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1904.

ORDINARY GENERAL MEETING.\*

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

The following paper was then read by the author :—

*THE CONCEPTION OF THE GREAT REALITY.*

By SYDNEY T. KLEIN, F.L.S., F.R.A.S.

AT the outset we must recognise that when we with our finite senses try to form a conception of the Infinite it necessarily takes the form of a negative, the negative applying to those things of which we have cognizance; we carry our thought to the utmost limit possible with our present knowledge, and when we have come to a standstill we conceive the Infinite to be not that but *something further on*. As our knowledge increases by small steps, that *something further on* seems ever to be flying from our grasp by mighty strides, until we are forced to bow our heads and recognise that we are in the presence of, though still not in sight of, the Great Reality. A divine impulse is ever urging us forward to greater conceptions, but shattering our hopes and giving us a feeling of despair if we arrogate to ourselves a greater power of conception than we have knowledge to sustain. We have to approach the study with indeed that feeling of elation which the knowledge of our divine origin wakes within us, giving us a feeling of certainty that our souls are capable in the hereafter to attain to the highest summit of knowledge, but with that humility in the present which makes us acknowledge that he who knows most,

\* Monday, April 11th, 1904.

knows most how little he knows. In this frame of mind let us now examine our surroundings.

We are living in a world of continuous and multitudinous changes, in fact, without change we could have no cognizance of our surroundings, we should have no consciousness of living; we have become so accustomed to certain sensations that we are apt to take them as facts and scoff at the suggestion that they are non-realities. I propose, however, to show that what we perceive are not realities; and true conception of our surroundings depends upon the knowledge which we can bring to bear to interpret the meaning of these sensations. It is only in response to our conscientious endeavours to form new concepts that knowledge is being daily revealed to us; the more we progress in knowledge the more we see that perception alone without knowledge leads to false concepts, and these in their turn if held dogmatically create fatal obstacles and difficulties to our progress towards the appreciation of both the natural and the supernatural. Let me give you a few examples of this in the natural.

In early times the sun and the stars were seen to revolve round the earth once every day, and, without knowledge of astronomy, this was taken for granted as an absolute fact; later on, however, it was noted that the stars never changed their relative positions; this necessitated a new concept, namely, that they were fixed on the inner surface of a huge globe. This false concept brought other difficulties into play, the question arose as to what was beyond the globe, and also the difficulty that the stars as well as the sun were found to be at such an enormous distance from the earth that their rates of motion were quite inconceivable; even in the case of the sun the motion represented over twenty-five million miles per hour and the apparent motion of the stars was thousands of times faster than light travels. These difficulties were not swept away until by the advance of knowledge, the falsity of conception based only upon appearance was made manifest and it was seen that it was the earth which moved and not the stars; even then, owing to its supposed antagonism to what was stated in the Bible, the new conception was opposed with great bitterness, it being long looked upon and denounced as a sacrilegious invention.

Our present conception that the earth turns round on its axis once every day and rolls in its orbit round the sun once in every year may be called a reality to our finite senses; but I shall show later on that, except for the finiteness of our senses

and the imperfection of our knowledge, the concept is not a true one—with perfect perception and perfect knowledge there can be no such thing as motion, which is the product of time and space.

Let us now go from our senses of sight to that of touch. If you hold a cannon-ball in your hand, perception by the sense of touch tells you that it is solid and hard, but it is not so in reality except as a concept limited by our finite senses. A fair analogy would be to liken it to a swarm of bees, for we know that it is composed of an immense number of independent atoms which are incessantly darting about and circling round each other at an enormous speed, but never touching. If our touch-perception were sensitive enough we should feel those motions and should not have the sensation of a solid; we have a similar case of limitation in our other senses. We can hear beats up to 15 in a second, but beyond that number they give us the sensation of a continuous sound, as you may see by this instrument (syren). In our sight-perception we also have the same limitation, we can see pulsations of intermittent flashes at the rate of 6 in a second, but beyond that number they give us the sensation of a continuous light; the effect is seen very clearly in making the top of a match red-hot; when stationary or moved slowly, it is a point of light, but move it quicker and it becomes a *line* of continuous light. If our sight-perception were sensitive enough we could see the darting about of these atoms, and the cannon-ball would take on the appearance of a swarm of bees. We are so accustomed to take everything for granted that it may perhaps startle some of you when I ask you to consider whether we can even assert that we have ever seen matter. Let us turn towards a common object in this room. We catch in our eyes the multitudinous impulses which are reflected from its surfaces under circumstances similar to those in which a cricketer "fields" a ball; he puts his hands in the way of the moving ball and catches it, and knowing the distance of the batsman he recognises, by the hard impact of the ball, that the batsman has strong muscles, but he can gain thereby no idea as to his character. And so it is with objective intuition; we direct our eyes towards an object and catch thereby rays of light reflected from that object, at different angles, and by combining all these directions we recognise form and come to the conclusion that we are looking at, say a chair; the eye also tells us that rays are coming in greater quantity from some parts of it and we know that those parts are polished; the eye again catches rays giving higher or lower frequencies of

vibration and we call that colour ; our eyes also tell us that it intercepts certain rays reflected from other objects in the room, and we know that it is not transparent to light ; and those are our perceptions of a wooden chair. We know, however, with great precision the relative weights and the forces exerted in the combinations of the atoms composing matter ; we know that they vibrate ever quicker and quicker as their temperature rises, and, as the quicker they vibrate the less cohesion they have, so matter passes from the solid into the liquid and thence into the gaseous state as the temperature is raised. Our greatest Physicists are ever working on this subject, and the theory which explains the most and seems to fulfil the conditions under which these atoms act, points to each of these being a vortex in the ether, that subtle medium which, having the properties of a solid of almost infinite elasticity, we know to be universally present, as it is by means of that wonderful elasticity that we are able to receive the light from stars sunk far away in the depths of space. I cannot show you a vortex in the ether, but I can start one of these through the still air of this room, and at a distance of 50 feet you will be able to appreciate it as a considerable force. One of the most interesting and suggestive thoughts follows from the conception of an atom as a vortex in the ether. It can be shown that in a perfect fluid where there is no vortex motion no mechanical action can possibly start it, but where vortex motion once exists no mechanical action can possibly stop it. Under these conditions matter is proved to be a manufactured article, not made by natural physical forces but by some great supernatural power outside the visible universe, and once having been made it can only be destroyed by the action of that same creative force. I shall touch upon this subject later on, when I suggest a new conception of the meaning of Creation ; meanwhile, I will only ask you to consider how, owing to our senses being limited by the considerations of time and space, we are surrounded by inconceivables ; and yet it is those very inadequate conceptions which force us to acquire knowledge, the greatest incentive we have to pursue our investigation, as we have seen, is the fact that perception without sufficient knowledge leads us into difficulties. Let me give you two instances of these inconceivables :—Infinite space is inconceivable by us, but it is also quite as inconceivable to think of space being limited, and yet one of these two must be true. Again, matter is either composed of atoms of a certain size which cannot be divided, or is infinitely

divisible: both of these are inconceivable, the latter for the same reason as that of the extent of space, and the former because it is inconceivable that an atom could not be divided into two parts by a stronger force than at present holds it together. It might be suggested as an explanation that if an atom could be divided it might cease to be matter, its parts would have no existence, and this is corroborated in a wonderful way by the fact that one of these vortices disappears immediately and completely if cut in two.

