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ORDINARY MEETING, MAY 16, 1887.

D. HOWARD, ESQ., VICE-PRES., CHEM. SOC., IN THE CHAIR.

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

ASSOCIATE :—Mrs. Woodrow, Middlesex.

HON. CORRESPONDING MEMBER :—Professor E. Hull, M.A., LL.D F.R.S., Director of the Geological Survey of Ireland.

Also the presentation of the following works for the Library :—

“Abraham, Joseph, Moses.” By Professor A. H. Kellogg, D.D.

“Witnesses from the Drift.” By D. C. Fradenburg.

The following Paper was then read :—

*ON TIME AND SPACE: TWO WITNESSES FOR A
CREATOR.* By the Rev. WILLIAM ARTHUR.

WE speak of both Time and Space now in a narrower, now in a broader sense. When contrasting Time with eternity, as we habitually do, we plainly mean by the former a terminable duration contained within an interminable one. But when contrasting Time with Space, we as plainly mean all duration whatsoever, irrespective of any limits. Again, when we contrast Space with Infinity, we clearly mean by the former a measurable extension contained within one which is immeasurable in length, breadth, or height; but when we contrast Space with Time, we mean by Space, all extension whatsoever, without any respect to bounds.

When it is in the narrower sense that we speak of Space, we may have in mind either the whole extension of our planet, or that of the solar system, or even that of all the worlds hitherto brought to view by the telescope. In any of these cases our conception of Space is that of a measurable extension, surrounded on all sides by an absolutely immeasurable one. So also when it is in the narrower sense that we speak of Time, we may have in mind either the duration of an individual life, or that of the human race; but in either case the conception of Time is that of a limited duration, included within an unlimited one which went before it and will run on after its termination.

It must not be supposed that I use the term Duration as a definition of Time or the term Extension as a definition of Space. In such matters I am wary of the definitions even of the masters, and should be timorous of any of my own. The term Extension is a wider one than Space, and so is Duration a wider than Time, as I apprehend the terms. Now the process of defining a term by a wider one is one which it would be easy to cover by the most distinguished patronage, but, in spite of that fact, to me defining by generalising is in philosophy like what condensing by vaporising would be in physics.

I shall not refer to writers whom I have had occasion to combat, and with whom defining by generalising is exalted into an art. But to take one for whom my intellectual respect is profound, Sir William Hamilton defines Time as "the image or the concept of a certain correlation of existences"; a formula to which also his definition of Space is conformed. Now this has not even the merit of being a mere generalisation. It begins to define an object by setting it under a class to which it does not belong, which class is that of mental images to which indeed does belong *our idea of Time*, but not Time itself. The human idea of Time never arose in the whole course of Time, until after countless worlds had for uncounted ages run through days and nights, through summers and winters, of different lengths. Now it is not of man and his thoughts that Sir William speaks, but of that Time itself, which long pre-existed man and all his ideas. Time an image! a concept! Time a child of Adam's brain, and not Adam a birth of Time!

Professor Calderwood so far improved upon this definition as to say that Time is "not an image or a concept" of a correlation, but is a "correlation of existences." This makes the immense difference of taking a thing out of a class to which it does not belong and setting it in one to which it does belong. If we accept the abstract term correlation as the name of the concrete thing which relates other things to one another, then Time is a correlation, *i.e.*, a correlator of existences. But correlators of existences are a large class. A chessboard correlates the existences of the chessmen, the House of Commons correlates the existences of the members; the sea correlates the existences of the fishes, the air those of the birds, and so on. Defining an object like Time, which under its own name is something perfectly distinctive, by referring it to so wide a class as that of correlations is defining by blotting out the boundaries.

I have assumed that Duration is a wider term than Time, and Extension a wider one than Space. The ground on

which I do so is this, that "Time" never expresses the mere idea of unregulated and unmarked duration, without order of succession or note of periodicity. On the contrary, as Locke says; "Duration as set out by certain periods, and marked by certain measures or epochs, is that, I think, which we most properly call Time."*

We do not think of the regular succession in Time of the swings of a pendulum as a mere matter of unregulated duration. No more do we think of the conformity of the arc described by each beat to that described by the foregoing and following ones as a mere matter of unregulated extension. We look upon both as proceeding by rule, which rule is set by a centre of action above the metals of the instrument.

Some would have us make believe that we do regard it only as "a mere series" of beats; but we cannot make believe anything so puerile. It is a series of beats with an overruling cause and fixed order. We do not think of the rise of day and the fall of night, of the regular coming and passing away of summer and winter as "a mere series," without prescribed order and sufficing cause. When men have to fit the facts of nature to a doctrine, they may get so far towards presenting processes like these as "mere series," that their fancy takes form in type, but a footing they cannot gain for it on the firm ground of enduring thought. Regulated or, as we say, "timed" succession, that is periodicity, is a structural fact in creation, and as such self-evident, and borne in upon the perceptions both in external and internal observation, so that our idea of Time, whether it is or is not pervaded *à priori* by a conception of rule, is so as matured, and that inevitably, by force of what James and John Mill would call inseparable association.

In itself, the term Time does not imply either the existence of limits to duration or their absence. But it does imply order in successions, and notes of periodicity, such notes as afford data for the measurement of duration. Wherefore, whatever else Time may mean, it does at least mean DURATION UNDER RULE.

In a manner analogous to what we have seen in the case of Time, the term Space does not express the idea of mere extension unreclaimed, neither traversed nor surveyed,—of blank continuity without correlated areas, notes of distance, or graduated scales, whereby to take dimensions. This would be, in the words of Locke, "the undistinguishable inane of infinite Space." We do not think of the successive orbits of the

* Book ii., c. xiv. § 17.

planets, or of the alternations of body and interspace in the sky, or of such alternation in a quill, or a shell, or in the animal frame, as a "mere series." Not any more than we so loosely think of the succession of cog and notch in a revolving wheel, or of the fitting of the cog of one wheel into the notch of another. In each of these cases the successive dispositions in Space are not "a mere series," they are a series embodying a pre-arranged order, and therefore answering to a pre-conception.

Like the term Time, in itself the term Space does not imply either the presence of limits or their absence. But it does imply the idea of measure in extension, of related distances, and of marks whereby distances may be noted. That is, whatever else Space may mean, it does at least mean
EXTENSION WITH ORDER.

The question as to whether our conception of duration under rule, and of extension with order, was born with us, or is the fruit of our experience, is one which has intensely interested thinkers. Many of them, however, have seemed to take pleasure in confusing this question with a very different one, namely, whether our minds did or did not give origin to Time and Space themselves. Born with us or not, none of us can remember the first time when we acted upon the assumption that if we wanted to lift our hand we could move it out of the spot wherein it was at that moment, and move it into another spot the next moment. In saying this, we say that earlier than the first record of memory, every one of us has acted in Time as well knowing that it was duration under rule, and acted in Space as well knowing that it was extension with order. We acted as knowing this, not in the sense of being able to put it into words, but long before we could put anything into words, as knowing it with that unquestioning knowledge which anticipates action and shapes it.

