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ORDINARY MEETING, APRIL 5, 1869.

THE REV. WALTER MITCHELL, M.A., VICE-PRESIDENT, IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following election was announced :—

MEMBER :—Rev. George Henslow, M.A., F.L.S., St. John's Parsonage, St. John's Wood, N.W.

It was also announced that the following work had been presented to the Library :—

"The Laws of Vital Force in Health and Disease." By E. Haughton, Esq., M.D., M.V.I. *From the Author.*

The Secretary, in the absence of the Author, then read the following paper :—

LIFE—BRIEF REMARKS ON ITS ORIGIN: BEING AN EXAMINATION OF SOME MODERN OPINIONS.

By J. HEWITT WHEATLEY, *Esq., F.G.S., F.L.S., &c., Mem. Vict. Inst.,* HON. LOC. SEC., *Sligo.*

IT is a grave misfortune for science and philosophy, as well as for our highest interests, that even a section of the scientific—men both by nature and education of high attainments—should devote its best energies to materialistic studies, till it gives to the material the pre-eminence due to mind; or so confuses the two together, as to get up a system which may bear the incongruous title of inorganic vitality.

Unfortunately, names occasionally leap into sudden fame, as the heralds of some startling announcement, conceived with ability and delivered with eloquence. It is taken up by many who never reflect that its claim to originality, or to well-considered and carefully wrought out-theory, has no better authority than either the support of evidences they have themselves borrowed from very doubtful sources, or hasty generalization from unsound philosophy and unsettled science.

The multitude has either little time, or scanty inclination, to sift and to investigate. In fact, the multitude is not a thinker. It delights in being thought for; and wherever it finds thoughts which arouse its sluggishness by their eccentricity, novelty, or plausibility, it is apt to testify its approbation. How can that sluggishness be more effectually aroused than by having views presented to it, one single glimpse of which it never had before, and which are at the same time of the most exciting character—altogether foreign to its previous impressions? Where the wonder that audiences are attracted, like moths, to the new light? There is nothing surprising in that. But what is surprising, is the adhesion of any competent thinker; for there is nothing remarkable in the logic, or perhaps novel in the facts: it is the assumption, the inference, derived from the orator's imagination, that beguiles, and is altogether unworthy the table of science.

There is a portion of these, forming a class of earnest minds seemingly devoted to discovery in pure zeal for truth. It is to the teachings of such I would call attention in the present paper. For the most part, it is composed of men of high scientific knowledge, who, nevertheless, put prominently forward what I conceive to be a very grievous misapplication of physical studies—that the deductions they draw from their discoveries are in opposition to our faith. This is announced without scruple as without proof; yet I doubt not, in most cases, under the perfectly honest conviction that they are correcting erroneous views.

I will endeavour on the present occasion to show that its leading doctrine—the evolution of life out of the material world—is a pure fiction, at utter variance with true inductive philosophy. Whether I succeed or not, I shall be well satisfied if the attempt call abler minds to the discussion.

In attempting to establish this conclusion, I must refer to some modern works, full of talent and of truths, but false in deduction, which, from the abilities and the labour apparent on almost every page, are calculated to mislead to a very important extent.

A few of even professed writers on the subject seem rather to avoid discussion on the actual origin of life. They "blunder round about a meaning." They examine the husk and the shell with great perseverance and no little skill; but they penetrate not to the kernel. With the microscope at one end of creation, and the telescope at the other, their time is devoted to experiments upon, and observations of, the inorganic alone; whence, as we may reasonably suppose from

contracted views, somewhat crude opinions result. These disciples of the elements are men who study the unintelligent so closely, intently, and perseveringly, that, strange to say, full of active intelligence themselves, they fail to recognize its necessity in the creation of the living intelligence of which they form a part. Hence, the miserable, petty, pottering creed, that life is a home-manufactured fabric of rough materials: more wonderful still, that the manufacturer is an inert mass or aggregation of masses. Let us look a little into this.

As far as I can make it out, our materialistic writers and lecturers seek to impress upon us the position that vitality is to be sought in the inorganic—and found.

Dr. Odling, in his *Animal Chemistry*, announces, "That all actions of the animal body are traceable to cosmical force; that in living as in dead matter there is no creation of force; and that any explanation of the phenomena of life which recognizes the agency of vital force is simply no explanation at all."

What is meant by all actions of the animal body being traceable to cosmical force? There are very strong reasons for believing, that every so-called natural force is but a mode of undetermined motion:—then life, if a natural force, is a mode of undetermined motion; and the power to will and to do, a myth; for as natural forces are not directed to any definite end, the willing to do and the doing must be involuntary—a contradiction in terms. At any rate, vitality is denied as an active agent, and is made to be somehow deduced from combinations of materiality.

Again, he says it is "abundantly manifest that the growth of a plant and incubation of an egg cannot be performed without a direct supply, and the development of animal organisms without an indirect supply, of external force." This is no argument in favour of the production of life by external forces. The plant and the egg have already life, before his external forces are brought to bear upon them. The application of warmth and moisture to the one, or warmth alone to the other, if only bestowed on the inorganic similitude of a seed or an egg, would hardly produce a plant or a bird. Life being present, its manifestation is brought about by certain external conditions. But the question at issue is, life *not* being present, would it be exhibited by any material combinations and applications of external forces? I believe not.

It is further said by the same author, that "by a reference to systems, and suns, and steam-engines, and mills, and telegraphs, I shall endeavour to satisfy you that the same

forces are at work in living plants and animals, as in the inorganic world." It can hardly be denied that the same forces are at work in the living as in the inorganic world. The substance came from the inorganic. It is a portion of it, into which life was introduced; an introduction that by no means did away with the inorganic powers. It was addition, not regeneration.

As verging toward the production of the living from the dead, he observes,—"We now find that the chemist, like the plant, is capable of producing from carbonic acid and water a whole host of organic bodies; and we see no reason to question his ultimate ability to reproduce all animal and vegetable principles whatsoever." Are these organic bodies, or any of them, necessary to abstract life? It cannot be said they are; for there are abundant living organisms without one or other of them. They are only concomitants of certain existences; and predicate absolutely nothing as to the production or the continuance of life.

