels of the Orange River of South Africa.

The CHAIRMAN.—I would just say that from my own point of view there is one important matter in this paper, and that is, the date of the ending of the Ice age, which the author sets down at about 5,000 years ago.

Now in Babylonia, civilization, such as it was, extends back certainly 5,000 years; and if in that country the estimates of the American excavators of Niffer may be accepted, it ought to go back 10,000 years from now.

That means, I suppose (I am speaking under correction of course), that the temperature of Babylonia must have been in those times, 5,000 to 10,000 years ago (and the farther back you go the more so), greatly affected by the presence of ice in other parts of the world, and that is a matter of some interest to people who consider the civilization and state of the country in ancient times and especially in connection with the products. The tempera-

ture, it seems to me, must have been lower in consequence of the extra nearness of the ice, and therefore the same plants and animals could not have existed there as in later days. One hardly likes to regard the temperature of the country as having been, such a short time ago, different from what it is now, and therefore one has to receive a statement of this kind with, I should say, a certain amount of caution.

I desire, as I am sure we all do, to return a very hearty vote of thanks to the author of the paper, which is exceedingly interesting, and to Professors Hull and Logan Lobley, who have added such important comments upon it.

Rev. JOHN TUCKWELL.—May I say with regard to that point that has just been raised, that in Professor Tyndall's volume, published some years ago on *Heat and Motion*, he makes reference to the Glacial period, and says the enormous accumulation of ice and snow in the northern regions would point to a very high temperature with an enormous amount of evaporation in some other parts of the world, otherwise we could not have the enormous accumulations of ice and snow in the northern regions. If so, that might, it seems to me, to some extent meet the difficulty which the Chairman referred to that there must have been as high a temperature in Babylonia as exists now. There are references on many of the Babylonian and Assyrian tablets to various forms of grain which may indicate what the temperature was, and would point to a temperature similar to that which it is now.

I notice in the paper that the author speaks of this—that there seems to be a break somewhere between the Palæolithic and the Neolithic periods. I should have liked to call attention to the fact that Professor Prestwich, in a paper he read here some years ago, referred to the deluge and to the extinction of a large number of those animals mentioned here, as if their extinction were occasioned, in some way, by a deluge,* and it may have occurred to the author that the enormous number of mammoths buried in Siberia must have lost their lives very suddenly and by a very sudden and excessive fall of temperature. They were, apparently, buried alive under many feet of ice, and have continued in such a condition to the present day that their flesh remains as sound as when they died, which would point to a

* *Journ. Trans. Vict. Inst.*, vol. xxvii, p. 263 (1893-4).

sudden fall of temperature and might possibly, therefore, in some way be connected with the event Sir Joseph Prestwich referred to in his paper here, and throw some light on the occurrence of the deluge.

The SECRETARY announced that arrangements had been made for the Annual Meeting to be held in the rooms of the Society of Arts, when the address would be delivered by Professor Sir Robert S. Ball, LL.D., F.R.S., of Cambridge University.

The meeting then adjourned.

ORDINARY MEETING.*

CAPTAIN HEATH, R.N., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following paper was read by the Author :—

*THE SUB-OCEANIC DEPRESSION KNOWN AS
"LA FOSSE DE CAP BRETON," AND THE
ADJACENT RIVER VALLEYS OF FRANCE
AND SPAIN.* By Professor J. LOGAN LOBLEY, F.G.S.,
F.R.G.S.

(Read Monday, January 1, 1900.)

THE sub-oceanic features off the western coasts of Europe have been prominently brought before the Members of the Victoria Institute by Professor Hull, in highly interesting and well illustrated papers, while the importance of the facts and the gravity of the conclusions that may be drawn from them have been recognized by the Royal Geographical Society and the British Association, before which bodies discussions of the subject have taken place. Communications on this important investigation have also been published in the *Geological Magazine*, from several geological authorities, including an important contribution to the discussion of the question in a paper on "The Eastern Margin of the North Atlantic Basin," by Mr. W. H. Hudleston, F.R.S., published in the *Geological Magazine* for March and April, 1899, which is accompanied by a bathygraphical map extending through fifty-five degrees of latitude.

* Monday, January 1st, 1900.

The corresponding subject of the sub-oceanic features off the eastern coast of North America has been dealt with in considerable detail by Professor Spencer and Mr. Warren Upham, who have shown that these features of the sea bottom on the western side of the North Atlantic Ocean are quite analogous, if not quite similar, to those worked out by Professor Hull on its eastern side.