Another example of perception leading to a false concept is our sense of pain; we apply a red-hot coal to the tip of one of our fingers and our perception would have us believe that we feel intense pain at the point of contact, but we know this to be a false concept, as it can be shown that the pain is only felt at the brain; there are in communication with different parts of our body small microscopical nerve threads, any of which may be severed with a penknife close to the base of the skull, with the result that no pain can then be felt although the finger-tip is seen to be burning away.

Another example is our sense of hearing. A musical sound is made up of a certain number of pushes in a second, but each push is silent; it is only, as we have seen, a musical sound to our sense when the pushes recur at intervals of not more than the sixteenth part of a second. The prongs of a tuning-fork vibrating five hundred times per second seem to be travelling very quickly, but are really only moving at the rate of five inches per second when the amplitude is the one-hundredth part of an inch.

Light is also composed of rills in the ether, but the rill itself is not light; it is only light when these rills strike with a certain enormous frequency on a special organ adapted for it, we might say, counting those frequencies, and if these frequencies fall below a certain number, or above twice that number, per second, there is no counting, there is no sense of sight. In fact, our physical senses are only adapted for appreciating frequencies within certain limits.

Let us now turn for a moment to our conception of the supernatural. Our earliest impressions are necessarily anthropomorphic; as children we are taught that God sees what we do, therefore He must have eyes; He listens to our prayers, therefore He has ears; He is able to walk in the Garden of Eden, therefore He has legs; He calls to Adam and speaks to His prophets, therefore He has a mouth; He sits on a Throne, therefore He has a body; and He raises His right hand when

He makes a solemn declaration, therefore He has arms; He is continually mentioned as being in certain definite places, He can therefore be localised. As our knowledge increases we find that these are conventional descriptions, but the former Conception clings tenaciously, and it is very common to hear statements showing that the Deity is looked upon as a magnified man with senses, greatly improved, but still limited; it is difficult for such persons to grasp the fact that God cannot be said to be *anywhere* but that *everywhere* God is. The principal difficulty is to realise that human conception is limited by considerations of Time and Space rendering motion a necessary basis for thought, but to the Spiritual, which transcends Time and Space, the only reality is the *here* in Space and the *now* in Time, and, to such motion can have no objective reality.

As in the case of the natural, the more we gain knowledge of our surroundings the nearer and nearer we get to the appreciation of *truth*, so may we see in the case of the supernatural that a knowledge of God is the *summum bonum* of our aspirations; that alone being able to give us a true conception of the Great Reality, the very essence of that personality which is necessary for each one of us if we are to experience everlasting life. Let us then take these two mysteries of Time and Space, the *for-ever* and the *never-ending*, and see whether we can get a clearer insight into the subject before us by tracing them to the utmost limit of human conception. I will first take the subject of Space, and I think the best method I can adopt will be to take you, in imagination, for a journey as far as is possible by means of the best instruments now in use. We will start from the sun, and, moving outwards, we will rapidly mark the number and character of the worlds involved in the solar system. Let us first understand what are the dimensions of our central luminary. The distance of the moon from the earth is 240,000 miles, but the dimensions of the sun are so great, that were the centre of the sun placed where the centre of the earth is, the surface of the sun would not only extend as far as the moon, but as far again on the other side, and that would give the radius only of the enormous circumference of the sun. Let us now start outward from this vast mass. The first world we meet is the little planet Mercury, only 3,000 miles in diameter, revolving round the sun at a distance of 36,000,000 miles. We next come upon Venus, at a distance of 67,000,000 miles. She is only 400 miles smaller in diameter than our earth, and with the dense atmosphere with which she is surrounded, animal and vegetable life similar to that on our earth may be possible. Continuing

our course, we arrive at our earth, situated 95,000,000 miles away from the sun. Still speeding on, a further 50,000,000 miles brings us to Mars, with a diameter of nearly 5,000 miles, and accompanied by two miniature moons. The conditions on this little globe are probably more like those of the earth than on any other planet, and its day is almost the same length, namely, 24 hours 39 minutes. The sight of this planet in a good instrument is most interesting. Oceans and continents are plainly visible, and the telescope shows large tracts of snow, though not necessarily water snow, surrounding its polar regions, which increase considerably during the winter, and decrease during the summer seasons on that planet.

The distances we now have to travel become so great that I shall not attempt to give them; you can, however, form an idea of the tremendous spaces we are traversing when you consider that each successive planet is nearly double as far from the sun as the preceding one.

In the place where we should expect to have found the next world we find a group of small planets ranging in size from about 200 miles in diameter down to only a few hundred yards. They pass through nearly the same point once in each of their periods of revolution, and it has been suggested that they are fragments of a great globe rent asunder by some mighty catastrophe; about 400 have been discovered and named.

We now continue our voyage over the next huge space and arrive at Jupiter, the largest and most magnificent of the planets. This world is more than 1,000 times larger than our earth, its circumference being actually greater than the distance from the earth to the moon. It has five moons, and its year is about twelve times as long as ours. Pursuing our journey, we next come to Saturn. It is nearly as large as Jupiter, and has a huge ring of planetary matter revolving round it in addition to eight moons. Further and further we go and the planets behind us are disappearing, and even the sun is dwindling down to a mere speck; still we hurry on, and at last alight on another planet, Uranus, about 60 times larger than our earth. We see moons in attendance, but they have scarcely any light to reflect. The sun is only a star now; but we must hasten on deeper and deeper into space. We shall again, as formerly, have to go as far beyond the last planet as that planet is from the sun. The mind cannot grasp these huge distances. Still we travel on to the last planet, Neptune, revolving on its lonely orbit sunk so deep into space that though it rushes round the sun at the rate of 22,000 miles per

hour, it takes 164 of our years to complete one revolution. Now let us look back from this remote point. What do we see? One planet only, Uranus, is visible to the unaided eye; the giant planets Jupiter and Saturn have disappeared, and the sun itself is only a star; no heat, no light, all is darkness in this solitary world. Thus far have we gone, and standing there at the enormous distance of 3,000,000,000 miles from our starting point, we can begin to comprehend the vast limits of the solar system; we can begin to understand the ways of this mighty family of planets and satellites. But let us not set up too small a standard whereby to measure the infinity of space. We shall find, as we go on, that this stupendous system is but an infinitesimal part of the whole universe.