He gives us the formulæ of a great variety of organic bodies derived in the way he states. Take one by way of example: formic acid is found in both the vegetable and animal kingdoms. What is the result of its manufacture in the laboratory? It is one of the constituents of some living organisms; and what does the chemist make of it? No more than what an accidental combination in nature of the same ingredients in the same proportions could make—a dead body. Grant that not only many, but all, organic bodies—every one pertaining to animal and to vegetable—can be formed by the chemist out of the inorganic, it seems to me he is far as ever from life. There is every component part of life in the inorganic—but not life. We do not require chemistry to tell us this. Dust we are. There can be no denial of our inorganic framework. But that is just the point—framework. What worked up the frame into life? Between the dust we were, and the dust we return to, there lies a something which the chemist does not appear to grasp. He lays hold of the dust before it is animated; and he lays hold of the dust after animation has ceased:—the interval?—the living interval? For that, there is no formula: nevertheless, he sees "no reason to question the chemist's ultimate ability to reproduce all animal and vegetable principles whatsoever." It has been foolishly put forward that organic bodies were the product of life only; and as the chemist finds them where there is no life, he concludes, somewhat rashly, that the discovery of life itself is possible. The gross materials are there. He finds the block; but where is the statue? It must come

from outward manipulation—from the chisel of the artist: whereas, simply by means of its own inherent powers of exfoliation, he would have the marble throw off the superfluous chips, and stand confessed a thing of beauty, without one trace of the rude block whence it sprang.

But may we not go further, and say, allow the faculty of vitality to the physical, allow the chemist's combinations to become life under his hands—he is working with the brightest and sharpest of tools, the human intellect? He is wielding the mightiest of all energies—mind. He is *living* power. He is exercising intelligence to work up matter to a state he never saw it assume of its own unaided energy; and of the past occurrence of which he has not the smallest particle of evidence. He has thrown the bright mantle of life around the fairy form in her lily bell. And what of that? He brought intelligence to bear; he applied mind to effect his purpose. If by the force of his own mind he thinks to bring life out of the insentient, why, since life is, should he not rationally conclude that mind had anticipated him? He says, no; the productive power is bound up in matter; and even if mind created matter, a law of vital production was impressed upon it; and there lurks life. Whether life is on the globe without the help of mind, or whether mind bestowed it conditionally on matter, his own intellect should in either case tell him that his endeavours are vain; for if it came without the aid of mind—fortuitously—he labours in the dark; there is not a shadow to guide him: it came without design, and aimless—an accident, an aberration. And if, on the contrary, impressed by mind on matter, it can only be made apparent according to the Will which impressed it, and not through the instrumentality of his own efforts of discovery. It is from that Will alone we can ascertain how the living appeared. The Supreme Will, being beyond the reach of human industry, perseverance, and sagacity, philosophy and natural history must be baffled. If we admit mind, we take life out of the province of the material; therefore no study of the material can aid our researches, beyond the germinative powers with which our senses make us acquainted: I mean, that we cannot add to the known causes of germination, that creative something which established those causes.

If life-giving capacity were bestowed on matter by the Creator, the appearance of vitality would still be to us an affair of the merest chance; for we have not the faintest, most transitory, ray of light whereby to elucidate the hypothesis. Unconscious matter, profoundly ignorant of the effective process, our consultation of it is vain. Shall we inquire of the

microscope by what means it discloses a world of wonders, undiscoverable by the natural sight? Our examination of its separate parts elicits no reply. Intelligence bestowed the power; the instrument knows nothing of it; neither can it bring that power into operation without the further exercise of intelligence from outside: hence, a superintending power—mind, the active agent.

A serious question here arises—Can we control that creative mind? If we discover a means of producing life from the inorganic, we do control it; for we can then exhibit life at *our* will. Putting the impiety aside, will any man of science, acknowledging that life-power was granted primordially to the material, give us a scientific explanation how the human mind has acquired, or can acquire, intelligence at the least equal to that of its Creator? This were to deify humanity. Yet more than equal to Deity must we be to discover and to apply that which it was the appointed duty of matter to manifest under certain material arrangements; for if we extract life from what matter was created to effect, we are counteracting the original decree by the superiority of our own interference.

There is another view. Suppose power to produce life under certain concurrent circumstances of natural combinations, was bestowed on the material world, and then all left to take the stipulated course, there would be progressive motion according to the primeval impress. Wherein does physical science teach such progressive motion? The extent to which it goes in this direction is simply that of the original impulse communicated to masses as masses, and the regulated action of natural forces. In these we have nothing progressive; the masses move as they ever did; the great and the small phenomena of nature are to-day what they were thousands of years ago; nor have we reason to doubt but they will so continue as long as materiality shall be. Independently of this, see the absurd working of it:—

The processes of nature have been co-extensive with the almost infinity of distinct existences with which we are acquainted. Grant a single combination to have happened:—we have one life, say the lowest form of the algæ. How many thousands of combinations must have happened, to produce the number of species already counted of living things below animal life? And what a crowd, after the first animal life! Stranger still, each of these life-giving chemical unions of matter must have been varied in a fixed, peculiar, and determinate manner, for the elaboration of each one of the multitudes of distinct known existences. One combination must

have occurred to send the tiger into the jungle; and another, to prepare the jungle for the tiger. Another, to set one species of fish swimming in the waters; and another, to produce one insect for its food. There must have been a peculiar arrangement for starting the feathered race; and a multitude of subsidiary arrangements in the feathery division to get up each distinctive tribe; and another multitude for the peculiar food of each.

From the smallest conceivable existence to the largest we know, the inanimate is called upon for myriads of separate and distinct commixtures for their production. There may be minds that can comprehend an aggregation of atoms, and an application of forces, bringing about an existence; then changing the formula, bringing about a second and totally different existence; again changing, and bringing about a third; and so on, till the peopling of the air, and of the earth, and of the waters, with animal and with vegetable in all their varied species, had been accomplished. I think the minds that can conceive it must have very wide margins for credulity.

This system,—or rather this purely speculative fancy, for system it is not,—is put forward by some, as showing the might and grandeur of Jehovah in an aspect far superior to that of a direct Creator. Can this detail work, however interesting and however beautiful they may consider it, compete with the majesty and display of Omnipotence, embodied in the most sublime line in the English tongue,—

"Let there be light,—and there was light"?