After the papers which have appeared in the *Journal of the Victoria Institute* by Professor Hull, it is not necessary for me to recapitulate the facts that have been ascertained or the general conclusions derived from them. Sufficient here will be a reminder that the Continental Platform underlying the sea on the western coasts of Europe has been found by isobathic soundings to be indented at places approximately opposite to present river-valleys by deep ravines or submarine valleys, the bottoms of which descend from the present littoral to the deep sea bottom outside the Continental Platform, cutting through what has been called the "Great Declivity," by Professor Hull, and the "Sub-Oceanic Slope" by Mr. Hudleston, while at the same time these depressions in the sea-bed widen out seawards in a manner similar to those of existing river-valleys.

It has therefore been concluded that these submarine depressions are none other than former extensions or prolongations of the river-valleys of the present land surface, formed by sub-aerial erosion when the continental area was elevated sufficiently, and this in late Geological or early Pleistocene times.

Although this explanation, which has been very clearly and strongly advocated by Professors Hull and Spencer, may appear to many obvious, and the only possible explanation of the remarkable phenomena in question, it has been objected (1) that the required change of relative level of land and sea is too great to accord with known geological facts; and (2) that the submarine depressions are not proportionate in all cases to the size and importance of the rivers to the mouths of which they are respectively opposite, and by which they are assumed to have been formed.

With the first of these objections I do not at present propose to deal, since I now wish to call attention to the second difficulty only, namely, the disproportion at present existing between some of the submarine depressions and the neighbouring rivers. I will therefore confine myself to the consideration of the question whether the elevation of land

surfaces to the extent required for the sub-aerial erosion of depressions cutting through the Continental Platform to its base would anywhere give such a change of position of greater and lesser erosive power as would sufficiently account for the admitted disproportion of some submarine depressions to the respective nearest rivers by the prolongation of which it is concluded they have been cut down to their present depth.

The examples most prominently brought forward of this disproportion are those of the small depressions opposite to the great rivers, the Loire and the Gironde, and the great depression called La Fosse de Cap Breton opposite to the smaller river, the Adour.

The Fosse de Cap Breton is in the bed of the great south-east angle of the Bay of Biscay, the Gulf of Gascony. It commences close to the shore-line adjacent to Cap Breton, about ten miles north of the present mouth of the River Adour, on the coast of the Landes, and extends westwards as a depression in the sea-bottom for a distance of about 100 miles. At a distance of six miles from the land it has a depth of 1,000 feet from the surface of the sea, and at ten miles from the shore-line a depth of 1,200 feet. At fifteen miles from the commencement of the depression another submarine valley from the mouth of the Adour opens into it on the south side, and then the Fosse rapidly deepens, assuming, in the words of Professor Hull, "the form and features of a grand cañon, bounded by steep, sometimes precipitous, walls of rock from 4,000 to 6,000 feet in height, and ultimately opening out on to the floor of the ocean at a depth of about 1,500 fathoms (or 9,000 feet)."

The sea bottom on the north side of the Fosse de Cap Breton is remarkably different from that on its south side. On the north the Continental Platform, commencing with a width of thirty miles, widens as it extends northwards, until it attains a breadth of about 150 miles off the coast of Brittany, while on the south side it is very narrow, at one place only six miles wide, and nowhere along the entire length of the Fosse of 100 miles is the platform more than twenty miles in breadth. Thus the Fosse de Cap Breton is approximately parallel with the north coast of Spain and at right angles with the southern part of the French shore of the Bay of Biscay, the coast of the Landes.

The adjacent coasts correspond in their physical features most strikingly with the sea floor on each side of the Fosse.

As is well known, the Landes is an extensive plain very little above the sea-level, spreading inland for a distance of 100 miles, and extending along the Bay of Biscay from the Adour to the Gironde, a distance of about 150 miles. The coast of Spain on the other hand is mountainous, the western extension of the Pyrenees, the Cantabrian mountains, fringing the shore-line, with their spurs forming head lands.

Corresponding, too, with the physical features of the two coasts is, as might be expected, their geological structure. The flat French coast area is formed of Quaternary accumulations overlying Miocene and Eocene strata, while the rocky, hilly, and mountainous Spanish coast lands are composed of strata of Secondary and Palæozoic Age.