Let our conceptions of Time and Space originate how they may, the truth remains the same, that these two factors in the Cosmos mingle with all our movements of thought, and give colour to our conceptions both of ourselves and of nature generally. As Locke says, there are few things "Whose modes give more exercise to the minds of men than these do." From its first anticipation, by a desire, the mind finds itself counting upon a Time not yet come. From its first act of memory, by a recollection, it finds itself recalling a time already past away. The two blend into one on the shifting ground of the Time actually passing. Time is thus at first declared to be, and ever after is shown to be, the arena of all events, of all antecedents and consequences, of all causes and effects,

of all change of states, of all mental action, of all growth, of all, to use a wide word, becoming; that is, of all progress from what has been to what hitherto has not been.

So also from its first sensation of touch the mind finds itself thinking of a place where a thing is, and a place from which a feeling comes. From its first sensation of sight it finds itself looking at a place where a thing is, surrounded by places where it is not. Then it sees a place where some other thing is, and this surrounded once more by places where it is not. Every touch upon the frame from without, every movement of a limb from within, as well as every sight, confirms and enlarges this experience of different places, some filled up by objects, some void of them. Thus from our earliest hours Space is encountered as the arena of all objects which can affect the senses; which means of all bodies, and of all physical movement. Hearing, taste, and smell still further extend this experience.

Every motion, whether seen, felt, or made, gives an experience of both Time and Space. The fly cannot pass over the cradle without consuming Time and traversing Space. It was yonder, and is not; it was not here, and is. So the nurse cannot grasp the arm without causing us to feel that something which was not at that spot a moment ago is there now. No more can we lift our hand to our head without being taught that where it lately was it has ceased to be, and where lately it was not it has come to be. It is a one-sided view to speak of Space as offering to us co-existences and Time successions. Things co-exist in Time as in Space, and things endure, succeed, and change in Space as in Time. Time is the essential condition of all action, and Space is the essential condition of bodily existence; it implies and presupposes Time in the origin, continuance, and changes of bodies. There are questions of Time, as changes of thought, which are not questions of Space; but there is no question of Space which is not also a question of Time. Mr. Herbert Spencer's mode of contrasting the two as the *forms* or abstracts respectively of successions and co-existences is more than an exaggeration of Kant's position; for the latter is perfectly clear as marking succession in Time, and in not excluding it from Space, and as saying that nothing can be in two contradictory states, except at two different times. Kant's dictum that Time has only one dimension, length, is a mere metaphor. Time has three tenses, past, present, and future, but no dimension; and Space has three dimensions, but no tense.

Neither of these two great elements in the system of

creation is presented to any one sense as its direct object, as are many great things and many inconsiderable ones. Yet they are both capable of being verified by all the senses, and are suggested to the mind by every object of sense and every change of sensation. Hence, like gravitation, which strikes no sense, they fill a larger space in our thoughts than many objects which not only appear to the senses, but greatly impress them. Even of these the importance is often felt to be higher as indices of Time and Space, than as objects of sense. The moon herself holds a place in thought as marking Time by her lights and shadows, greater even than that which she holds as a spectacle in the sky. The stars also influence thought by their function as marks of distance in Space, more even than by their beauty as points of light. Matter strikes the senses; but if it is in a great mass, its limits as set in the sky, or on the ground, imprint upon the mind the lesson of how narrow its circle is, as compared with the sweep of Space. And if, on the contrary, matter is presented in a germ, which has to grow before even the microscope can discern it, then it imprints on the mind the lesson that on the descending scale of littleness, as on the ascending scale of magnitude, our measurements lose themselves in the abysses of Space. Motion also strikes the senses; but if it be the travel of a world which takes ages to go round its orbit, it ends by impressing us with the brevity even of its long year compared with the whole compass of Time. And if the motion be the vibration of a ray of light, the repetitions of which in a single week would compel science to tax its powers of expression in vain, then does this multiplication of movements in a brief duration tell us that our plummet cannot sound the capacity of Time for admitting of actions.

Thus does every event emerge out of its own non-occurrence and disappear in it; and thus does every body begin out of its own non-existence on one side, and end in its own non-existence on the other. The event may be the flash of a new conception or the beat of a heart, it may be the fall of a shower or the revolution of a comet, or it may enclose as many events as a great war or a reign of fifty years; but in any case, it is a fleeting pulse in a permanent order. It is bounded before by the "ere it began," and is bounded behind by the "after it ceased." In every event the IS arises out of the WAS NOT, and disappears in the NO MORE. The body may be a huge planet or an invisible particle of cosmic dust, but in either case it is a dot of matter in a sea of the intangible. An insect has a world to stand upon, but a world stands on intangible space. To the right and the left, above and below, it is bounded

by its own non-existence; and if matter only be existence, then by absolute non-existence. In the case of every body the IS arises out of the IS NOT, and disappears in the IS NOT.

Thus at every step in our course through space are we challenged to tell how existence originates amid non-existence, and how these two have been combined so as to constitute a harmonised structure. And at every point in the course of Time we are challenged to tell how action can arise amid inertness, and how these two can be combined in a rhythm of movement. Does non-existence bring forth existence, or is there a Maker? Does inertness initiate and control action, or is there a Fountain of Life, a Ruler?

Whether our original conception of Time and Space is native and anticipates experience, or grows out of it,—technically speaking, whether the conception is *à priori* or experiential,—all these facts just mentioned develop and mature the conception. And I am bound to say that to me, citing experience as accounting for origins, and not merely for developments, is like citing drill as accounting for soldiers. Get your recruits, and drill will make soldiers of them, but to think of the drill as the origin is lamentably short thinking. You may overawe me with umbrageous names, but no name and no array of great names can alter the fact that experience develops, but does not create. To speak of “powers” of mind as being originated by experience, as Mr. Mill does, to me represents helpless hanging to a theory. What experience can elicit, depends on what it finds.

The experience of a wall on which an astronomer casts the spectrum will never engender either a poem, a theory of optics, or a fresh addition to chemical knowledge. No more will any of these arise out of the experience of a bird which, just as well as Locke could have done, sees at Niagara the numberless little rainbows which dance in the spray.

The ancient hills have had more extended experience than we of Time and Space, yet that experience has elicited from them no theory, no controversy, no science, no devotion. In human experience no fact is more certain than that no man can recall in his own experience a single passage upon which he did not enter, carrying with him the idea of a NOW and a HERE, together with the feeling that the NOW stood in connexion with a THEN, both foregoing and following, and also that the HERE stood encircled by an ELSEWHERE. When the mind was ripened, we found that on whatever side we followed up the ELSEWHERE, whether underfoot, over head, to the right hand or to the left, it always led not to an end but to the ENDLESS; and moreover, that whether we followed up the WAS or the IS TO-BE,

between which our Now palpitates, they both reached over into the unlimited, and merged in a FOR EVER.