The Christian world is told that it believes the introduction of life to have been "done in a marvellous way, and not in the way of nature." How was nature itself done? Is there nothing marvellous in the creation of the physical? Think of the first appearance of that host of magnificent worlds now peopling space—and who can say, let their creed be what it will, it is not marvellous exceedingly? But we can learn without much difficulty many of the general facts of the material. We can bring its grand and mighty forces into our service; our messages are sent on the wings of electricity, and the wind is our servant. Hence, easier familiarity with the seen than the unseen. The real wonder seems to be, that through any pretence of science it can be said, the home and the food of life were *created*, while life itself was to *proceed* from that which was tobe its dwelling-place and its support.

One gigantic source of modern error on this subject appears to be the hasty deductions of geology, whereby we are shown

what pretends to be an enormous antiquity for the world, and a number of successive appearances of new forms of life. This is quite fanciful; as may be easily conceded when we reflect, that geological science is yet unsettled in its own principles: it cannot, therefore, be accounted a safe guide when it plunges into conjecture.

The occurrence of all those broken-up patches of living things, or successive and multitudinous developments, are extraordinary enough. But, as if to exhaust completely and effectually the last remnant of our unsuspecting trust, we are called upon to believe, that, after all the vast numbers of changes at which I have hinted had turned up, there was a sudden cessation. It is not denied, that since man was on the earth there is other change in the material world than rearrangement of parts. Why should this be so? Why innumerable combinations to effect such immense works—and then no more? We are told, all the life we see, and much besides, was furnished by the inorganic. Why did it stop? As the result of mind, we could understand it; as the result of the mindless, I know not by what line of argument it can be maintained. It is perfectly explicable by the doctrine of one creation, for that implies a continuous act till complete; but under these lingering appearances, reason is at fault. Dr. Odling calls vital force a "fiction"; yet, making the assertion unreservedly, he fails to give us any insight into the original generation of life. He obtains organic compounds from inorganic substances. The experiments are interesting and useful. But every believer in the Bible is as well satisfied of the inorganic origin of his body, as the greatest chemist.

In *Animal Chemistry* we further read:—

> I have shown you that in the organism of the plant, carbonic acid and water are submitted to a constant deoxidising change, whereby they become successively converted into more and more complex bodies; many of which we are now able to produce; all of which we hope some day to produce by similar processes in the laboratory; that the change in composition undergone by carbonic acid and water is attended by a storing up of solar force in the resulting products; and that the correlative change in composition undergone by these products into water and carbonic acid is attended by a liberation of the force stored up in them; that in every organ of the animal body oxidation is continually taking place to furnish that organ with the force necessary for the performance both of its nutritive acts and external manifestations.

In the first part of this paragraph, we have deoxidation producing more and more complex bodies. In the latter part, we

have oxidation furnishing every animal organ with its powers. Hence it would seem, that deoxidation was a sort of substitute for mind—inventing, improving; and oxidation, a sort of substitute for vitality—supplying force and invigorating—the parent of every nutritive and external act—the furnisher of all organs with their respective powers. How can we interpret this, save that oxidation is the life in the animal, derived from what deoxidation puts together in the vegetable?—that a living muscle requires the stimulus of oxidation to force it into action? and that vitality is a secondary affair in the scheme of organisms—at the very most, only promoting oxidation, which does all the work? There is some ingenuity in thus pulling down the value of life: it is a great object with certain philosophers, and facilitates the introduction of minor projects;—such as the manipulation of the inorganic in search of life—development—et hoc genus omne. If this be a true exposition of the writer's meaning, he agrees with Mr. Darwin and the author of the *Vestiges;* the latter appearing to have furnished the former with his system; for he says, "The organic rests on one law, and that is—development." In the midst of these various proceedings, solar force is introduced. The change in carbonic acid and water, dependent on deoxidation, induces the resulting products to imbibe a certain amount of sun-force. It does not here seem to perform any vital function; for we read, that oxidation supplies the power requisite for every organ to perform its part in the system. In another place, however, we find the following:—"We perceive that muscular exertion does not proceed from vital force generated within the body, or, indeed, from force of any kind generated within the body, but only from a liberation within the body of pent-up solar force, which at some time or other had been rendered latent in the separated carbo-hydrate of our food on the one hand, and oxygen of our breath on the other." So that now, oxidation is found not to suffice; and the sun is made the agent in furnishing the muscular power.

Just before the last-quoted passage it is said:—"In the attempt to lift a heavy weight, the oxidation of muscle within our bodies produces a direct liberation of heat instead of motion." We seem to have a little complication here. It does not appear that oxidation now furnishes every organ with the necessary and appropriate powers for the performance of external acts. It ministers to the liberation of sun-force; which then becomes the origin, and thenceforth the exhibitor, of muscular manifestations. If oxidation simulated life, what need of penning up sun-force, and liberating it again, to produce the same result? The source of muscular power,

according to this theory, is either a portion of the material world absorbed by another portion, or a portion of the material absorbed by the living. Can material acting upon material, generate anything but material? Whatever may be the combinations of natural products, and whether they absorb sun-force or any other material motion, the experimentalist is dealing with nothing but the inorganic, yet expects the elimination of life. But if sun-heat be absorbed by, and become latent in, an object not inorganic—in vegetable, for instance—and so conveyed to animal in its food, we have now matter acting on life. How can that matter perform any function of life, since life already was? It cannot be pretended that sun-heat is life; for it is said to be imbibed by life: it may, therefore, be a part of living tissue, but not itself producing that tissue.

A great deal has lately been made of this absorption of sun-force, either by matter or organism, and its subsequent liberation. Rub two pieces of ice together, and they will be melted by the generation of heat during the process; or, rather, according to the doctrine of latent heat, by the liberation of formerly stored up sun-force. That heat is an accompaniment of friction, no one doubts. Does it necessarily follow it should have been previously imbibed, whether directly from the sun, or indirectly through former metamorphoses? We are assured that such is the fact; that sun-heat has been received and become latent till the application of the test for reproducing it. Granting this to be, we can, from no structural studies whatever, gain a knowledge of the introduction of heat into bodies, any more than by dissection of the brain, we can track thought to its home; and by looking on the cerebral convolutions, determine their revelations.