Of the rivers flowing into the Gulf of Gascony, or south-east angle of the Bay of Biscay, the principal is the River Adour, which, although called by Dr. Blanford a comparatively trivial stream, is better, I think, described by Professor Hull as "a fine river." It has a breadth at the city of Bayonne of 800 feet, and from its source in the Pyrenees to its mouth measures at least 200 miles, and has several important tributaries, as the Nive, which joins it at Bayonne, the Oloron, the Gave de Pau, and on the north, the Midouze, which give the Adour a large drainage area extending for fully 120 miles along the northern side of the Pyrenees. About fifteen miles to the south of the mouth of the Adour, the River Nevelle flows into the sea at St. Jean de Luz. This at present is an unimportant river, but a little farther to the south and joining the sea at the very angle of the Bay of Biscay there is a river that deserves more attention than it generally receives. This is the River Bidassoa, the boundary river between France and Spain, and differs from the Adour and the Nevelle in draining the south side of the western part of the Pyrenees. It is even now a considerable stream, and the alluvial flats seen as Fuentarabia, at its mouth, is approached shows that in quite late Quaternary times it was a much greater river. These three rivers, the Adour, the Nevelle, and the Bidassoa, now pour their waters into the sea at the head of the Fosse de Cap Breton.

We may now inquire whether, under the conditions that must have obtained with an elevation of the contiguous lands to 9,000 feet above their present levels, the output of ice, and afterwards of water, together with the action of the sea at the bight of the Bay of Biscay, would not be of sufficient erosive power to produce the Fosse de Cap Breton,

while at the same time there was no such enormous erosive power possessed by either of the then existing rivers, the Loire or the Gironde.

With an added elevation of 9,000 or even of 7,000 feet not only the higher and mountainous districts of France and Spain, and especially the Pyrenean region, but the whole of the area so raised would be brought under glacial conditions. The Pic de Nethou in Maladetta, Mont Perdu, and a few other summits in the Pyrenees about 10,000 feet in elevation, have glaciers at the present time, and there would be many more glaciers on the Pyrenean mountains were it not for the fact that their summits are not favourably grouped for the accumulation of great glacier-producing masses of snow. Under the conditions supposed, the whole range of the Pyrenees, including all its spurs and offshoots, would reach far above the snow-line. This mountain region is of considerable breadth, for the main sierra of the Pyrenees is buttressed, as it were, on each side by mountains for a distance of from fifteen to twenty miles from the axis of the range, giving a breadth, therefore, of from thirty to forty miles of mountains extending in length from the Bay of Biscay to the Mediterranean Sea.

Although the summits of these mountains are not well adapted for the accumulation of snow and the formation of glaciers, this is not the case with those parts of the region now well below the snow-line, since there are innumerable valleys of great capacity amidst surrounding lofty hills and mountains, which if above the snow-line would retain snow and so accumulate sufficient material to produce very many and very large glaciers. Winds from the west and south-west, that is from the ocean, would prevail as now and bring with them enormous amounts of vapour and air charged with evaporated water from the warm surface waters of the equatorial seas and the scarcely less warm waters of the deflected equatorial current flowing north-eastward as now from the American continent, but, in consequence of the elevation of the West Indian, or the Antillean region, having a less northerly course. This vapour and water-gas would be rapidly condensed by the great cold of the mountains and plateaux, and the mountains being of great elevation, the atmosphere would be compelled to give up a very large proportion of its water. There would, consequently, be over the whole of the European south-west region an unusually great precipitation, and thus the material for the

production of vast glaciers and ice-sheets would here be furnished in profuse abundance.

It ought also to be borne in mind that with the elevation of the American or western continent also, or of its central portion, the Antillean region, there would be no so-called "Gulf Stream" as now to bring warmth-giving waters and consequent warmth-giving winds to the north of Europe. This deprivation would intensify the glacial conditions consequent upon elevation in the areas to the north, and the great cold so produced there would react on the temperature of mid and southern Europe. Thus an additional refrigerating influence must be taken into account. The result of the whole would be the covering of the Pyrenean region with an ice-cap or continuous glacier of great thickness through which only the more acute summits would penetrate. This vast body of ice, gradually descending to lower levels, as the Greenland ice-cap does at present, would form an ice-sheet covering all the lower levels. We are thus compelled to conclude that with an elevation of 9,000 feet, or even of 7,000 feet, the entire region of what is now southern France and northern Spain would have a climate of quite Arctic cold, and would be covered by a vast and continuous capping of ice.*

Glacial conditions, with the elevation postulated, must have extended over the whole of France, but they would be greatly intensified in the Pyrenean region and especially in its western half, from its elevation, and the much larger body of vapour-charged air that would be there intercepted and the consequent enormous amount of snow that would there be precipitated.