Let us now look forward along the path we are to take. We are standing on the outermost part of our solar system, and there is no other planet towards which we can wing our flight, but all around are multitudes of stars, some shining with a brightness almost equal to what our sun appears to give forth at that great distance, others hardly visible, but the smallest telescope increases their number enormously, and presents to our mind the appalling phantom of immensity in all its terror standing there to withstand our next great step. How are we to continue on our journey when our very senses seem paralysed by this obstruction, and even imagination is powerless from utter loneliness? One guide only is there to help us, the messenger which flits from star to star, universe to universe; light it is which will help us to appreciate even these bottomless depths. Now, light travels 186,000 miles per second, or 11,000,000 miles every minute of time. It therefore takes only about four hours to traverse the huge distance between our sun and Neptune, where we are now supposed to be standing. But to leap across the interval which separates us from the nearest fixed star, will require a period not to be reckoned by hours or by days or by months, long years must roll away before light, travelling with its enormous velocity, can complete its journey. Let us use this to continue on our voyage. On a clear night the human eye can perceive thousands of stars in all directions, scattered without any apparent order or design; but in one locality, forming a huge ring round the heavens, there is a misty zone called the Milky Way. Let us turn a telescope with a low aperture on this, and what a sight presents itself. Instead of mist, myriads of stars are seen surrounded by nebulous haze. We put a higher aperture on, and thus pierce further and further into space; the haze is resolved into

myriads more stars, and more haze comes up from the deep beyond, showing that the visual ray was not yet strong enough to fathom the mighty distance; but let the full aperture be applied and mark the result. Mist and haze have disappeared; the telescope has pierced right through the stupendous distances, and only the vast abyss of space, boundless and unfathomable, is seen beyond. Let us pause here for a moment to think what we have done. Light, travelling with its enormous velocity, requires as a minimum average ten years to traverse the distance between our solar system and stars of the first magnitude; but the dimensions of the Milky Way are built up on such a huge scale that to traverse the whole stratum would require us to pass about 500 stars, separated from each other by this same tremendous interval; 10,000 years may therefore be computed as the time which light, travelling with its enormous velocity, would take to sweep across the whole cluster, it being borne in mind that the solar system is supposed to be located not far from the centre of this great star cluster, that the cluster comprises all stars visible arrayed in a flat zone, the edges of which, where the stratum is deepest, being the locality of the Milky Way.

Let us once more continue our journey. We have traversed a distance which even on the wings of light we could only accomplish in 10,000 years, and now stand on the outskirts of a great star cluster, in the same way, and, I hope, with the same aspirations, as when we paused a short time ago on the confines of our Solar System. Behind us are myriads of shining orbs, in such countless numbers that human thought cannot even suggest a limit, and yet each of these is a mighty globe like our sun, the centre of a planetary system, dispensing light and heat under conditions similar to what we are accustomed to here. Let us, however, turn our face away from these clusterings of mighty suns, and look steadfastly forward into the unbroken darkness, and once more brace our nerves to face that terrible phantom—immensity. We require now the most powerful instruments that science can put into our hands, and by their aid we will again essay to make another stride towards the appreciation of our subject. In what to the unaided was unbroken darkness, the telescope now enables us to discern a number of luminous points of haze, and towards one of these we continue our journey. The myriads of suns in our great star clusters are soon being left far behind; they shrink together, resolve themselves into haze, until the once glorious universe of countless millions of suns has dwindled down to a mere point of haze almost invisible

to the naked eye; but look forward: the luminous cloud to which we are urging our flight has expanded, until what at one time was a mere patch of light has now swelled into a mighty star cluster; myriads of suns burst into sight—we have reached the confines of another Milky Way as glorious and mighty as the one we have left, whose limits would require 10,000 years to traverse; and yet in whatever direction the telescope is placed, star clusters are to be seen strewn over the whole surface of the heavens. Let us take now the utmost limit of the telescopic power in every direction. Where are we after all but in the centre of a sphere whose circumference is 100,000 times as far from us as the nearest fixed star, and beyond whose circuit infinity, boundless infinity, still stretches unfathomed as ever; we have made a step indeed, but perhaps only towards acquaintance with a new order of infinitesimals; once the distances of our solar system seemed almost infinite quantities; compare them with the intervals between the fixed stars, and they become no quantities at all. And now when the spaces between the stars are contrasted with the gulfs of dark spaces separating firmaments, they absolutely vanish below us. Can the whole firmamental creation in its turn be only a corner of some mightier scheme? But let us not go on to bewilderment; we have passed from planet to planet, star to star, universe to universe, and still infinite space extends for ever beyond our grasp. We have gone as far towards the infinite as our sight, aided by the most powerful telescope, can hope to go. Is there no way then by which we can continue our journey further towards the appreciation of this infinity? A few years ago we should probably have denied it was possible for man to go further; but quite lately a new method of observation has been developed. This I shall take for my next stepping-stone.

Let us first consider this question: Why is it that the further an object is withdrawn from the eye the fainter and smaller that object becomes, until at last it disappears altogether from the sight? There are two quite distinct reasons for this. First, the rays from any shining point diverge from such point in all directions; hence the nearer the object the greater the number of rays which will enter the pupil of the eye; and, conversely, when the object is removed to a great distance, so small a quantity of light finds its way into the eye that it fails to excite the retina sufficiently to cause the impression of sight, and the object is invisible. Now, if you take a lens, or what is popularly called a burning-glass, and place it in the beams of the sun, you will see that it gathers all the

rays falling on its surface into a bright point of light behind it; now place such a lens between your eye and a star, taking a star so far away that the eye unaided can only just see it as a glimmer of light, what happens? Why, instead of the eye receiving only a faint and almost imperceptible quantity of light, it appears now to take in the whole mass of rays which pass through the larger lens; for the lens has caused them to converge into a pencil of light sufficiently minute to enter the eye; thus the eye receives as much light as though the pupil had been enlarged to the dimensions of the lens. Thus armed, to what remoteness may we not now reach? The star might now be withdrawn so deep into space that the whole light concentrated by the lens is not more intense than the faint ray was from the star in its first position; and this mighty acquisition has been attained by the simple interposition of a piece of glass, and of course the larger the lens the further we can pierce into space. We now come back to the second part of our question:—"Why does an object become apparently smaller and smaller as it is withdrawn from the eye, until it at last disappears from sight?" The reason is, that the eye is a very imperfect instrument for viewing objects at a great distance; the eye can only see an object when it is near enough to subtend a certain angle, or in popular language, to show itself a certain size, in fact, the eye cannot single out and appreciate parallel rays. Could it do this, objects would not grow smaller as they are removed. This pencil might be removed to the moon, 240,000 miles away, and would still appear to the eye the same size as it does here close to you, but the result would be inconvenient. You would never be able to see at one and the same time anything larger than the pupil of your eye. The beauties of the landscape would be gone, and our dearest friends would pass us unheeded and unseen; everyday life would resolve itself into a task similar to that of attempting to read our newspaper every morning by means of a powerful microscope; we should commence by getting on to a big black blotch, and, after wandering about for half an hour, we might then begin to find out that we were looking at the little letter e, but anything like reading would be quite out of the question. We may, therefore, be thankful that our eyes have the imperfection of not appreciating parallel rays. But we will now consider how this imperfection may be remedied by science. There are two ways of doing this, viz., firstly, by increasing the amount of light received, by means of telescopes of great aperture; and