According to the sun-force theory, organisms must be perpetually giving it off as long as life endures; continual re-absorption going on to supply the waste. And this, we are told, is accomplished by the heat which had been rendered latent in the food we consume and in the air we breathe; the powers of the animal, so far as sun-force is concerned, must therefore be proportioned to its appetite and capacity of lungs.

It seems then to follow, from their own arguments, that all living things, if not exactly children of the sun, are greatly dependent on sun-force, as one of the conditions of life accompanying constructive organization; other material combinations being further conditions of life. It results, therefore, that neither separately nor conjointly, can these be the life, or produce it; nor of themselves manifest inde-

pendent action. Both chemist and anatomist are dealing with the matrix alone; the informing spirit is beyond the ken of the material student.

Force cannot create itself; nor, when created, assume creative rank. The diffusion of vitality now requires the agency of vital power. Does it not follow that its original issue on earth required vital power too? If the present perpetuation of life can be no otherwise than through life—which is an undeniable truth—the introduction of life on the globe must have also been through life: it was, in fact, only perpetuating it—only introducing the principle to another sphere. This latter, we call creation. But it was as surely life giving life then, as it is now. It is a strange perversity that claims life as necessary to life at one period and not at another; that the intromission of life was radically different from its maintenance; that it came by inorganic action, and is kept up by vital. If it were continued by inorganic action, its inorganic origin would be intelligible: being continued by vital action, is not its vital origin equally intelligible? Is there a second method by which philosophy can avoid the confusion of the material *then* and the immaterial *now?* I do not know of it. Let us not be deceived by the word, creation: it is but the first *view* of life; which by no means infers it was the first existence. Life is eternal; which is philosophically proved, to my mind, by the doctrine of similarities;—the present, in its connection with past and future, is a portion of immortality—the continuance of what was, the embodiment of what will be.

The sciences of chemistry and anatomy are highly interesting and useful. Indeed, I am strongly impressed with the notion that chemistry's search after this modern philosopher's stone will accomplish as glorious an advance in itself as that from former alchemy to its present high position. It were almost more than rash to affirm as much for modern comparative anatomy, as sometimes pursued.

A word or two now on Mr. Grove's *Correlation of Physical Forces.*

The subject appears to be treated with great ability. That the forces with which he deals are correlated I am quite willing to grant to the full extent he claims for them, except in the case of motion, which I cannot understand as a force, but as the expression of forces. That the rest of those named by Mr. Grove—heat, light, electricity, magnetism, and chemical affinity—are correlated I think he satisfactorily shows. But there are others which he does not name, air and water, for example,—both natural forces of great influence. Is there cor-

relation between these and the others? I imagine not. How can air or water become light? or light be liquefied? Unless all natural forces be correlated, general deductions from the correlation of a portion of them must fail. Correlation of part of the natural forces cannot govern the whole, nor can it therefore lead to any definite conclusion in our study of natural phenomena.

If it be intended to connect the doctrine of correlation of forces in any way with vitality, I conceive it must be unsuccessful. Mr. Grove quotes Dr. Carpenter as suggesting "the probability of extraneous forces, as heat, light, and chemical affinity, continuously operating upon the material germ, so that all that is required in this is a structure capable of receiving, directing, and converting these forces into those which tend to the assimilation of extraneous matter, and the definite development of the particular structure." The material germ remains to be discovered. If it were under our hand, it might receive extraneous affections, as water receives heat; but directing is a property of life—perhaps even confined to its highest forms. The water does not direct the heat in the production of steam. The external force may direct the material structure, but the directing is as unpremeditated as the impelling physical movement is involuntary. Instead of this, the very material structure itself is called upon to direct those forces to an invariable and given end, converting them into other forces tending to form a totally different structure —meaning, of course, living structure. Is this so? Mr. Grove inclines to the affirmative, and supports his views thus: "As by the artificial structure of a voltaic battery, chemical actions may be made to co-operate in a definite direction, so by the organism of a vegetable or animal, the mode of motion which constitutes heat, light, &c., may, without extravagance, be conceived to be appropriated and changed into the forces which induce the absorption and assimilation of nutriment, and into nervous agency and muscular power."

Now, I think this may not be received without the greatest extravagance. There can be no doubt about the actions of a voltaic battery. But in all such reasonings it appears to be forgotten that life is there the directing power, not the insensate machine, nor the force with which it is connected. It is organism working to a specific purpose, not physical forces appropriated and changed by the material machine or directed by it. Life charges the battery, and guides the results. Vital power is the operator throughout, by means of its exponents, the brain and the muscle of the operator. It is vitality compelling the elements; not the elements engaged in

organic operations. Thus vitality appears to be out of the reach of material combinations; *it* controls *them*, and is consequently a power superior to them. Grant the wild supposition that life is eventually produced from inorganic elements, will that show us what those elements can perform? I do not quite see it. The only fact adduced would be that life was there; not that the unaided physical could bring it forth. You, as a living machine, are putting together, of purpose, what you expect as a voluntary gift from dead machinery. If life sprang up under your manipulations, do you expect materiality to compete with intellect? No matter what forces are bestowed on machinery, it requires extraneous power to set it going, and to keep it going.

Yet another point;—can the mind of man conceive progressive motion originating in matter? Mr. Grove announces a great truth in saying, "It is an irresistible inference from observed phenomena that a force cannot originate otherwise than by devolution from some pre-existing force or forces." This drives us out of the material world for the pre-existing force. Although Mr. Grove starts by setting down motion as a force, he is inclined to believe, and on very strong grounds, that physical forces are but modes of motion. I also believe that motion is a result of those affections of nature we call forces; and the forces, themselves, derivative motion. Since, then, motion does not originate in matter, as a distinct motor—as all known forces devolve from anterior force—and since we cannot comprehend other origin for them, we cannot seek for the pre-existing force among natural phenomena. It can only be—as the inevitable consequence of this inquiry—a force foreign to the inorganic; a power above and beyond all natural forces.