The sum total of our Now and the WAS and IS TO BE we learned to call Time, and the sum-total of the HERE and the ELSEWHERE we learned to call Space. And as children may ask what gold is made of, and beginners in science may ask what carbon is made of, so we ask what Time is, and what Space is; and we prefer sonorous answers rather than being told that gold is gold and nothing more, and that carbon is carbon and nothing more. Metaphysicians, instead of taking Time and Space as ultimate facts, admitting of no analysis, make magnificent guesses, and dress out definitions in imposing academic robes. Meanwhile, mathematicians and physicists, taking them as ultimate facts, have studied their properties and relations to the boundless advantage of mankind. So has the common mind likewise done, taking Space in the structure of the Universe, and Time in its processes as ultimate facts just as they are in this city; for the space in which London stands is the same to it as that in which the world stands is to the world; and the Time in which the stones of London are quarried, hewn, built up, and worn away to dust, is the same as that wherein the world received its existence, and has its being. The common mind rests on Space as on the ultimate fact in structure, the indispensable arena of finite bodies and motion; and it rests in Time as the ultimate fact in origins, as the indispensable arena not only of bodies and motion, but also of finite minds, thoughts, and deeds. In the one it sees body and void, existence and non-existence, uniting together to point to a Creator; and in the other it sees life and death, thought and unconsciousness, action and inertness, uniting together to point to a Lord and Giver of Life.

But this acceptance of Time and Space, as ultimate facts not to be analysed, but to be built upon, which has shown itself to be the mine of the mathematicians and the highway of the common progress, is just what the metaphysicians have refused to submit to, albeit it is what true metaphysical insight would dictate as the right course. Kant formally raises the question what are Time and Space, and instantly starts aside from it, saying he will first discuss the *conception* of Space. But unable to keep either to the one subject or the other,—that is, either to Space itself or to *our conception* of it,—he replies, “Space is not an empirical conception deduced from external experience.” He afterwards adds to this negative the affirmative that it is a pure intuition.* In both

* *Kritik der Reinen Vernunft*, pp. 62, 63, ed. of 1853, Hartenstein.

these propositions one thing is obvious, namely, that the predicate is not spoken to the subject expressed, but to another subject understood. The subject expressed is Space, but the subject spoken to is *our conception* of Space. The peculiarity of two subjects to one predicate cleaves to Kant in the first place all through his discussions of Time and Space, and in the second place in many of his returns to the subject throughout his great work to which that subject is fundamental. Hence much of the obscurity and self-contradiction which have been freely censured, notwithstanding which, however, the lights breaking in at point after point, even in the most cloudy places, are real openings into the unbounded blue.

We have seen that Sir William Hamilton fell into the pit digged and left open by Kant, and defined Space, as "an image or concept," which trap Professor Calderwood avoided. Another of Kant's expressions, perhaps his most prevalent one, is that Space and Time are forms of phenomena, Space the form of external, and Time the form of both external and internal phenomena. His lead in this respect is so far followed and so far declined by Mr. Spencer, that the latter calls them forms, not of thought but of things, and *abstract forms*, describing Space as the abstract of co-existences, and Time as the abstract of sequences. His words are, "The abstract of all sequences is Time. The abstract of all co-existences is Space."* Probably Mr. Spencer means that our conception of them is an abstract conception, for it is to that his reasoning points.

Locke, who had treated of Space and Time before Kant, had avoided the perils of definition. So far from confounding body and Space, as Victor Cousin supposes him to do, he proposes that Space should be called expansion, and that the term extension should be confined to bodies. "They are as different as resistance and not resistance." The extension of body he declares to be that of solid, separable, movable parts, while the extension of Space is that of unsolid, inseparable, immovable parts. To those who ask whether Space is body or spirit he replies, "Who told them that there was or could be nothing but solid beings which could not think, or thinking beings which are not extended?" which is all they mean by body or spirit. To those who ask whether Space is substance or accident, he says, "I know not, nor shall be ashamed to own my ignorance, till they that ask show me a clear and distinct

* *First Principles*, § 62. See more fully his *Classification of the Sciences*.

idea of substance," to which he adds that "it helps not our ignorance to feign a knowledge when we have none, by making a noise with sounds without clear and distinct significations."*

Lotze, who in the main follows Kant, discusses Space at length, and his view is thus summed up: "Space and all spatial connexions are merely forms of our subjective intuitions not applicable to those things and those relations of things which are the efficient causes of all particular sensuous intuition." †

This does not tempt one any more than earlier definitions to frame a new one.

The reality or non-reality of Time and Space has been a favourite topic with philosophers. Not to go back further than Lucretius, he makes Space a thing in itself, but Time not so. The ground of this distinction is "that it is only from events which occur that our sense gathers what has been done in the past, what is now being done, and what will hereafter be done; and no one feels Time by itself separated from motion and rest." ‡ Indeed, the Trojan war was only an accident of a certain people and a certain country, and its events are clean passed away. That, he thinks, proves the non-reality of Time, and it is quite as reasonable as much of what Kant and others say, and far better said. But as to the reality of Space, the same facts prove it, for had there been no matter, and no room and Space, there could not have been any campaign, siege, or wooden horse. Actions, therefore, is his dogmatic conclusion, exist not by themselves, but matter and Space do, and actions and events are their accidents. He forgets that matter cannot exist without Space, any more than actions can take place without Time; and that therefore his principle would require him to call matter an accident of Space as well as action an accident of Time. He also forgets that, as no one feels Time separated from motion and rest, so also no one feels Space separated from matter and motion. Kant is right as against Lucretius in putting Time and Space into one category, but Lucretius is right in affirming the reality of Space, which carries that of Time. He does not reflect that if a war could not take place without Space, no more could it without Time; and that if events pass away, so do bodies. Where is the wooden horse? All of permanence he has enjoyed is due to the greater persistence of thought than of body. Had not mind kept his memory alive, but left body to sustain body, the dead would have buried the dead. As body

* See Book ii., c. xiii. §§ 12-18.

† *Microcosmos*, vol. ii., p. 615.

‡ Book i., p. 459.

is the link between place and place, bringing into correlation two Spaces which otherwise would exist in isolation, so is mind the link between Time and Time, bringing the past to life in this present, and giving work and fruit to the future ere yet it has come to pass. The reality of Space was anterior to that of Mycenæ or Troy, and more permanent as well; so the reality of Time was anterior to that of Greece and Phrygia, to that of earth, or the planets, or any given space on earth, or on other planet, and is likewise more permanent.