secondly, by employing an artificial retina a thousand times more sensitive than the human. Now the human retina receives the impression of what it looks at in a fraction of a second, provided, of course, that the eye is properly focussed, and no further impression will be made by keeping the eye fixed on that object. But in celestial photography, when the telescope is turned into a camera, the sensitive plate having received the impression in the first second may be exposed not only for many seconds or minutes or hours, but for an aggregate of even days by re-exposure, every second of which time details on that plate new objects sunk so far in the vast depths of space as to be immeasurably beyond the power of the human eye, even through telescopes hundreds of times more powerful than the largest instruments that science has enabled us to construct, and yet here is laid before us a faithful chart, by means of which we may once more continue our journey through space. A short exposure will show us firmaments and nebulae just outside the range of our greatest telescopes, and every additional second extends our vision by such vast increases of distance that the brain reels at the thought; and yet, as we have seen, exposures of these sensitive plates may be made not only for seconds, but for thousands and even hundreds of thousands of seconds! And still there is no end, no end where the weary mind can rest and contemplate; the mind of man can only cry out that there is no limit. In spite of all its strivings and groping by aid of speculative philosophy, the finite cannot attain to infinity, nor get any nearer to where the mighty sea of time breaks in noiseless waves on the dim shores of eternity.

Let us now examine in a similar manner the second great mystery, the Infinity of Time.

With this object in view we will first consider the human sense of sight and hearing, and take sound, or the vibrations which affect the drum of the human ear. Sound travels in air at about 1,130 feet per second, and if the vibrating body giving out the sound oscillates sixteen times in one second, it follows that, spread over this 1,130 feet, there will be sixteen waves, giving a length of about 70 feet to each wave. This is the lowest sound that the human ear can appreciate as a musical note. When the number of vibrations in a second sinks below sixteen, the ear no longer appreciates them as a musical sound, but hears them as separate vibrations or beats. The best instrument for illustrating this is the "Syren." This comprises a disc with sixteen holes pierced at regular intervals round the

edge, a jet of high pressure air is forced through each of the holes successively as they revolve. When the disc does not quite complete one revolution in a second, only fifteen puffs come to the ear in a second of time, and they are heard as puffs; but when the rate reaches one revolution in a second, the sound, as if by magic, changes into the lowest musical sound. The octave above this is obtained by doubling the number of puffs, namely, by revolving the disc twice in one second, and the next octave by revolving four times in a second, and so on, until at about the thirteenth octave the sound has become so high that the majority of listeners cannot hear it, and fancy it must have stopped, whereas a few will still be saying, "How shrill it is." At last, at about the fourteenth octave, it passes beyond human audition, and although we can show that the air is still vibrating, all is silent, the ear being incapable of hearing so many beats in a second. It is, however, possible to make these higher vibrations perceptible to our senses. We can actually measure the length of these silent waves, and as we know the rate at which they travel, we can at once compute the number which occur in a second of time and thus ascertain their pitch. We now have to travel only about forty octaves before we arrive at those subtle frequencies which the eye appreciates as light. Beginning with red, the effect transmitted to the brain passes to orange, yellow, green, blue, indigo and violet; only about one octave that the eye can appreciate, and all is darkness; but we can still go on a little further by the help of Science. Beyond the violet we have the actinic or chemical rays, which are used in photography, and which enable us to trace the frequencies for a further two octaves. Beyond this we cannot pierce with our present knowledge; but there may be, and probably are, latent in our nature, senses which, properly developed, will be able to appreciate still more subtle vibrations, and organs which perhaps even now are being prepared for the reception of these subtle influences. Science steadily points to electricity and magnetism being a form of motion, and it may be that in these invisible rays we may some day discover the nature of those mysterious forces. We want, as it were, a special "microscope" to examine these vibrations, which I shall refer to later on, and a similar method to that already mentioned in Space under Celestial Photography, to traverse and examine hundreds or thousands of octaves by each second of exposure; for although the path extends to infinity, we have already arrived at the utmost limits of our finite senses, and find that after all we can only appreciate, as it were, a few inches along the huge line of

infinite extent, stretching from the Creator, the infinite down to the created or finite; and bear in mind that we have only travelled in one direction; the path we have taken extends in the opposite direction also to infinity. We started with sixteen vibrations in a second, as the lowest number we human beings can appreciate as a musical sound; let us now descend by octaves. The octave below is eight vibrations in a second; the next four; then two; and then one vibration in a second. But we do not stop there. The octave below this is one vibration in two seconds, then in four seconds, eight seconds, sixteen seconds, and so on, until it is possible to conceive that even one frequency in a million years might be appreciated as a musical sound, or even as one of the colours of the spectrum, by a being whose senses were greatly extended in both directions, but still finite.

Once more we must call a halt. Our finite minds become bewildered in attempting to even glance at these infinities of time.

We measure space by miles, yards, feet, and inches; we measure time by years, hours, minutes, seconds; and by these finite means we try to fathom these two marvellous infinities. With our greatest efforts of thought we find, however, that we can get relatively no distance whatever from the *HERE* of Space and the *NOW* of Time. It is true that the *present*, as a mathematical point, appears to be hurrying and bearing us with it along the line stretching from the past to future eternity, but in reality we get no further from the one nor nearer to the other. Let us change our view, and examine this subject under a different aspect.

First of all, look round this room and note the different objects to be seen. Even in so small a room you do not see the objects as they really are at this instant, but as they were at a certain fixed length of time ago. Those objects which are further away are further behind in point of time than those that are nearer to you—in fact, however near you are to an object, you can never see it as it is but only as it was. We are dealing with very minute differences here, they being based on the rate at which light travels; but they are differences which are known with a wonderful degree of accuracy.

Now let us follow our subject. The moon is 240,000 miles distant. We do not, therefore, ever see her as she is, but as she was  $1\frac{1}{4}$  seconds ago. In the same way we see the sun as he was eight minutes ago, and we see Jupiter as he was nearly an

hour ago. Let us go further to one of the nearest fixed stars. We see the star as it was more than ten years ago; that star may therefore have exploded or disappeared ten long years ago, and yet we still see it shining, and shall continue to see it until the long line of light has run itself out; all around us, in fact, are the appearances of blazing suns as they were thousands of years ago, and by the aid of the telescope and of our sensitive plate, we catch the light which started from clusters and firmaments probably millions of years ago. Now let us take the converse of this. To anybody on the moon the earth would be seen as it was  $1\frac{1}{2}$  seconds ago, and from the sun as it was eight minutes ago; and if we were at this particular moment in Jupiter, and looking back, we should see what was happening on this earth an hour ago, namely, when you were arriving at this house. Now let us go in imagination to one of the nearest fixed stars, and looking back we should see what was happening 10 years ago; and, going still further to a far-off cluster, the light would only just now be arriving there which started from the earth at the time when man first appeared, and all the events which have taken place from that remote time to the present would, as time rolled on, reach there in exactly the same succession as they have happened on this earth.