The great ice-sheet spreading to the north of the Pyrenean range would move in the direction of least resistance. When the surface features of southern France are considered it is at once seen that the direction of least resistance to an advancing ice-sheet from the northern side of the western half of the Pyrenees would be to the west, or in the direction of the sea, over the region now occupied by the drainage areas of the Adour and the Garonne, which includes the extensive low plain of the Landes, at present little above the level of the sea, to which it extends. The whole of

* On this subject see paper by Professor E. Hull on "Another possible cause of the Glacial Epoch." *Trans. Vict. Inst.*, vol. xxxi, with plate, p. 141 (1897-8).

this region, having little variation of elevation of surface, is one well defined physical area with higher lands on the north and east and the Pyrenees on the south, and open only to the sea on the west. This great area, consequently, under glacial conditions must have been covered by an ice-sheet, or vast glacier, moving constantly westwards, and as constantly giving off portions of itself to the sea where is now the Bay of Biscay.

The discharge of glacial ice from the southern part of the west coast of France would consequently be of vastly greater amount and erosive power than any discharge of land ice from the parts of the coast farther north, where neither the physical features of the interior land nor the climatal conditions would be nearly so favourable for the production of vast masses of moving ice descending to the sea along a restricted coast-line. As this constant discharge of glacial ice would powerfully erode and cut back the land, the sea cliffs would here be more rapidly cut back than farther north, and the coast-line would consequently recede and form a broad indentation. The great width of the submerged Continental Platform at the north of the Bay of Biscay, from 100 to 200 miles, and its comparative narrowness off the southern part of its eastern coast, corresponds in a remarkable manner with what might be expected to result from such localized intensity of erosive action.

Simultaneously with the great erosion by the glacial ice from the northern side of the Pyrenees there would be erosive action going on from the movement and discharge of the glacial ice produced on the southern side of the western end of the range. This would be by no means small. The district that now forms the north-western part of the Spanish province of Navarra and the whole of Guipuscoa consists of mountains rising to 3,000 or 4,000 feet above the sea-level, separated by deep valleys. These valleys when elevated above the snow-line would be eminently adapted to hold snow and form large glaciers. One of these, the valley of the River Bidassoa, runs far up into the mountains, and bifurcates and ramifies into deep and spacious subsidiary valleys that are quite ideal receptacles for the accumulation of vast masses of snow. This extensive valley, or rather system of valleys, opens out at its seaward termination in the very bight of the Bay of Biscay, and but little to the south of the Fosse de Cap Breton.

And along the whole of the south side of the Bay of

Biscay there are the long ranges of the Cantabrian mountains, which would also with the elevation supposed be the gathering grounds for, and the source of, innumerable glaciers. The erosive action consequent upon the continuous descent of glacial ice from these mountains would be very great also, and would consequently have a most destructive effect upon the northern coast of the Iberian peninsula, which would rapidly recede along its whole length, and in complete accordance with what would be the result of such action is the narrowness of the submerged Continental Platform along the north coast of Spain.

It will be obvious, from the considerations now briefly stated, that with the land of south-west Europe elevated above its present levels to a sufficient extent to place the bottom of the Fosse de Cap Breton above sea-level, enormous destructive action would be going on at the south part of the west coast of France and along the whole northern coast of Spain. In addition there would be the great glaciers from the south side of the western end of the Pyrenees cutting back the shore-line with very great erosive power at the angle formed by these two lines of coast.

Such powerful and simultaneous coast-destroying processes would have for their necessary result the formation of a great and deep bay in the very place where is now the more western and the deeper and wider part of the Fosse de Cap Breton. It must also be borne in mind that this bay-formative process would be going on throughout the whole of the vast period of the uprise, and only culminating in power at the time of the maximum elevation.