One favourite method of bowing a reality out of existence is to begin by saying that the universe consists of such and such things; and whereas this thing is not one of those, it is nothing. Suppose we first agree that Westminster Abbey consists only of stone, timber, mortar, glass, metal, and tiles; we can at once proceed to say that such things as design and proportion are no realities in its system, no constituent elements of its structure. Proportion, what is that? Is it stone or lime, timber or metal, glass or slate? Nay, not any of such lower things. It is an ordinance of mind, set for the ordering of all these inert bodies, ere yet they could rise from the condition of mere stuff into the higher rank of a structure. This ordinance was made in Time hidden from all eyes and inaccessible to all measures; and mind issued it forth from itself, and impressed it on insensible lumps till all answered back again, and came into a system conformed to its behests. Without proportion, there could have been no Abbey. Therefore, let us not begin by settling it that the Abbey consists absolutely only of material, for we may possibly find that there is in it also a mighty reality of mind. Without proportion no structure, without a design no proportion, without an end in view no design, without anticipation of Time to come no end in view, without utilising of Time present no anticipation of Time to come, without experience of Time past neither utilising of Time present nor anticipation of Time to come, without Time itself none of these three, and without a finite mind no such use of Time. This chain gives us at one end an agent, at the other a structure. Between them lies the condition and the means. Time is the condition of the planning of the agent and of all his operations. But it is not the only one. In Time he can conceive his end and also his means, and can devise the plans for executing them; but it is only in Space that he can execute; this, then, is a second condition. But another is dominion, for no Time or Space would enable a man without power over his own body and other bodies to make a structure. Even power over his own body and other bodies would not suffice for the rearing of such a structure as Westminster Abbey.

He must also have power to command other minds, power to make them apprehend his instructions and obey his orders. Thus not only are Time and Space illustrated in every coigne of the Abbey, but also mind, and its dominion over both subordinate mind and matter. Its dominion over matter includes dominion over form and position; and, in a measure, over substance. The glass is an instance of a new substance, the work of man, and many substances show new qualities which man has superinduced upon their natural ones. Every point in the structure of the Abbey implies design. Every moment of its existence records the persistent and controlling power of mind; so in the space of the great structure of the Universe, every point displays design, and every moment of its existence records the rule of a mighty Governor.

Locke gives a neat instance of how the fallacy of incomplete division works. To one who asks, "Is Space spirit or body?" he replies, "Who told you that there were not other things than spirit or body?" Manifestly Space and Time are neither; but that does not hinder their being the most momentous realities in the system of creation: any more than the fact that design and proportion are neither stone nor timber hinders their being more momentous realities in a structure than any stone or any timber. You may substitute for all the stones and timbers others and preserve the structure; you cannot substitute other proportions and designs without destroying it. Kant did not put the concrete cases of spirit and body, but two abstract ones. Are Time and Space things in themselves, actual entities, or only states or relations of things? * By entities he evidently means substances in which properties can inhere, and states be developed, and, of course, he means finite substances. Now, who told Kant that there were not realities, which were antecedent to finite substances; realities, the pre-existence of which was a condition necessary to the coming of finite substances into existence, as necessary as was the Space between Norwood and Hampstead for the coming into existence of London, or a clear design and fixed proportions for the coming into existence of Westminster Abbey? Lucretius also has his pair

* It is hard to translate the word *Bestimmungen*. The ordinary "determinations" is not good English, is ambiguous, and is far more material than the really good German word. Perhaps "state" comes nearer to it than "property," or "condition." The German word means a condition of things fixed, appointed, settled by voice, not by physical force. Hence, in mechanics, "determination" is the right translation, but in metaphysics, though most natural, is a misleading one, except to practised readers.

of all-comprising elements. All things consist of body or void, *i.e.*, of matter and Space; a vastly nobler conception than the familiar materialistic one of our own day, which assumes that all realities are either organic or inorganic, which may be called the philosophy of the gallipot. Now, be it remembered, he ascribes, and properly ascribes, as clear a reality to Space as to body. Moreover, he so states the relation of the two as to show that this is the reality which takes the precedence, and on which the other reality depends. "Were there no room and Space, void, as we call it, bodies could not be set anywhere, and could not move in any direction."* Thus Space is so real that motion could not take place without it, and, indeed, bodies could have no place to stand in, no place to move out of, no place to move into.

Mr. Herbert Spencer names three constituents of the system of the Universe,—matter, force, and motion. Obviously each of these pre-supposes Time and Space. The authors of *The Unseen Universe*—who, though wary of metaphysics and holding to science, have ten times the philosophical faculty of some writers who affect above all things philosophy,—take as constituents of the *physical* universe, matter and force; but, of course, pre-suppose Time and Space.

These instances suffice to illustrate the fact that whether in words men assert or deny the reality of Time and Space, or whether they, like Kant, sidle into a position of asserting their non-reality in idea, but their reality in experience,† they all as working thinkers assume their reality, and must assume it, just as the mathematicians do and must. How could matter be real, and Space, without which matter could not exist, be unreal? How could force be real, and Time, without which force could not give an impulse, be unreal? How could motion be real, and Time and Space, without either of which motion is impossible, be unreal? The reality of Time and Space is equal to that of matter and force. It is more than equal; it is a reality older and higher, more fundamentally constituent than theirs. Let us take two tests of reality, one adopted by Mr. Herbert Spencer, and the other by the authors of *The Unseen Universe*. Mr. Spencer's test is, that whatever persists in consciousness is real. Nothing persists in consciousness more than Time and Space. The Pyramids, when I took my last look at them from the heights above Bisateen, as they peaked up like opaque gables in the

* Book i., p. 426.

† Technically, their transcendental ideality and empirical reality.

lemon light of the after-glow, had more to say about Time than anything else. The test of the authors of *The Unseen Universe* is that whatever does not admit of being either added to or deducted from, in its aggregate, by our power, is real. What objects more completely meet this test than Time and Space? I do not say that either test will bear criticism; but that taking them, however exaggerated they may be as tests of reality, Time and Space stand both of them. Kant himself cannot overcome that reality. As matter of experience, he fully admits it. It is only when we ascend to "pure intuitions," and those are they into which enters *no element of experience*, that Time and Space become merely ideal. When he makes them, as he constantly does (for in that he is consistent throughout), the indispensable conditions of all phenomena, he implicitly concedes to them a reality above that of any single phenomenon. This implication becomes stronger when, without referring to Locke, Kant expands an important observation of his, saying that we can conceive of the absence from Space of any of the objects in it, but what we cannot conceive of is no Space; and that we can conceive of the non-occurrence in Time of any particular event, but positively cannot conceive of no Time. This recognises the great fact in Nature that, whatever is present here and absent there, Space is all-persistent; and that, whatever is actual now and past to-morrow, Time is ever-persistent. You may think of every house, street, and vehicle from Norwood to Hampstead as out of existence, but the Space abides. There with them, there without them, there before them, there after them, it and Time, though not even gases, are the most steadfast of all cosmic realities.