Let us now come, in imagination, towards the earth, from some far-off cluster of stars. If we traverse the distance in one year, the whole of the events from the creation of this world would appear before us, only thousands of times quicker. Make the journey in a month, a day, an hour, a second, or a moment of time, and all past events, from the grandest to the most trivial, will be acted in an infinitesimal portion of time.

Do not these thoughts make clear some of those metaphysical enigmas which confront us whenever we see great injustice being perpetrated and crimes remaining undiscovered. Let us but turn to any point of space and we shall find at each point, according to its remoteness, the actual deeds being enacted, whether for good or whether for evil, in fact it may be said that throughout infinite space every event in past eternity is now and will be for ever and ever indelibly recorded. A crime committed hundreds or thousands of years ago may never have been found out; but for ever and ever there is and will be to eternity depicted in space the actual living scene from beginning to end. The criminal and his victim have alike died and turned to dust; the place and surroundings have been swept away from the present *here*; but for ever and ever

the whole tragedy will be acting *there* in the presence of the Great Reality; when we have fully grasped this, we recognise that omniscience is synonymous with omnipresence, and we appear to have here an insight into that Great Book wherein are registered every thought, word and deed which in the direction of the Reality has helped to nourish, or, in the direction of the shadow, has tended to starve the *personality* of each one of us, for we know that every word we utter or that has been uttered from the beginning of the world and every motion of our brain connected with thought, is indelibly imprinted upon every atom of matter. If our sense of perception were greatly increased we need not go to Palestine to see on the rocks *there* the impressions of the image of Christ and His disciples or the words they uttered as they passed by, but any stone by the wayside *here* would show His every action and resound with every word He uttered. In fact, every particle of matter on this earth is a witness to that which has happened, every point in space and every moment in time contains the history of the past in the smallest minutiae. The *here* embracing all space and the *now* embracing all time are the only realities to the Omniscient.

Let us once more change the scene and we may grasp even more clearly that Time is not a *reality*, but is only a mode or condition under which our material senses act. A tune may be played either a thousand times slower or a thousand times quicker, but it still remains the same tune, it contains the same sequence of notes and proportion in time, the only characteristics by which we recognize a tune. And so in the same way with our sense of sight, an event may be drawn out to a thousand times its length or acted a thousand times quicker, it is still the same scene. An insect vibrates its wings 10,000 times in a second and must be cognizant of each beat, whereas we have seen that we, with our senses of sight and hearing, can only appreciate at the most respectively seven and twenty vibrations in a second as separate beats. That insect must therefore be able to follow the life of a plant or a flash of lightning under the conditions of a microscope magnifying several thousand times compared with our vision. The whole life of some of these insects extends over a few hours only, but is to them as full of detail as our life of 70 years, but to them there is no day or night, the sun is always stationary in the heavens, they can have no cognizance of seasons. If, on the other hand, we take the converse of this, we may conceive conditions under which the power of appreciation might be reduced to only one

vibration in twenty-four hours; there could then be no knowledge of the sun except as a broad band of light always extending across the heavens, one could not follow its movements so as to see its shape. Let us look at this from another aspect: we are looking at the insect whose wings are beating 10,000 per second and if we travel away from it at the rate of light, the present will always be with us; the wing, although still vibrating at that enormous rate, will appear to be stationary and will continue in that state for a million years provided we continued our flight with the rays of light. If we travelled a little slower than light, say one minute less in a thousand years, the same scene would be presented to us, but that which was acted upon this earth during one minute of time would now take a thousand years to accomplish; the swiftest railway train would appear standing still, it would take  $5\frac{1}{2}$  days and nights to cover each inch of ground. It is thus possible to understand how the growth of a flower, the flight of a bird, or the lightning flash might be drawn out and examined under conditions of time which would lead to the discovery and tracing of even the principle of life itself. The same conditions may be attained by greatly increasing our power of perception, and I have been able to construct what may be called a time microscope to show this effect. Instead of an insect's wing I use a large tuning-fork kept in rapid vibration by an electro magnet, the whole being projected on a screen and, as our perception is increased, the projection of the tuning fork on the screen will be seen to slow down and at last come to rest, although it can still be seen and heard vibrating at its full capacity. But let us go one step further and increase our flight beyond the rate at which light travels, scenes would now progress in the opposite direction to that which we are accustomed to; men would get out of bed and dress themselves at night and go to bed in the morning, old men would grow young again, tall trees would grow backwards and enter the earth, embedding themselves in the seed, and the seed would rise upwards to the branch that nourished it; the dead would be taken from their graves, brought back to their homes. The future would change places with the past, the effect would give birth to the cause as presented to our finite senses; but to the Great Reality there is no change, the here and the now comprising all beginnings, ends, causes and effects.

Once more we must call a halt: we again see that time and space are only relative modes by which our senses appreciate our surroundings; if everything connected with us were from this moment to move twice as quickly and be half the size, we should

be absolutely ignorant of the change, and if this were carried to extremes and everything happened infinitely quicker and all our surroundings became infinitely smaller, we could have no cognizance of the change, our sun and the stars with their respective distances might be reduced in size until they were no larger than the molecules of iron in the blade of a pocket-knife, or infinitely smaller, an eternity compressed into a moment, but our earth would continue on its orbit round the sun, our daily life would go on as usual, and we should have no knowledge of change. We must recognize, therefore, that time and space are not realities but are limits only, set to our corporeal senses, in fact, they are but transient conditions under which matter exists. The Spiritual, the Present, the Here, are the only realities, all else is but shadow which will cease to exist when the Light of Truth reigns supreme.

With these conclusions before us I will suggest a new conception of the Creation. All creation around us is the materialisation of the Thought of the Deity, He does not require time to think as we do, the whole of the Universe is therefore one instantaneous thought of the Great Reality; the forming of this world and its destruction, the appearance of man, the birth and death of each one of us, is absolutely at the same instant, it is only our finite minds which necessitate drawing this thought out into a long line, and from our want of knowledge and our inability to grasp the whole, conceiving that one event happened before or after another. In our finite way we examine and strive to understand this wondrous Thought, and at last, a Darwin, after a lifetime spent in accumulating facts on this little isolated spot of the Universe, discovers what he thinks to be a law of sequences and calls it the evolution theory, but this and other theories are probably only one of countless other modes by which the *intent* of that Thought is working towards completion, the apparent direction of certain lines on that great tracing board of the Creator whereon is depicted the whole plan of His work.