In his address to the British Association in 1866 on "Continuity," Mr. Grove, speaking of an elephant arriving on earth, without having had antecedent progenitors, says, "I know of no scientific writer who has, since the discoveries of geology have become familiar, ventured to present in intelligible terms any definite notion of how such an event could have occurred: those who do not adopt some view of continuity are content to say, God willed it." Can our philosophy or our science lead us over the boundary of the physical? On that boundary, we are tottering on the outermost edge of philosophy's teaching: one step more, and we are in that beyond, which science cannot penetrate. This seems to be a chief reason why some contend for the supremacy of matter. They would bring everything within the compass of human reason; so they trammel the intellectual;

they bind it to the horns of the mountain; they chain it to earth; they force it to minister in the temple of the rocks. Where science ends, faith begins. As the unseen cannot be brought under the influence of human skill, it is either altogether rejected, or an influence conceived delegating life-production to inanimate nature. This latter has become a not very uncommon notion. A power is acknowledged, superior to the material creation—out of the sphere of science—in the domain of that which evidences things unseen. Why does their faith stop at the restriction of life to subsequent conditions of matter? The followers of this creed acknowledge faith up to the point they think their own peculiar views require. Having any amount of faith themselves, why should they try to break down that of another, whose belief is a little more than theirs? If they have any, they admit the principle. It is only in degree we differ, not in kind. They are talking contradictions when they would put down the Biblical believer, whose creed is the most extensive and truest continuity; for it counts back from all our surrounding organisms, till, lost in the earliest inorganic formations, it recovers them in eternity. On the border-land we meet face to face the question, Where now is life? The index points —beyond.

"Those who do not adopt some view of continuity are content to say, God willed it." By what view of continuity can we account for the arrival of the elephant on our planet? There are many, like the humble individual now speaking, who can only track the elephant of to-day to the first elephant on earth. Is there a monad for the elephant, a monad for the condor, and a monad for the pampas grass? or do all these originate in one monad? If each of them have separate and distinct origins in matter, may we expect a recurrence of the combinations which produced them, and consequently a fresh supply of elephant, condor, and pampas grass? or why, if all have one origin, should the thing springing therefrom, even in millions of ages, get split up into these distinct forms, which, when assumed, become permanent? and why it should not have stopped at various intermediate forms, making these the culminating points? In short, why was form arrested at all? The law of its arrest, derived from unconscious matter, presents us with a truly miraculous uniformity; for which, neither the development, nor any other system with which I am acquainted—save that of the Bible alone—can account.

The last quotation is part of a commentary on a freely translated passage of Lucretius, which ends thus:—"If he"

(the elephant) "had no antecedent progenitors, some such beginning must be assigned to him," as that "he fell from the sky," or "appeared out of the cleft of a tree," &c.; —anything but recognition of a personal Creator.

What was this animal's antecedent? As the idea of his first appearance on earth, in his perfect form, is held to be only fit for ridicule, he of course came from some embryotic state, either in his existing or other form—a germ. From all the materials within the scope of human knowledge, the only notion of a germ we can establish is that of reproduction. The *first* was obviously not reproduced. I am, therefore, constrained to believe in a pre-existing creative Power. To whatever minute point we ascend, that point has life: confining ourselves to earth, no form of continuity can therefore reach life's origin.

There are some arguments, again, brought forward in support of continuity, which to the best of my belief are neither new nor true. "If an animal seek its food or safety by climbing trees, its claws will become more prehensile . . . . each portion of the frame will mould itself to the wants of the animal, by the effect on it of the habits of the animal." So continuity enforces the doctrine, that the giraffe got his long neck by trying to obtain food out of the reach of shorter vertebrata; in fact, that animals were produced by this most unnatural natural system, in striking opposition to their former wants, brought forth for one course—the terrestrial—urged on to another—the arboreal—by what? their nature? their instinct? Then they had one nature and one instinct in the early part of their career, and another nature and another instinct in a later part. This is too subtle for my comprehension. I can make nothing of it but a flat contradiction. The animal's requirements are at variance with its powers! Desires and necessities are bestowed upon it, together with impotence of attainment! What manner of thing is this? Transmigration of souls is as the wisdom of Solomon to it. I suppose it is done in what they call the "way of nature"; nor is it a bad illustration of what we might look for under the rule of unreason.

On this point Mr. Grove appears to go the whole length of Lamarck, one of whose illustrations is that of a bird driven to seek its food in the water. The wish for locomotion on that element induces it to strike out its feet; the toes spread; a membrane between them would be very convenient; sufficient practice at the new exercise induces the skin at their roots to extend into one, and the webbed foot is accomplished.

One of the curiosities of literature may be found in tracking the effects of different authors' ideas on cognate subjects. Lamarck talks of the shore-bird feeding at the muddy edges of the water; and to avoid sinking on the soft substance, stretches its legs to the very utmost, and the consequence is the establishment of the long and bare-legged waders. The author of the *Vestiges of Creation* speaks of the colonizing principle of certain wading birds, which might have advanced into "dry grounds and woods; elected to the new life perhaps by some of those varieties of appetency which occur in all tribes; thus exposing themselves to new influences, and ceasing to experience those formerly operating, until by slow degrees, in the course of a vast space of time, the characters of the pheasant tribes were evoked." Lamarck sends the shore-bird into the mud to get his long legs, and the author of the *Vestiges* plucks him back again to resume his short ones, at the same time converting the spoonbill or the stork into the pheasant.

Fœtal inferiority is again advanced in the address on "Continuity," as supporting its views. I do not see how it is possible to sustain an argument on the adult and perfect, from the unborn. Progression to the typical, implies imperfection in all the uterine stages up to the last. I am afraid Harvey must bear the blame of promoting the doctrine of embryonic lowliness, and the deductions thence ensuing; for he speaks of the gradual development of the embryos of all animals, from the structureless mass to the perfected creature; yet neither the elaborate chapter in the *Vestiges*, nor the adhesion of any present writer, shows more or less than that the embryo of each race produces its like; that the bird never stopped short at the reptile, nor the mammal at the bird. If the first stage were the perfect image, there never could have been any other stage. Uterine growth is nothing more than the gradual perfecting of the *kind;* fitting it up for the after-purposes of its peculiar existence; of necessity, therefore, not fully formed till the period of parturition. Through whatever stages the embryo may pass, the idiocrasy is never lost—it is true to its kind in the first stage as the last.