Perhaps the sharpest note of the reality of Space, half confessed by Kant with reluctance and inconsistency, occurs in the expression, "two cubic feet of Space." How would Kant give us two cubic feet of "a pure intuition"? When he tells us that Space has three dimensions, how would he give us the length, breadth, and thickness of the "subjective condition of sensibility," which is one of his most formal descriptions of Space? When he asserts that geometry determines the properties of Space synthetically, and yet *à priori*, he does not tell us how the properties could be geometrically determined of a something which is "nothing as soon as we leave out the conditions of the possibility of all outward experience, and take it as something which underlies things in themselves"?* When

* *Kritik der Reinen Vernunft*, p. 67, ed. 1853.

Sir William Thomson, seeking the lowest possible density of ether, takes a cubic mile of Space, and shows that in one cubic mile we must have at least ether enough to weigh the thousand-millionth part of a pound, how would he find his cubic mile of a "form of our subjective intuitions," as Lotze has it? When you can take of a given thing cubic feet, cubic miles, cubic leagues, and find that your length, breadth, and thickness are always secure; and when you can take nothing measurable, without first having this thing to underlie it, as indispensable to it and its activity as the floor of the stadium was to the horse, the chariot, and the race, it is not easy to admit that even ideally this thing can be made into a nothing, and very easy to assert that in experience it is one of the immovable realities. In fact, Kant's assertion that you cannot even think of the non-existence of either Space or Time is a prod of a sharp sword which lets out the gas from the arguments going to prove that ideally they are unreal. No, in idea, they, of physical things, are the two which cannot be moved. Listen to Kant himself, when not undertaking to tell us what an ultimate fact consists in; but when dealing with the ultimate fact itself as the basis of others. "Wherever and however often I may think of a cubic foot of Space, my conception of it is always identical." Does not that prove its reality and persistence in the ideal, as in the sensible world? But he continues:—"But nevertheless two cubic feet are distinguished in Space only through their positions (*numero diversa*);"* that is, they are not separated, they are perfectly united, but they are in different places. Are two "pure intuitions" or two "necessary representations," *i.e.*, mental images, in different places? Again: "One part of Space, even though perfectly similar and equal to another, is nevertheless outside of it, and by that fact is separate from it."† How can two parts of a "pure intuition" be one outside of the other and separate in space from one another?

From the gross reality of solids we are led to the finer reality of liquids, from that to the rarified reality of gases, from that to the subtle reality of forces, from that to the super-sensuous reality of ether, from that to the immaterial reality of Space and Time, from that to the potent reality of spirit. As grossness diminishes, significance in the system of universal structure increases. Rock is real, but cannot move itself; forces are real, but cannot either begin their own

* *Kritik der Reinen Vernunft*, p. 254.

† *Ibid.*, p. 243.

motions or terminate them; ether is real, but cannot either think or act; Time and Space are real, but cannot either design or fashion; spirit is real, and even as finite spirit can move, can originate motion, can design, can fashion, can rule. Time and Space are the one groined archway, through which we look from the world of bodies away into that of infinite and eternal spirit, from things which are made, moved and governed to that which designs, and creates, and orders things in their courses.

Our consciousness of existing in a passing NOW and in a circumscribed HERE is always attended by the experience that neither the foregoing Time by which our NOW is bounded on the one side, nor the following Time whereby it is bounded on the other, ever discloses a limit. The same experience attends all inquiry for an end to the Space which environs our HERE in every direction. Thus, from the first moment of reflection, we are placed under the tuition of a system which marks out ourselves and our sphere as representing finites in the midst of the infinite. One idea never presented to us in nature, but only in the speculations of men, is that of finites without an infinite. For ourselves it is only at one pin's point, as it were, of the universe, that we are present; and in all the rest we exist not. Yet, with that vast expanse where we are not, our connexions are manifold and vital. So also it is only at one moment of eternity that we are thinking, feeling, or acting; the past has ceased to be, the future has not begun to be; yet in that past are all the roots of our being, and in that future all its issues.

Body everywhere is confronted with the absence of body, motion is always alternating with intervals of rest, and in the higher realm of mind consciousness alternates with periods of unconsciousness. Now, whether it be the alternate solid and void, the alternate pulse and pause of motion, or the alternate consciousness or unconsciousness of minds, the opposites do not clash as in chaos, nor yet do they mix confusedly like water and earth in a gutter, but they combine into an order, like dry land and sea. The alternation of body and space is structural, that of the arc of motion and the node of rest is functional, that of consciousness and unconsciousness is functional in a nobler sphere. Take the interspaces in the wing feather of a hawk, or those in the shell of a nautilus, or those in the solar system,—in each instance they are as clearly structural as are the interspaces in Westminster Abbey. If it be said that what is not matter cannot form part of a structure, all we can say in reply is that bad metaphysics must give way to good facts. The interspaces

are an essential part in a system of structure. The term "structureless" might be worse interpreted than by saying that it describes a body without ordered interspaces. Change the interspaces in the eye, in a honeycomb, in a bell, or in a microscope, and the utility of the solids is destroyed.

Between world and world the interspaces spread out into chasms which the imagination cannot comprehend, and yet, in experience, those chasms are found not only to be consistent with common action as members of one system, but to be themselves part of that system. Between finger and finger of the same hand, between mote and mote of the same dust, between molecule and molecule of the same metal, interspaces mark off the individual. They constitute in every case breaches in material continuity; but wherever there is a structure the order and arrangements of those breaches is an essential part of the structural design. We may call these interspaces void, pure space, empty space, but under any name we must bear in mind the fact that they are an essential part of the system of structure. The immaterial Space may extend over the thousandth part of a hair-breadth, or over a thousand millions of miles; but in either case in it reigns a design common to the bodies and the voids which are combined in one system. Design pervades the bodies, design pervades the interspaces, and both bear witness to the control of a common mind, supreme over tangible and intangible alike.

When in the midst of a great chasm of space a solid body appears, whence came it? The space had no more tendency to produce either planets or atoms than has the air to produce birds or eggs. Well suited as is the bird to the air, and the air to the bird, they are not the authors one of the other. The surrounding air does not more clearly mark out the bird as a finite creature, than does the surrounding interspace so mark out the largest globe, as well as the invisible molecule. This defines matter as being not a unit, but a countless host of atoms existing individually, and related to one another across ever-recurring breaches of continuity; thus matter not only lacks infinity, but has not continuity, and yet the breaches of material continuity are not necessarily destructive of connexion, but are often made the means to a higher form of inter-relation. In the words of Bacon, matter is "an army of infinite small portions or seeds."* No number of finites can make up an

* Works, ii., 290, ed. of 1824.

infinite; and things which are at every point ending and beginning cannot be things which themselves had no beginning.