Let me give you a similar example of creation by a word which even our finite minds can grasp. When I utter the word *cat*, it starts a practically instantaneous thought in your minds, the power of that thought being dependent upon the knowledge you have gained. If you analyse it you will find that, though instantaneous, it comprises all the sensations you have ever felt on that subject throughout your whole life. It commenced, perhaps, when you were only a year old, and sitting on your mother's knee, your hand was made to stroke a kitten, and you

felt it was soft and it gave you pleasure; later on when you were older you had it in your arms, and you felt the first intimation of that wonderful *στοργή* which manifests itself in most children in their love for dolls, it was delightful to cuddle, and that it purred; later on you found that it played with a reel of cotton and that it could scratch, make horrid noises, and many other things which make up the life of a cat and connect it with its surroundings. All these thousand and one facts are now drawn out, by analysis in Time and Space, in a long line, and are placed one in front of the other, but the thought started by the word cat was a fair example of an instantaneous creation. One other example of an instantaneous thought:— Let us suppose a large room fitted with, say, a hundred thousand volumes comprising all the knowledge gained by every specialist in every science concerning the plan of Creation. In our finite minds, under the limits of Time and Space, the word representing that library would start, when uttered, an instantaneous thought analogous to that of our last example, according to the knowledge that each individual had already acquired of the contents of those books, but this knowledge had only been gained by taking down each volume separately and reading one book at a time, beginning at the beginning and taking each page in succession, and a lifetime would not suffice to enable us to read them all, whereas if our knowledge were complete, if we were omniscient, the word representing the contents of that room would start an instantaneous thought comprising not only every book, but every chapter, page, word, letter and punctuation contained in that library or in one which comprised all knowledge from the beginning to the end of Time.

May we not carry the analogy even further and see that as our conception of a cat was made up of numberless small acquisitions of knowledge, some of which had to be discarded or eliminated as errors from our minds as our knowledge grew, and as each true fact became confirmed and impressed upon our brain, it made itself a *permanent* record, so in this wonderful thought of the Great Reality, whose mind may be said to be omnipresent, each individual soul is a working unit in the plan of creation; each unit as it gains a knowledge of the will or intent of the Deity forms for itself a personality helping forward the work towards its fulfilment; without that knowledge there can be no personality, no unit in the great completed thought, no life hereafter; may we not even carry the analogy one step further and see that, as in the case of our conception

of a cat when fully formed, certain *permanent* records on our brain are made use of for forming new concepts on other subjects, so it may be that we shall be employed to eternity in working out other plans of the Great Reality, when His new thoughts touch upon those particular traits which find a sympathetic response in our personalities; we shall in fact carry with us vestiges of numberless completed creations, each one of which will beautify and intensify our personalities. Does not this conception open up a wonderful vista of our noble inheritance in the great scheme of creation, and how we, when carrying out His will, are truly offsprings from the Great Reality?

In conclusion, let us once more realise that to the Great Reality neither time nor space exists as an objective, the beginning and end coalesce; a million years is coincident with a moment of time, and we can then perceive the fallacy of the stock argument that "The belief in omniscience necessitates a belief in fatalism." The future is present to the spiritual; though to our senses a million years is almost unimaginable, and every moment of that time events are subject to the free-will action of man, yet to the spiritual there are no such limits; the creation of the world and its future dismemberment, the birth of each one of us and our death, must be at the same moment. We can therefore understand how the Great Reality is cognizant at this very moment of what will be taking place millions of years hence without in any way interfering with the free-will of those who live and act during that period; in fact to the spiritual the present includes the whole of past eternity and overlaps future eternity. The spiritual which had no beginning and will have no end, is always in the *present* and comprises *everywhere*, the here and the now being the only realities. When we have once grasped this we begin, perhaps for the first time, to penetrate the meaning of those mysterious words of Christ:—

"Verily, verily, I say unto you before Abraham was I am" (*ἐγὼ εἰμὶ*).

#### DISCUSSION.

The CHAIRMAN.—We have to thank the lecturer for this exceedingly interesting and very valuable appeal to our thoughts and to our imagination to realize one of those profound conceptions. I do not know that they are not altogether unrealizable; but the nearer we get to them the better it will be for our metaphysical

condition. We are conditioned in Time and Space, we are conditioned in finality, and by reason of the imperfection of our nature we may guess that we must be so conditioned in order to work out our life. We work subject to those conditions, and if we try to know everything that is not our business, to know and try to understand the Infinite, we run our heads against something, and the sooner a child learns that it hurts its head to run it against a door the better. It seems to me that the line of thought presented here is valuable. The power of conception by the senses of course varies in different animals. I believe a dog's conception of sound is keener than ours, and that he can hear a considerably higher octave than we can. Again, a cow can hear considerably below. For myself I have grave doubts whether grasshoppers, for instance, make any noise except occasionally; I have heard members of my family say, "What a fearful noise they were making!" As far as my knowledge goes they do not make a noise, and possibly there are other things where one is equally unable to grasp the whole. It is humiliating, but I think it is very wholesome, to have this sense of limitation of our thoughts, and if we carry it out the world-old puzzle of Predestination and of Free Will is only caused by this idea of ours that we understand things absolutely, and that, therefore, that sequence of thought that is present to our minds is the thing itself. Words fail when we contemplate the absolute existence of Time and Space, and the more we think of it the more we doubt.

Rev. F. A. WALKER, D.D.—The author says, "An insect vibrates its wings 10,000 times in a second." It would be useful to know what insect he refers to, or whether it usually vibrates its wings so many times a second. I think the vibration of the wings of an insect is caused in great measure by the circumstances under which the insect finds itself, and that if the insect is in a condition of hunger or fright it will vibrate its wings much more rapidly than ordinarily. A blue-bottle fly, when caught by a spider, will vibrate its wings very rapidly, and clutch the spider in its efforts to escape, and so rapidly will it vibrate its wings that you can scarcely see them. The wings become more visible again as its physical condition becomes weaker, and it succumbs to the spider, but it would be interesting to know if the ordinary vibrations are so rapid as stated here. Again, Mr. Klein mentions an instance of an insect's

wings vibrating and states the effect of using a large tuning-fork. It is a well known fact that if you produce a very slight vibration with a tuning-fork in close proximity to a spider's web, a vibration so feeble that the human ear will scarcely take it in, the spider, nevertheless, hears it, the sense of sound being greater in the lower animals; in fact, the sense of hearing in the spider I imagine is much more acute than its power of sight.

The AUTHOR.—I have often brought spiders out of their webs by sounding a tuning-fork near them. I believe you taught me how to do it in our earlier days.

Rev. F. A. WALKER.—Spiders that have no webs are much slower in catching their prey than those that work by sound. Spiders that weave a web work by sound, and they hear the vibrations of the wings of an insect, but spiders that do not weave a web work by sight, and in pursuing their prey they frighten the insect.