Rudimentary organs are again pressed into the service; and which—as we read in the last cited paper on Continuity —"must either be referred to a lusus naturæ, or to some mode of continuous succession." Take the Apterix. It cannot be a lusus naturæ, for that is an abnormal growth; whereas the Apterix produces its like. Here we find the wing of the bird reduced to the lowest rudimentary form—a mere stump. Continuity says, this effete wing is derived from continuous

succession and modification from wing, properly so called. I cannot trace the steps, and think there are strong reasons for believing there are none. The whole of the bird's bones are solid; not hollow, for the sake of lightness, as in flight-birds. The sternum is a mere buckler, without the keel of the flying tribes; neither has it any abdominal air-cells. The whole frame is utterly opposed to flight. It is that of a purely land animal. If the ancestors of this terrestrially-made bird ever flew, I could understand how, from long disuse, it might have lost its flight-powers; and how, the same conditions always present, they might perhaps gradually wither quite away. But why should that part of the osseous structure, unconnected with the organs of flight, be so generically changed? The entire bulk is unadapted for flying, not the rudimentary wing alone. If it be argued by the continuitist that the frame has changed for the descensive reason that abolished the wing, he is making the frame in its totality an engine of flight, which is untrue of any bird. Again, do the warmest advocates of continuity pretend that it adds to, as well as takes from,—at least where they are making use of the argument of rudimentary organs? In the present example, we have this gradually "worn-down" wing furnished at its extremity with a hook. How can we account for the phenomenon of addition? I see but one principle which can do that; the ancestral Apterix possessed the same instrument, and therefore never had a true wing.

None of these citations appear to be very well calculated to sustain the system of continuity.

In this class of thinkers, a good deal of argument will be found bestowed on the confusion of primary and secondary powers. "If," says Mr. Grove, "we now assign to the heat of the sun an action enabling vegetables to live by assimilating gases and amorphous earths into growing structures, why should such effects not have taken place in earlier periods of the world's history, when the sun shone as now, and when the same materials existed for his rays to fall upon?" His rays are called upon to aid in keeping existing organisms alive; which is all he can be proved to do now, and which he always did since vegetable was. Before then, there were the "materials," but nothing else. The sun is one of the aids in reproduction; how can we thence argue that he brought the first vegetation into life? There are no more grounds for this, than to consider original introduction and subsequent reproduction the same act, or effected by the same means. The difference appears to me as obvious as that between the seed and the plant; the plant springs from the seed, which is

reproduction; the seed is first formed on the plant, which is production.

In spite of all the volumes, and the addresses, and the lectures that have been written and delivered on the subject, the truth after all seems to lie in a nut-shell; the seed being produced by the plant as a provision for the perpetuation of its kind, necessitates in the first plant an origin anterior to seed. I apprehend this is a legitimate inference from what we know; for, as far as I am aware, no philosophy and no science can show reason for reversing the natural law, that descent is from the perfect formation. The plant is visibly the parent of the seed; and as visibly is only perpetuated by it. That the exact opposite occurred in the case of the first life, is neither philosophical nor scientific (unless I greatly misunderstand those terms), and for which I can find no warrant in nature. You may reverse the argument, and tell us, the seed visibly produces the plant, and is therefore the parent. But you are likewise reversing the process of nature. I think by strict inductive philosophy, we may obtain the following formula of creation. To propagate the plant we first take the seed from itself; we can therefore follow up seed from plant to plant to the first *plant*. You cannot follow up plant to the first *seed*. You say, we sow a seed and a plant arises—the seed is first. Argue that upward. Whence came the seed you sowed? From a previously existing plant, which came from a seed too. Leave this seed, then, as the first of the series. Why not? Because the earliest knowledge you have of seed is from the *bearer* of it—the seed's producer—the plant: hence the plant had precedence—the seed came after; and also because, though seed is the mode of defence from extinction, it is only from the absolutely complete that seed is derived—that complete must therefore be, or have been, for seed to be.

So of all life.

Under the material doctrine of life—whether as issuing from matter unconnected with previous impress from without, or wrapped up in matter by the Creator for future development—the philosopher is stopped, not only before he touches upon existence, but before he has investigated the unintelligent substance of his own planet with sufficient accuracy to determine, not merely its life-originating, but even its life-sustaining powers. On the very threshold we encounter uncertainty. A preliminary inquiry has not met with a satisfactory answer. So comparatively simple a thing as root-function does not seem to be clearly ascertained. M. Corenwinder not long since read a paper on this subject before the French Academy, in which he detailed some interesting experiments,

showing that a portion of the carbonic acid found in the root must have other access than by absorption; the quantity of the acid being invariably greater than that supplied to it, whether as gas or solution in water. Where does the surplus come from? While we are ignorant of common root purposes —of mere vegetable feeding on the inorganic—it must be a daring hand which shall aim at plucking life from that whereof we have such scanty knowledge,—of the very mechanical contrivances of which we know so little.

Dashing assertion is not, however, wanting. In Dr. Page's work on "Man," the following is quoted from Professor Huxley:—"The whole analogy of natural operations furnishes so complete and crushing an argument against the intervention of any but what are termed secondary causes in the production of all the phenomena of the universe, that in view of the intimate relations between man and the rest of the living world, and between the forces exerted by the latter and all other forces, I can see no excuse for doubting that all are co-ordinated terms of nature's great progression from the formless to the formed,—from the inorganic to the organic,—from blind force to conscientious intellect and will." Divide this materialistic creed into two sections. We have first, that analogy of natural operations completely establishes secondary causes in the production of all phenomena; and second, that the phenomena of the universe are co-ordinated terms of nature's progress from blind force to intelligence.

1st. If secondary causes are to be judged by analogy of natural operations, they are nothing more than re-arrangers and reproducers, all we know of natural operations being re-arrangement of physical, and reproduction of vegetable and of animal; the analogy, therefore, reaches at furthest to the reproductive powers of nature—not to the productive. I cannot see the crushing argument against a primary force producing those secondary causes. They are themselves "phenomena of the universe," producing other phenomena; and by consequence dependent on their cause, as these latter are dependent on them. Their place in creation is that of re-agents; they manifest and determine the presence and character of the Great First Power.