Not less clear than the mark of finite set by interspaces on the nature of matter, is the mark set by them upon it of dependent. Neither molecule nor planet exists for itself. The very interspace which displays the individuality of each particle or each world, while preventing contact, provides for intercommunication. Across it are maintained interdependence and interaction; for no world suffices for itself, and no particle exists without contributing somewhat to the general plan. Interdependence and interaction across interspaces are kept up, in the absence of material continuity, by currents of force. Every chasm is crossed by invisible, intangible, inaudible strings of touch which hold now world and world, now mote and mote, in practical relations. Not one hand-breadth of space can we select but is crossed by operative action and reaction. No more can we in the "army of infinite small portions" select a particle which supports itself, or one which in moving does not keep step with the others. The unity of a battalion is not maintained by material continuity, nor does the separate individuality of its component parts destroy its unity; but it is a higher unity, unity by ordinance of mind, not by cohesion of body; by oneness of design, not by a single centre of physical force. Rising from a battalion to an army, we find that a single centre of mental and moral force can, by a slight motion of the lips, set a hundred thousand centres of physical force in timed and ordered movement, and that, in its turn, each of these does with a number of inert bodies whatsoever it wills, or even with the body of an animal.

Whether the atom be a hard and indestructible solid, as Lucretius has it, or a vortex, as Sir William Thomson with great show of reason has it, it is pre-eminently a centre of force. Not more distinctly does each mind contain its own store of powers, fitting it to act and be acted upon, than does each atom. In Herschel's words, which have been a light to me ever since I was a boy, it is "a manufactured article." But it is not manufactured for solitary existence any more than are hooks and eyes, or buttons and buttonholes, or valve and cavity in a pump. As clearly as each of these declares itself originated to fit to and work with the other, so clearly does each atom declare itself made to work with others. By one set of qualities it sends out impulses, by another it receives impressions. It is made for combined action.

Every atom is a platform of forces, with its departure and

arrival side. What those forces consist in, it is as impossible to say as it would be to doubt their reality. Lucretius ascribed cohesion,—and I suppose adhesion also, though I do not remember that he distinguishes between them,—to the fact that certain kinds of atoms were made with hooks. But if Sirius, without any hook, can fix my eye upon him, some finer tie than a hook may link particle of gold to particle of gold, and particle of oil to particle of oil. Whatever cohesion comes from, it takes but short steps. A little way off and it is no more effective. So also with adhesion. Let the putty, the glass, and the wood be one inch apart, and they will never adhere. No Space will avail always to keep asunder two bodies moving towards one another, but the least Space will permanently keep asunder two destitute of motion. Now, suppose that all forces were short range, like cohesion and adhesion, then interspaces would be blank gulfs, untraversed and impassable. But matter which cannot either move itself or stop itself when once moved, shoots out from itself something, we know not what, which acts farther off than either adhesion or cohesion, or yet chemical affinity,—something which acts across appreciable and even considerable interspaces,—for instance, magnetism. This operates not promiscuously on all bodies alike, but discriminatively, producing its characteristic effect only on some. But at distances far beyond those to which the action of a magnet can be traced, we find heat and gravitation effective. Is gravitation body or spirit? Is it organic or inorganic?

If you only adopt the favourite method of saying that it must be some one of a few things, you will easily prove that it is nothing at all. Fifty stronger arguments than those of Lotze or Kant to prove the non-reality of Space might be constructed to prove the non-reality of gravitation. On the principle of Democritus, of “either body or void,” of course it is nothing at all; for it is not body and it is not void, any more than a letter is either a writer or a distance between writer and reader. But as the letter is a link of communication between mind and mind across an interspace of a mile or a thousand miles, so is gravitation a link of communication between body and body across gaps of any dimensions. At every point in Space, its crossing-lines, all well laid and well trodden, raise the question, “Who laid down these lines, and who keeps them up?” The whole traffic of creation depends upon them, yet are they as invisible to Stephenson or Lesseps as were the rays of the evening star to blind John Milton. Yet it is not of so much consequence to us here in London that the crossings at all the junctions should be kept

right as it is that nothing should go wrong at any point in Space where line and line intercross, as they do at all points ; for any failure there, and we, our traffic, our London, our globe, were all undone in one collision.

Finite, then, and dependent, matter is also marked out by the interspaces as combined. Just as the individuality of its particles proves that they are not self-originated, and as their inter-dependence proves that they are not self-sustained, so does their co-operation to common ends prove that they are related to what lies beyond themselves in Space, and what is future in Time ; and that, consequently, they are directed from some common centre of order. The position of every molecule relatively to its own mass is strictly ordered. That of every mass relatively to every other mass is also strictly ordered. In the march through Space each mote and each constellation follows a line laid down, and proceeds at a pace measured and timed. The lines are dispersed over incalculable distances ; the paces are various beyond count ; the objective points are unknown to the separate columns ; yet, in all the host, the throb of progress and the interval of rest keep time,—time divided as by One able to make much of the millionth part of a minute ; and every courser steps to notes of a silver bugle too fine for mortal ears.

Bacon ranks among things of the utmost incredibility the supposition that “an army of infinite small portions or seeds, unplaced, should have produced this order and beauty without a Divine marshal.” Yea, verily ; such numberless individuality, such close inter-dependence, such complex combinations, without a common seat of direction, would be a chimera of imagination so grotesque that, in Bacon’s words, a few sentences earlier than those just quoted,—“I had rather believe all the fables in the Legend, and the Talmud, and the Alcoran, than that this universal frame is without a mind.”* “Unplaced” is one of Bacon’s much-meaning words. A great army of individuals unplaced would be a great mob. Yet the materialist is in this double perplexity ; in the first instance all particles were unplaced,—were, he thinks, self-existent. Democritus himself assumed that whatever is one is necessarily self-existent, and as the atom is one it is self-existent. I should reply the egg is one, and is therefore self-existent. But these same materialists have to teach that in practice the entire value of things depends on how they are placed. We find them placed as they are, and the materialist sagely

* Works, ii., 291.

instructs us that the difference between one substance and another is a mere difference in the distribution of their particles in Space. Therein lurks the ordinary fallacy of a half-truth. It is not a *mere* difference of distribution. The distribution is by rule; the difference is one responding to a conception. Attempt to make particles of hydrogen and oxygen in equal proportions constitute water, and you will learn that they are placed, that there are certain positions into which you cannot put them, and others out of which you cannot keep them, if given conditions arise. The law of definite proportions has settled the question as to whether atoms have qualities, and shows that their qualities do not, as Democritus thought, wait for combinations to originate them, but that combination has to wait obediently upon pre-existing qualities, as it cannot take place except in conformity with their requirements. A conception of mind imposed on matter had anticipated future Time, and ruled future combinations in Space. Just as a conception of mind imposed on thread, loom, and shuttle anticipates future Time, and determines how in Space warp and weft shall combine. Or as in architecture, a conception of mind imposed on a stone will compel it to fit in at a certain part of an arch, and not fit at another.