[The Chair was then vacated by Mr. HOWARD and taken by Captain HEATH.]

Mr. MARTIN ROUSE.—I should like to ask the lecturer to kindly re-state the arguments derived from rapidity of hearing and his observations by which he arrives at the conclusion that past, present and future are all one to God.

The AUTHOR.—I drew up five or six conclusions upon this paper which, perhaps, may give you what you want if I may read them.

*Conclusions to be drawn from Paper on "The Conception of the Great Reality."*

No. 1. As we gain a knowledge of the Reality, and our personality becomes a real power, we approach the point where we may even feel that we are thinking, or having divulged to us, the very thoughts of God.

No. 2. "Infinity" is non-existent, it is a self-deception, a figment created by the finiteness of our senses, the necessarily pseudo-conception formed by our senses which (cramped by the dominion of time and space) are incapable of grasping the *whole* reality.

No. 3. "Duration" in Time and "Extension" in space, the twin mysteries which ever elude our grasp when we try to analyze them (because they are simply modes under which our senses act), are yet

absolutely necessary to us for perception. Without the former we could have no cognizance of warmth, pitch in sound, or colour in light, and without the latter the time beats being without amplitude, would have no power to affect our senses. When combined they give us the impression of motion, without which we should have no consciousness of living.

For convenience we arbitrarily divide Time into two parts, namely, past and future eternities, and space into the infinitely small and the infinitely great: In the case of Space, we treat its two divisions on equal terms, but in the case of its twin sister Time we have unaccountably got to look upon the future as non-existent until we arrive at, and are able to perceive with our senses, what is happening there. This curious state of things is probably only accidental to the present stage of development of the human mind, and may at any time be rectified; it would anyhow seem to be as reasonable to maintain in the case of Space that when travelling towards a foreign town, that town does not really exist until we arrive there. Time and Space may in a certain sense be looked upon as two great permanent existences, but in reality the former is all contained in the *now*, and the latter in the *here*. It is only our finite mode of perception under present conditions which prevents us seeing each as a whole, as stated in Conclusion No. 2.

No. 4. When we increase the rate of perception until it is equal to what may be called the Flow of Time, we enter into the *now*, the permanent existing present, where motion ceases to exist; the same condition is attained by *either* increasing the rate of transmission in Space until it is equal to the rate of transmission of those frequencies which are the very base of all perception, *or* by increasing the extension in Space of the perceptive sense until it becomes omnipresent. In both cases the *now* and *here* are reached.

No. 5. If our senses were extended so as to be capable of perceiving the *whole* truth, we should realise that the only reality is the spiritual, the here and the now.

The difficulty of forming a true conception of the Reality is increased by our not generally recognising the following:—

*First*.—That the invisible is the real, the visible is only its shadow.

*Secondly*.—God cannot be said to be anywhere, but that everywhere God is.

*Thirdly*.—That our senses only perceive the surface of things.

Nature may be likened to the glass of a window upon which may be seen patterns, smudges, dead flies, etc. ; it requires a knowledge of the reality to enable us to look through the glass at the reality which is beyond.

*Fourthly.*—That it is not we who are looking out upon Nature, but that it is the Great Reality which is looking into us and persistently trying to tell us the sublimest truths.

Mr. MARTIN ROUSE.—I wanted to say that I did not understand how there can be no sequence to God. If One cannot see faster than light and yet only as slowly as light, He cannot see at two different rates at the same moment, and therefore He must have one definite rate of seeing, and if He sees at one definite rate, then He sees each event in succession, and therefore there must be a past as well as a present and future to Him.

Rev. JOHN TUCKWELL.—I thought I should like to say a few words ; but at this late hour they will be few. I cannot help thinking that admirable though this paper is in its intention, and though it is valuable and suggestive, there are a great many sentences in it that need to be corrected. I think the writer of the paper has, at all events, got into some confusion in the use of the word *reality*. In some cases he prints it with a small *r*, and in other cases with a large *R*. I suppose the capital letter indicates some slightly different conception in his own mind to that indicated by the small *r*, but surely God is not the only reality !

I confess the paper is confusing, and I hope the lecturer will revise it so that it may be a little more accurate in some of its details.

I would refer to one of his illustrations. He has told us that as you get away from the world you see things that transpired yesterday ; and then, further away, things that transpired a year ago and a century ago, and so on. But I think he has forgotten to prove to us that ether exists everywhere. How do we know to what extent throughout Space ether exists ? All this is based on the assumption that ether exists universally throughout Space, and this conclusion as to the presence of everything at one moment is all dependent on waves, or rills, whatever may be the correct expression, in this mysterious substance, ether. But you have there the idea of succession. Every wave of the ether, every beat of the insect's wing, is preceded by one beat and is followed by another beat. Here you have, in the very language of the paper, a denial

of many of its propositions. You have succession. We are told that an insect's wing beats 10,000 times a second, which means that you have a first beat, a second beat, a third beat and so on, up to the 10,000 beats. What is that but succession? are we to suppose that all those beats take place instantly at the same moment? If they do not there is succession, and if succession there is Time, and if there is Time the whole of the reasoning, on this basis, falls to the ground completely. But I think the lecturer has also got into confusion between our conception of things and the conceptions of the Divine Being. I can easily understand, at least it is thinkable and believable, of course, that to the infinite mind everything is present, that there is nothing past and nothing future in the infinite thought. All is present to Him which is not to my finite mind; but I am not God, and God is capable of creating a universe that is not Himself, and in this universe He is capable of creating beings whose senses do not deceive them. Bishop Butler says, "God did not give us our senses to deceive us," and though I am not certain what light or matter may be, there is something that occurs to me to give me the idea of light as I look at a window. There is a horse yonder, which was not there a little while ago, and I believe there is something there, and that this is an objective universe, and that there is something outside my own consciousness; and therefore, whatever may be the fact concerning the mysteries of the divine being, though He made me, not like Himself in every respect, or equal to Himself, I have some notion that His works are objective realities.

I have thrown out these undigested thoughts to show that we are on safe ground when we hold to our old belief that there is an Infinite Being, that we are creatures surrounded by objective realities, that the future is future and the past is past, that there is something that corresponds with these expressions, something that corresponds with the idea of past, present and future, and that the common sense view of the world and realities is the true one.

Mr. BOSCAWEN.—I think the mere fact that we are finite creatures impels us to know the Infinite. It is an ideal we cannot reach, but to which we always look and like to look. It is an unknown quantity. The mere word *finite* implies Infinite, something beyond us, and whether we call it God, or whatever we call it, we must admit that there are things beyond us which we cannot realize.

I agree with Mr. Tuckwell in one respect, that it is a very curious paper. There are many things in it which we can agree with, and many things we cannot agree with. But whatever view you put on it you must remember this, that the human intellect is limited, and that there are things around us to-day with which we are familiar which years ago would have amazed us.

The CHAIRMAN.—Allow me to convey a very hearty vote of thanks to the author for his paper, and for the immense amount of valuable matter which it contains.