2nd. That the phenomena of the universe are co-ordinated terms of nature's progress. So that, no matter how the universe was made, all its phenomena are only gradually unfolded with nature's onward movement "from the formless to the formed." Though there is no direct denial that the universe may have been created by Divine Power, there is denial of that Power having created any of the attendant

phenomena. There is some confusion here. The lightning flashes,—the magnet attracts,—storm desolates,—the sun gives forth his warmth,—electricity circles the world,—light envelops creation—are not these phenomena of the universe? are they not integrants of it? could the universe be, without them? To what phenomena, then, does the Professor refer? and wherein lies the difference between its phenomena and its operations? Whenever natural history seeks to explain the genesis of nature by natural means alone, I cannot divest my mind of a feeling of vagueness, of assumptions, of incompleteness. Even granting a force originally invested in nature, capable of throwing off all the magnificence of space, and sustaining it, by the slow degrees claimed for its works, that does not remove the materialistic creative movements: we can only recognize a power bestowing power—the creator of the material, leaving it to exhibit both the living and all the material phenomena flashed upon us from myriads of the sublimities of unlimited grandeur:—a shapeless mass was therefore the only act of true creation! a shapeless mass from which all else was—developed! a shapeless mass which filled space with glory—which gave forth life, and death, and immortality!—a wondrous creed—a conclusion wild and unphilosophical.

In the work on "Man," just named, every one knowing some of the author's previous works, would of course be prepared for strong opinions in favour of the geology whose fundamental principles have never been settled, and for the whole succession of imaginative deductions which might reasonably be expected from such premises; but I was surprised and pained to read the following:—"It is of no use, then, when new questions like the present are mooted, for certain minds to work themselves into a frenzy of orthodoxy, and savagely smear themselves with theological war-paint, and raise the old war-whoop of the Bible in danger." The man who could scatter opprobrious sentiments like these, broadcast, instead of the soft word and the hard argument, must have imbibed such a bitterness of prejudice, as to be hardly trustworthy when estimating the preponderance of credibility for or against the Bible.

In the same essay there is one quite new doctrine taught—at least new to me—that "time is without limit." It is well to have prepared an eternity, to work out the results of a philosophy which teaches the development hypothesis, that there was no such thing as independent creation unless of the physical, and of that physical without its phenomena! Although this speculation may have an eternity for its school-

room, I may be allowed to doubt whether its scholars will ever perfect their task.

A hypothetical nest for the living once fairly imagined, harsh denunciations against life being a direct creative act, are rather largely indulged in, as will be found in those writings where material devolution is taken up against direct creation. In the last-named work, Dr. Page says, that the essential difference between man and the animals immediately beneath him, "was not a thing brought about by a direct and independent act." Man was not created, is the theme. Nothing was created except a lump of the inorganic, is also the theme. Everything besides proceeded thence, according to the aboriginal plan of the creator of the nucleus.

This is the best side of the materialistic theory—matter impressed by the Deity with all that has appeared; and, according to some, with much more still to be developed. Even here we do not lose that contradiction, the material generator of the living. So determined is this scientific section the natural world shall be claimed as our origin, that strong efforts are made to get at the ultimate particle which eventually becomes the perfect organism. Strive as you may for the ultimate principle of germinal matter; subject what you will to the highest microscopic powers we have; go further—bring in imagination to your aid; let the mind conceive subdivision of matter until its powers of conception are lost in the vast calculation—the last glimmering of connected thought in relation to the mass is still a divisible entity. This is not what we seek. We have not arrived at the ultimate particle. No powers possessed by humanity ever can. And if they could, the ultimate particle is not the life itself. All reasoning shows that the ultimate particle must be matter. Does matter, as such, grow? Who can say it does? Every effect of nature's mightiest powers is but change of matter; we can detect no signs of growth. It is life that grows; and though it may require the inorganic for its sustenance, it is life that, feeding on the unformed, occupies more and more space, and assumes fresh forms utterly unlike those whence its nourishment is drawn, till it reach the perfect vegetable or animal according to its kind. It might seem of small consequence, whether material food under the assimilating powers of life, becomes instrumental toward future size and form, or whether matter grew, being alive. But the whole question hinges on this; for if matter grew, being alive, life would proceed from matter: whereas, matter being acted upon by life, life is more independent, and eventually becomes the visible ruling power of the material world, so far as its constitution is suitable.

It would seem, then, we are driven to one of two conclusions—either that certain particles of the inanimate are directed upon certain other particles of the inanimate for active formative purposes, and developed as the necessary conditions arise; or that there is a Power independent of, and superior to, and directing, inanimate nature—the immediate Creator of life upon the globe.

I have thus endeavoured to lay before you, as briefly as I could, a few further observations on the origin of life; tending to show that life could not have proceeded from the inorganic, by and through the means of the inorganic; that the perfect form was the original creation; and that existence must therefore have necessarily come from outside the material body—not in the sense of life-productive power having been bestowed on that material body for remote development—but direct from a source having life before its manifestation here as life.

NOTE.—Throughout this sketch I have often used the term "force" as applied to physical phenomena. I have only done so in accordance with the theories on which I have been commenting; my own view being that there is only one force, either in our world or out of it—Mind; the mind co-existent with Eternity, co-extensive with the Limitless; and the mind of man: all else is motion.

The CHAIRMAN.—I propose a vote of thanks to the author for his very interesting paper on a difficult and obscure subject. The subject is so obscure that we must expect obscurity in some parts of the paper; but on the whole Mr. Wheatley has treated the main parts of the subject in a very satisfactory way. It is a subject that deserves discussion; and I hope it will elicit a good one, especially as some of the questions involved in it are now being brought very prominently before the scientific world.

Mr. BROOKE, V.P.—I shall be very happy to make a few brief observations on this paper, and to supplement them by some further observations directed in answer to a lecture which was delivered some little time ago in Edinburgh by Professor Huxley, and which has since been printed in the *Fortnightly Review;* and I shall endeavour to point out some few of the errors into which the author of that lecture has fallen. There are many points in the paper before us which would bear some remark; but I shall only refer to one point to which I hardly offer an objection, but in which I think the author has fallen into some confusion of ideas in regard to forces. The term "force" is perpetually confounded with what force produces, as I have already pointed out on a former occasion. In the case of artillery, you speak of the force of