Now the alternative of this view is that of the materialists, who, however the metaphysical setting of their atoms may vary, have to face the fact that the atoms are all finites, and that Space demonstrates them so to be; and also that they are all inter-dependent and fitted for combination, not in mere series, but in fixed proportions, and after pre-determined rules. They must hold that this pre-determined order is itself a birth of chaos, and not the offspring of design. No one is abler, ancient or modern, than Lucretius, and no one more honest. He faces his own theory, which is what few modern materialists have the courage to do. There was no god, no mind, no original order, or congenital qualities of things. Atoms and Space had existed from eternity. Atoms had been driven in perpetual motion. They came into collision. After many collisions things came right. The world arose, life began. It was all by *spontaneous* action of the atoms, all the work of nature. He never hesitates, lest any one should ask what is nature, what is the *sponte sua*, the free will or the own accord of an atom that has no qualities? What is the force to drive atoms about in Space, when there is nothing else in existence save atoms and Space only? On the contrary, he strains words to express the idea of mindless movement, and issues without foregoing design. Bacon evidently had in view his language when he spoke of seeds unplaced, "seeds in

number numberless and sum unfathomable fly about in manifold ways driven on in ceaseless motion this world has been made by nature, and the seeds of things chancing spontaneously to clash,* after being brought together in manifold wise *without purpose, without foresight, without result*, have at last combined in such masses as, suddenly thrown together, became on each occasion the rudiments of great things, of earth, or sea, or heaven, and the race of living things.”†

A favourite illustration of the philosopher who thus slightly constructs us and our “environment,” is that of the letters of the alphabet, which being so few, supply all the words of his poem merely by occupying different relative positions in Space. This crowning proof he repeats several times; but not once does he inform us that Space and the alphabet having been left to themselves evolved out of their *sponte sua*, their own free will, a wind blowing equally on all sides which drove the letters about; that they, so driven, chanced to come into collision, and repeating clash after clash did not, as might have been expected, seeing that they had no pre-established affinities, clash themselves into super-chaotic chaos, but instead thereof, without purpose or foresight, clashed into nouns and verbs, cases and tenses, particles and propositions. Nor does he tell us that thus aimless and mindless they had, in addition to the arrangement of themselves in Space, so come to preconceive Time as to bring in short syllable and long, stress and pause, in due alternation, thus anticipating the tendency to rhythmic movement in the reader’s voice, and the love of timed “numbers” in the hearer’s ear, as they had already by their arrangements in Space anticipated and prepared for his eye and his understanding.

We come upon a deep if not a fathomless mystery in human nature when we see a man of large and luminous genius bending over his pages, by forces of thought giving birth to what had never before been, by lights of mind foreseeing both the movement of his own intellect and that of other intellects, fore-arranging symbols composed of lines and voids, lines often inclosing interspaces, so as to evoke in other minds thoughts never there before, thoughts of Time and Space, of matter and intellect, of gods and men; so as to evoke now images of coarsest animal passion, and now ideas of profound philosophical import; and so, moreover, at the same time to lead the voices of others through rhythmic movements, and to regale their ears with harmonious numbers;

* “Sponte sua forte offensando semina rerum.” Book ii., 1059.

† I here use the translation of Mr. Munro, and underline some words,

and yet, he who does all this, seizes upon the process as one which shows how the letters did it all.

He forgets mind. Yet mind did it all. He wants to exclude God from creation, and excludes man from his own handiwork. Mind made the letters. Mind fixed upon the form of each so that the individual elements were unchangeable. Mind fixed their combinations so that permanently certain groups formed new individuals, composite but compact. These composite individuals, or words, mind assorted, as previously it had assorted simple individuals or letters. Then mind again grouped these individuals into higher wholes, called sentences, and so forth. Yet mind is the one element omitted in the argument. The clay is the power and the potter is forgotten. Thus are so-called systems formed by eliminating the one element which controls all the others.

The limits of this paper have not permitted of more than a mere glimpse at the range of subjects opened up by the contemplation of the interspaces, and have not permitted even of entering upon the corresponding subjects which have been indicated, namely, the intervals of Time in alternations of motion and rest, and those of consciousness and unconsciousness. Under these are comprised the two branches of inorganic and organic motions. The class of inorganic motions embraces *motions of transport*, in which a mass not only changes place, but carries with it other bodies; *motions of transference*, in which a mass merely changes its own place; *motions of transmission*, in which a mass remains stationary, but receives and transmits a wave of force; *motions of emission*, in which a stationary mass throws off particles of its own substance; *motions of impulse*, in which a mass imparts to an external substance a wave of force, which wave that substance passes on; and, finally, *motions of attraction and repulsion*, in which one body draws another to itself or pushes it off from itself. Under the class of organic motions we have the two great branches of voluntary and involuntary motions, extending from the movements of growth up to the planned actions of an intelligent agent, and then on from him to the artificial movements of tools, implements, and machines. In all these, when brought under patient survey, it will appear that what I before said holds good,—the opposites of motion and rest do not clash as in chaos, and do not mix in disorder, but harmonise on a system responding to a pre-conceived ideal, and pointing to an anticipated use.

How clearly Lucretius recognised the fact that in all processes which come within the range of human experience forms and events answer to a pre-conception of mind, becomes

evident when, in speaking of such a simple experiment in Time and Space as what we call walking, he says :* “ No one begins to do anything until after his mind has foreseen what it aims at.” So teaches experience, absolutely so. No experience of man’s work shows us ordered arrangements in Space or ordered events in Time, except as they respond to a pre-conception. Absolutely no experience has ever been had of a case in which things having no nature to begin with, clashed themselves first into a nature, and next into an order. To us the printer’s types are an apt illustration of the atoms ; and to conceive of the types as originally so many pieces of shapeless metal, clashing themselves first of all into *a*, *b*, *c*, and *d*, as a preparation for other performances, exceeds surely the self-command even of a materialist. It is only in a region beyond the limits of all our experiences that such unfledged fancies can dream that they take wing.

Let him look at each letter, and then say if, in every case, the conjunction of interspace with body is not structural, and if structure does not point back to proportion, proportion to design, and design to an intelligent agent.

The illustration of type was not, of course, present either to Lucretius or his precursors. To them the letter formed under the hand as a direct act of mind. To meet their theory, pen, ink, and paper were all the pre-requisites to writing ; the scribe was a superfluity, an agent too much. Thomas Moore, in one of his satires, gives a letter of a young lady describing the preparations for her father’s great poem ; he had pens, ink, and paper, many accessory facilities, “ in short, everything he has that a poet can want except words and ideas.” Now, ideas are just the elements with which materialism dispenses. But they are the elements which all experience tells us are the governing ones. Therefore, as standing in one spot of Space, we look above, below, before, behind, to the right hand, to the left, and feel that on every side the end is nowhere, and the Infinity everywhere, we ask, can Infinity mean nothingness ? can extension reach beyond being ? And as breathing in our one instant of Time, we look behind and before, and see that the end is not in either and the Eternity in both, we ask, can Eternity be nothingness ? Can duration last beyond being ? No ; every hand-breadth of space records the work of a Maker, and every tick of Time speaks to the presence of a living Preserver.