After the subsequent subsidence of the land areas had commenced and the lower levels had reached warmer zones of the atmosphere, the glacial ice would melt, at first on the land near the sea, and then farther and farther away from the coast, and with continued subsidence rivers would take the place of the former ice-sheet. These rivers would have great volume and great momentum, for they would be the only discharge for the vast accumulations of snow on the yet large areas above the snow-line as well as for the winter snows and the rains on the areas below the snow-line.

An examination of the hydrographical or drainage areas of the Garonne and the Adour shows that there is no marked physical division between them, the land between

the most western of the southern affluents of the Garonne and the most eastern of the southern affluents of the Adour having no greater elevation than the land between two affluents of either of these rivers. And between the main rivers themselves where they approach each other, between a few miles from Agen on the Garonne and Aire on the Adour, there is only a maximum elevation of 300 feet above the level of the sea. So that the entire area between the River Garonne and the Pyrenees may be considered to be physically but one hydrographical area, that with a greater volume of water, a greater fall, and consequently a much greater momentum of water-flow, would be drained by one river-system, since such conditions are calculated to give a straighter flow and a more direct discharge of drainage.

It is therefore highly probable that before the surface reached its present low level, and while the volume and momentum of the river-water was much greater than at present, the drainage of the whole of the great area between the Garonne and the Pyrenees, and now flowing in two river-systems, would be discharged into the sea from one river-mouth. This mouth, there is reason to think, was at the part of the coast where is now the deep water near the head of the Fosse de Cap Breton which bears the name of "Le Goul," and is opposite to Cap Breton.

A straight line joining Le Goul with the nearest point on the River Garonne, where it bends from a westerly to a northerly direction, near Port St. Marie, passes close to the River Adour at the point of the great bend in its direction from the north-west to the south-west between St. Sever and Dax and about ten miles from the latter town. This line is, moreover, nearly coincident with the valley of the chief northern affluent of the Adour, the River Midouze, for many miles.

And, indeed, even in recent times, and after continued subsidence had lowered the whole area to its present levels, it is known that the Adour entered the sea at Cap Breton, and then subsequently the mouth of this river was at a point on the coast still farther north that yet bears the name Vieux Boucan. Vieux Boucan is about twenty-five miles north of the present mouth, to which the river was finally diverted in the year 1579, and which outlet has to be maintained for the benefit of the city of Bayonne by costly engineering works. Thus the River Adour itself has had three different positions for its *embouchure*.

This considerable change of the course of a river in geologically recent times is an illustration of what great alteration may take place in river courses where the surface is approximately level and where Æolian deposits are accumulating. These deposits of blown sand are in the Landes very considerable and would in the past rapidly fill up any river channel from which the waterflow had been diverted.

It would thus appear that after this region had subsided to a very considerable extent from its previous maximum elevation, but before it had reached its present levels, a great river, taking to the sea all the waters from the glacial ice of the northern side of fully half of the entire range of the Pyrenees, and draining besides the lower area between these mountains and the higher lands of mid France, flowed directly towards the head of the deep bay previously formed by glacial action. This large and rapid river would be a sufficiently powerful eroding agent to cut down a great gorge at the head of the glacial bay. The River Bidassoa, coming from the elevated mountain valleys, would also pour into the same bay its abundant waters and add its erosive power, while the Rio Urema, the Rio Bilbao, and other rivers from the Cantabrian mountains would indent by smaller ravines the sides of the great embayment.

Besides the powerful erosive agents, glacial ice and rapid rivers, there must be added the waves of the sea, by which the sides of the great gorge in the coast-line would be cut back. By this action a widening process would contribute in giving the form and dimensions characterizing the Fosse de Cap Breton.

When by continued subsidence still lower levels had been reached, approximating to those now existing, and when the glacial ice of the Pyrenean region had ceased to lie on the mountain slopes and the inland waters had much diminished, with a corresponding great diminution of momentum of flow, a tendency to deviation from a short, straight, and direct course would, with accumulations of Quaternary deposits, favour a division of the main stream, and so bring about a separation of the old one great river-system into two river-systems. Some of the head waters, and these the more western, would unite into a main stream taking a more southerly course to the sea; and others, and these the more eastern and the greater in number and volume, would unite into a main stream taking a more northerly course. Thus

the separate rivers, the Adour and the Garonne, would be formed, and the latter, uniting with the Dordogne, would pour its waters into the Bay of Biscay by the wide channel of the River Gironde.