The SECRETARY (Professor EDWARD HULL).—I beg to second that. I feel very grateful to the author of the paper for the great pains he has taken, but I must say it is a paper that will require considerable consideration on the part of the Council.

The vote of thanks having been duly carried, the Meeting closed.

#### Remarks by Professor LANGHORNE ORCHARD.

Though this paper contains much that is interesting, suggestive, and ingenious, the reasoning does not appear to be free from fallacy. The argument developed in the paper is surely based on misapprehension. The velocity with which light travels, and that with which an observer's eye travels, could in no case affect the successiveness in arrival of pictures of scenes enacted at different distances of time or space. Although an omnipresent Being might perceive all past visible scenes in pictures simultaneously present, this is no proof that past events are not really past. Present knowledge of a past event is not knowledge of a past event as a present event. The panorama does not constitute the history it represents. An event is one thing, knowledge of it is another.

Another curious fallacy occurs in connection with the Author's theory of Creation, where an "instantaneous thought" is called an "instantaneous creation," as though a "thought" was the same as a creation. The origin of a concept is, however, not a creation of the object. It is noticeable, also, that the Author admits a *succession* of such origins. May I suggest that the word "Externalization" should be substituted for "materialisation"? The fact that Past and Future are as real as Present is indicated by all three being elements in the sacred name Jehovah. It is also witnessed to by our intuitions, which cannot have been given in order to deceive us.

## THE AUTHOR'S REPLY.

The AUTHOR.—In replying to the discussion, I cannot help expressing a regret that those who have spoken have not attempted to criticise the general plan of argument of the paper, especially as among the Members of this Institute we have so many deep thinkers who are capable of adding much to the interest of the subject. Indeed, with the exception of the Chairman, not one of those who took part in the discussion appears to have grasped the design for which it was written. The title of the paper was originally "*Our* Conception of the Great Reality," but our Secretary, or the printer, altered this to "*The* Conception," and this may account for one of the speakers, who seems to think the paper was meant to show how the Great Reality Himself forms conceptions; he, however, goes further and makes the startling suggestion that God perceives by means of light, and argues from this that God *must* see events in sequence! Surely we cannot imagine an Omniscient and Omnipresent Being receiving knowledge by the perception of senses; neither can He be said to form conceptions, He does not have even to think, for He *knows* everything. Such comments come under the category of those, referred to in my paper, who still look upon God as though He were a magnified man with senses enormously increased, but still finite.

The Rev. Mr. Tuckwell complains of my not putting a capital "R" when I refer to the reality, and argues, from that, that I have got into confusion. I would remind him that the paper in his hands was an uncorrected proof struck off without my seeing it, and, although in two places I find a small "r" when referring to the Great Reality, which will of course be put right when the proof comes into my hands for correction, in every other case the word reality is meant to be written with a small "r" as referring to the spiritual, the here, and the now. The whole argument of the paper is not, as Mr. Tuckwell seems to think, that God is the only Reality; but that the spiritual, the here, and the now, are the only absolute realities as opposed to the generally accepted idea that matter, space and time are still realities even when examined apart from our finite senses. He also expresses the hope that I will revise

the paper and be more accurate in some of my details. I should have wished that he had pointed out where such revision was necessary. He does indeed mention two as illustrations, but I fail to see that he has shown any need for revision; he says that I have omitted to prove that ether exists everywhere; I have made no such statement, neither does my argument take this for granted. In illustration of the human perception sense I was contented to point out the fact that ether extended not only sufficiently far to carry the sight of events a year or a century back, but for millions of years back. But this was only an illustration, it was not meant to argue that God required the presence of ether to gain a knowledge of past events. He also argues that because I state the fact that to our finite senses an insect beats its wings 10,000 times a second, and each beat is in front or behind another, therefore there must be sequence in reality, the whole argument of my paper controverts this. He quotes Bishop Butler as saying, "God did not give us our senses to deceive us," and argues that this proves that matter, time, and space are absolute realities. I do not think that Bishop Butler would feel complimented at being thus quoted, because we know as a fact that our senses do woefully deceive us; it is a matter of everyday experience that "Perception without knowledge leads us into false concepts," and this, as pointed out in the earlier part of my paper, is our greatest incentive to gain knowledge.

Professor Orchard fails to grasp the fact that whether you are watching an event in the same room or from a distance which light would take a thousand years to traverse, you are still looking at that event from the same intuitional advantage, you do not see in either case the event as it *is*, but only as it *was*. But again, I would like to point out that the method of my argument was to lead the finite mind to appreciate that to an Omnipresent Being every past event was present, it is only the finite sense of sight that is affected by the rate that light travels. I think the illustration I gave of a word starting in the human brain an instantaneous thought, was a fair analogy and useful for forming a conception of Creation as an instantaneous thought of God, where the mind of God may be said to be omnipresent. I also prefer the word *Materialisation* as being more in consonance with our surroundings, and it does not raise the question of how there can be anything external to an omnipresent being.

Dr. Walker can study the rate of beats in any insect's wing by noting the pitch of the sound given out by that wing ; this will give the exact number of beats per second ; the highest rate which has been recorded, as far as I know, is about 12,000 per second, the pitch in this case being  $5\frac{1}{2}$  octaves above the ordinary pitch of a man's voice, or  $4\frac{1}{2}$  above a woman's. I made a curious discovery last summer whilst trying experiments for perfecting my *Time-Microscope*. I found, as explained in my paper, that as the rate of perception was increased until it approached the rate at which time may be said to flow, motion gradually slows down, until at a certain point it ceases to give evidence of movement. I took the common house fly, and ascertained that its wings beat about 900 times per second, and by experiment I was able to prove that it had clear sight perception of frequencies up to, at all events, 600 per second, by the following means :—I found that if I approached the fly at the rate of 3 inches per second it always flew away, but at 2 inches per second it had no perception of movement, and I could, four times out of five, put my finger upon its back and hold it fast. It was curious to see it turn its head to look at my approaching finger, but it evidently could not see that it was moving. I tried this experiment on other kinds of flies, and in the case of a large dragon-fly, settled in the middle of a road, which I had several times tried to get near by walking slowly, I found that I could only approach it at the rate of about half an inch per second, thus giving a rate of perception to that insect of only about 200 per second, and I was able to pin it down to the ground with my finger after taking several minutes to approach it. This, and other experiments I have made, provided a curious proof of the conclusion I had arrived at by other means, that time and space, and therefore motion, cease to exist as objective realities when the rate of perception is sufficiently increased.

In conclusion I would like to say that I fully appreciated from the commencement that the subject of my discourse is far too vast to be adequately covered in the short space allotted to papers read before this Society. I have only been able to touch, and that briefly, on one of the many aspects of the Great Reality, but if I have succeeded in interesting the members and have given reason for thought for other minds to work upon, my object in addressing you to-night has been fully attained.