* Book ii., 883.

The CHAIRMAN (Mr. D. Howard, V.P.C.S.).—We have to thank the writer of the paper for the profound study of which it is the evidence. There are a good many people who say, What have we to do with metaphysics, and what have we to do with Lucretius? The best answer I know is, What *have* we to do with them? The very people who say, What have we to do with metaphysics?—as a rule before very long, will proceed to indulge in metaphysics without being aware of it, and therefore will indulge in them with no more chance of success than a painter would have of painting if he did so without being aware that he was painting. So a metaphysician who begins by despising metaphysics will not be very successful in his work. The study of thought, or the study of mental processes, is surely not rendered unnecessary by the study of physical science, of which we are so proud, but of which little enough was known to Lucretius. Yet you will find, in what purposes to be the result of modern scientific study the ideas of Lucretius repeated with marvellous exactness; so much so, that one wonders if men who write books on metaphysical subjects have ever remembered that Lucretius has written before them. Had many modern writers of the agnostic school read Lucretius, it should have saved their writing, for a good translation would have been all that they needed to give to the world. These studies are just as necessary to us as they were to Aristotle. Indeed, the idea of metaphysics,—that which comes after the physics in the scheme of Aristotle,—is perhaps more needful to us than to Aristotle. Much of what we are pleased to call physical science is not physics, but metaphysics. You never get an elementary treatise on scientific subjects without finding yourselves at once landed in metaphysical subjects, and metaphysics, not known to be metaphysics, are of a most doubtful character. Take the assumption which the author of the paper has contended against, take the illustration he gave as being evidence of a Divine power behind them, and we find those very facts of time and space used as an argument against the Creator simply because the writer of such an argument has never remembered that before talking of time and space he should have tried to understand what time and space are. I hope those who have studied this subject will give us the benefit of their remarks.

Rev. Professor W. F. SLATER.—I should be sorry to think that the visitors to-night would maintain absolute silence after the very eloquent paper which has been given us through Mr. Arthur's kindness, upon subjects which are more or less interesting to all. I do not profess to be able, just at this moment, to review practically or scientifically the discussion of this wide subject. As the paper has proceeded I have observed one or two matters which might be open to remark. The criticism of the various systems of Philosophy has been full of enlightenment. It struck me, from my slight acquaintance with Kant's views of time and space, that he was open to the criticism which Mr. Arthur advanced; namely, that he was in danger of the confusion of these two things as they are in themselves with our ideas respecting them. At the beginning I thought that the essayist was intending to set before us a system of dualism,—that he was about to assert

that for us time and space were both finite and infinite, but, subsequently, the opinion was advanced that matter must be regarded only as finite. On this point my mind is somewhat doubtful. The great question of metaphysics is whether unity of thought upon these subjects is possible. The metaphysician may be right when he asserts that his general conceptions are real ; but can we say that the physicist is not right when he asserts that, so far as our knowledge and reasoning go, the material system is practically infinite? However, all will allow that the essayist has brought into the service of his exposition a very abundant mind, and that his essay furnishes glorious illustrations such as are too seldom found in metaphysical disquisitions where the reasoning goes straight on without such assistance. Those given to-night have illuminated the whole track of thought and have enabled us to see most clearly the drift of the writer.

The CHAIRMAN.—It is always a great disadvantage to the discussion when a paper is very thorough and very true, while if an author indulges in some grand defect there is generally a pretty lively discussion ; and I feel this evening that the paper has been so very thorough in its treatment of a very difficult subject, that it has, as has been well said, perhaps been rather hard for others to join in after so admirable a treatise. It is a subject on which, I believe, the more we think, and the more we really go over this paper, the more we shall value the thoroughness of it. I believe more and more in the importance of these questions. We have everything to gain, and nothing to lose by going to the very bottom of the subject. I do not consider that the Christian thinker need, in the least bit, fear *depth*. It is *shallowness* which is the great, terrible danger, and the very danger of much thought in the present day lies in its shallowness. When we consider how marvellously clear, how marvellously profound the scepticism of Lucretius was, and yet how little did it avail against those whom he would have called ignorant men, unworthy of the name of philosopher, against whom he was then pitted ; we may, I think, trust that in the future, as in the past, the truth will not suffer from profound attacks any more than from superficial attacks. The truth will not suffer from superficial attacks, but the thinker may, and it is in the superficiality of modern thought that lies the great danger. I am sure we welcome with great heartiness so thoughtful and deep a paper, and I will ask you to join in a most cordial vote of thanks to the author on this occasion.

The AUTHOR.—I must acknowledge the great kindness shown, first in the patience of the audience, and secondly in the toleration of the observations made. I confess I felt rather afraid in dealing with the subject, not that the fear was of this kind, that I was going where I did not know my way, because I confess I have long thought upon the subject, and I felt I knew where I was going ; but, on the other hand, I knew that it was a subject that was not likely to be very taking. In regard to an observation as to infinite matter, the word "infinite" is used in so many senses. Generally speaking, it only means indefinite. When you speak of an infinite series of numbers, of course that has nothing to do with infinity

at all, except that you never get to the end. Infinity, to my mind, is a word that includes all fulness of everything and that excludes all possible breach of continuity. What is a series of numbers but simply a series of breaches of continuity? The moment you admit a breach of continuity, infinity proper is gone, utterly gone, and the whole question of infinite matter is settled by this other question, Is there any breach of continuity? If there is, then infinity in the proper sense there is none, though in the popular sense there may be. So far from looking upon this as a complete paper, it is a very dry abstract of a rather lengthy study. I thought at one time that I would probably confine myself to giving a series of Kant's views, with arguments upon them; and then I thought I would do the same with Lucretius; but I found that either would be too cumbrous, so I put together as well as I could in haste, at the last, certain abstracts from careful hard work. I was reminded as I sat here of what I believe were my earliest meditations upon this subject. I was a child, perhaps five years of age, and was being led down in the glens of Antrim to the shore to be bathed, and I wanted to know something about the ships that were in the offing—where they were going to? I was told that some were going to Belfast, some to other places, and some to the end of the world. I asked, "What is the end of the world like?" I do not remember the answer, but I know that whatever it was it called out the rejoinder, "I want to know what it is like; do the sky and ground break off both together, or does the ground break off, and the sky go on?" I do not remember the answer, but I never forgot the controversy, and it shows that even in childhood the mind is filled with these conceptions, and that in childhood it was easy to conceive of an end of things below, but not easy to conceive of an end to the things that are above.

The Meeting was then adjourned.