Then subsequently would be formed those minor depressions which are continuous with the present mouths of the Adour and the Gironde, the southern depression extending to the deep waters of Le Goul in the Fosse de Cap Breton, and the northern depression extending across the Continental Platform towards its edge to the north of the great Fosse.

If I have rightly interpreted the geological forces acting in the south-west European region during and after the Glacial Epoch, then the peculiarities of the sub-oceanic depressions of the Bay of Biscay have been accounted for by simple natural causes, and the origin of the Fosse de Cap Breton, which Reclus seemed to despair of elucidating, has been explained.

I venture to think, therefore, that the facts and considerations now adduced have removed one of the difficulties in the way of the general acceptance of the hypothesis of the sub-aerial erosion of those remarkable depressions in the sea-bottom that Professor Spencer and Professor Hull have so prominently brought before our notice in their highly interesting and important papers.

DISCUSSION.

The CHAIRMAN.—I think we must all feel much obliged to Professor Logan Lobley for the very useful contribution that he has made to this subject, which has completed that which Professor Hull read before. Some of the points he touched on he did not explain to us so fully as Professor Logan Lobley has done to-day. He seems to have explained the peculiar construction of this deep water basin very clearly to us.

I hope those present will make remarks upon the subject.

Mr. DAVID HOWARD.—The theory put forward by Professor Hull and supplemented by Professor Logan Lobley is exceedingly interesting. I cannot conceive such a localized action of water under the sea as to make a deep cut—unless under the most

extraordinary circumstances. This valley, shown by the contours, must have been cut while the land was above the sea; but it would be very interesting to work out this point. One cannot bear too strongly in mind the enormous power that speed in water has. Take the Thames Valley, where the water runs fast it cuts its way. The same volume and amount of water deposits the very mud it has cut from the upper level on the lower level, so that it is not quantity only but velocity. Therefore, if we once have a deep gulf cut and a quantity of water behind, we have a condition that constitutes an erosive action and nothing would determine it more than the Pyrenees. There you have one of the ranges of mountains that stops the entire moisture or current of air on the north side of those mountains. One knows how complete and intense is the dryness in the north of the Alps, with such excessive damp on the south, and that condition, with the warm Atlantic breezes cut off by the Pyrenees, would cause a constant and strong stream of water down the Adour just where it wanted to cut this deep gulf. Under those circumstances I must say I think about as strong a case is made out for that origin of these gulfs as it would be possible to have.

Professor LOGAN LOBLEY (in answer to a question by Mr. Baber) said: The configuration of the coast-line, at the time of the elevation, did not at all correspond with the present. It would more nearly correspond with the margin of the platform represented by the 200 fathom contour of the present day. So that you may take it that the coast-line at that time would be a long way distant from the present coast. These various indentations would be formed by subsequent erosive action occasioned by local circumstances, causing a greater amount of cutting back on one part of the coast than the other; but the general increase of denuding or erosive action, would be on the southern part of that coast-line, and the general effect of that would be to produce an embayment which would be afterwards continued by the action of the rivers.

The CHAIRMAN.—With reference to the action of water that Mr. Howard referred to, one can hardly realize, unless one sees it, the effect of configuration on mountains when brought into contact with the warm atmosphere of the tropical regions. I have seen, four feet high, close on the ground, a cloud rise in the horizon not much larger apparently than a man's hand. In half an hour,

or three-quarters of an hour, I have seen it as it approached the land, rapidly increase in size to about a square mile. One could hardly imagine that all that water could be deposited in such a small space. Of course if you get mountain ranges of 20,000 feet with a warm south-west wind blowing, you can imagine the enormous quantity of water that would be precipitated. Then as to the movement of sand, one can hardly imagine, unless one has seen it, the action of the wind on sand and the height of the sand wave. It is very much like the formation of a wave of the sea, and one sees how quickly the sand wave will move directly there is any wind of any strength. One sandhill I remember distinctly, about three-quarters of a mile long, and the edge of it was just as sharp as the back of a knife. Directly any wind blew the edge of sand fell down by its own gravity, a fresh edge being formed and its face always standing at a certain angle. So with a bay like that of Biscay you can understand any quantity of sand being thrown up.

I am sure we desire to convey our best thanks to Professor Logan Lobley for his very interesting paper, which I think has completed the whole question that was brought before us by Professor Hull on a previous occasion.

The meeting then adjourned.

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