the gunpowder, and of the force of the shot. Now the gunpowder has force, which is the power of propelling the shot; but the shot has no force at all—it has only energy; that is to say, the shot has the power, when propelled, of effecting destruction by dealing a heavy blow; but it has no force. That is merely one of a thousand different examples that might be given of the erroneous application of the term "force"; "force" should be limited to that which produces energy. But what I wanted to point out was, that Mr. Wheatley, in speaking "of the rest of the forces named by Mr. Grove—heat, light, electricity, magnetism, and chemical affinity,"—has fallen into the error of confounding force with energy. What Mr. Grove speaks of as forces are certainly not forces, but the results of force. But the author says: "There are others which he does not name—air and water, for example; both natural forces of great influence." Now what idea he can have of force as comprising the qualities of air and water, I am at a loss to conceive. I cannot imagine what definition of force can be given to include air and water. I think that is a little oversight on the part of the author. But the paper is a very excellent one, and it contains much sound argument. As the subject before us is "Life and its Origin," I may now make a few remarks on Professor Huxley's paper, which is entitled "On the Physical Basis of Life," and I will endeavour, in a few words, to give you an idea of the substance of that paper. Professor Huxley begins by stating that "protoplasm," which he translates into "physical basis of life," is the material from which all organized beings are formed. He is quite right in stating that that protoplasm, or physical basis of life, consists of these inorganic elements—oxygen, hydrogen, carbon, and nitrogen. He is also correct in stating that animals do not possess the power of forming protoplasm from those inorganic elements, while that power is possessed by the vegetable kingdom. It is also true, as he states, that a solution of carbonate of ammonia, or smelling-salts, contains in itself all the elements necessary for the formation of protoplasm; but certainly no animal could live upon a solution of smelling-salts. (Laughter.) No animal has the power of combining the inorganic elements which are found in the solution of smelling-salts into that material called protoplasm, which is the foundation of animal and vegetable existence; but plants do possess that power. A plant would grow in a solution of carbonate of ammonia, and would combine the protoplasm necessary for its development from the elements contained in that solution. But Professor Huxley then goes on to argue that the formation of protoplasm and the formation of organized beings from protoplasm is equally the result of natural forces as is the formation of water from its constituents, oxygen and hydrogen. He states the well-known fact that if oxygen and hydrogen gases are mixed together in certain proportions, and an electric spark is passed through them, an explosion takes place; and the only residue is a small quantity of water, exactly equivalent in weight to the gases which had previously existed. He goes on to say that by a certain reduction of temperature the water thus formed will become solid ice; and the gist of his argument is, that the formation of organized beings from the protoplasm—

from the physical basis of life—is a precisely analogous proceeding to the formation of water from oxygen and hydrogen. He says :—

"Is the case in any way changed when carbonic acid, water, and ammonia disappear, and in their place, under the influence of pre-existing living protoplasm, an equivalent weight of the matter of life makes its appearance?"

Now here he is right so far, that no protoplasm is formed except under the influence of pre-existing protoplasm ; but he omits here to state that that protoplasm must already be organized into a living being before it can possess the power of re-organizing or forming protoplasm from the inorganic materials of nature. Protoplasm, as such, cannot produce itself ; and therefore Professor Huxley is here entirely wrong. It is not produced simply under the influence of pre-existing protoplasm, but under the influence of that protoplasm which has become constituted an organized being. Between the two there is a very great difference. The argument of the author is against the existence of what we call vitality ; and he gives this illustration, as he supposes it to be, of his argument:—

"And why should 'vitality' hope for a better fate than the other 'itys' which have disappeared since Martinus Scriblerus accounted for the operation of the meat-jack, by its inherent 'meat-roasting quality,' and scorned the 'materialism' of those who explained the turning of the spit by a certain mechanism worked by the draught of the chimney?"

Now we shall soon see that that vitality is not so easily got rid of as Professor Huxley supposes. He says in one of the most important parts of his paper :—

"It may seem a small thing to admit that the dull vital actions of a fungus, or a foraminifer"—[one of the very lowest orders of beings]—"are the properties of their protoplasm, and are the direct results of the nature of the matter of which they are composed. But if, as I have endeavoured to prove to you, their protoplasm is essentially identical with, and most readily converted into, that of any animal, I can discover no logical halting-place between the admission that such is the case and the further concession that all vital action may, with equal propriety, be said to be the result of the molecular forces of the protoplasm which displays it."

Now I think I can help him to discover a logical halting-place which he does not seem to have observed. He begins that passage by observing :—

"It may seem a small thing to admit that the dull vital actions of a fungus, or a foraminifer, are the properties of their protoplasm, and are the direct results of the nature of the matter of which they are composed."

It may seem a very small thing to him, but it seems to me to be a very great thing, and to be just the root and gist of all the difference between materialism and immaterialism ; and in this way :—A fungus is a plant of a very lowly organization, but it must be a fungus before it has the power of producing the protoplasm of which future fungi may consist. It must become a fungus before it has the power of assimilating and producing fresh proto-

plasm. So long as it existed merely as protoplasm, it was destitute of that power, and it could not obtain that power before it was under the influence of a germ derived from a pre-existing fungus of the same kind. It is only under the influence of that germ that, finding suitable materials for the formation of protoplasm, it can convert and constitute that protoplasm by a succession of changes into the entire organism which we call a fungus. Then it is that, as a natural consequence, the fungus has not only the power of reproducing similar germs to those from which it itself arose, but it has also the power of producing protoplasm, and of combining together those inorganic elements into protoplasm which is to become the pabulum, the food, the building materials of another organism of the same kind. What Professor Huxley seems to look upon as a very small thing is really a very great one. It is the whole gist of the question, and it is not to be passed over or acceded to in that way. I will grant the Professor this much, that if we admit that the vital actions of the fungus are the direct results of the nature of the matter of which it is composed, we admit the whole question. But it is the same throughout the range of the whole animal creation. No piece of protoplasm has the power, simply as such, of reproducing protoplasm ; but when any piece of protoplasm is under the influence of a pre-existing germ whether animal or vegetable, that protoplasm is formed into an organized being, and that organized being is capable of producing other germs which will reproduce their kind and the protoplasm which will serve as material from which their after-existence is built up. Now, in following this out, we are inevitably led back to the great first cause. We get a succession of protoplasms so formed, but in each case it has only been under the influence of a being resulting from a germ which has proceeded from another germ of the same kind, and that from a former germ ; and so on. We are thus carried back, step by step, to the great first cause, who must have been the originator of all the individuals from which the germs were produced. That is an inevitable consequence, and therefore all the argument on the other side falls to the ground.—I can hardly pass over the contents of this lecture of Professor Huxley, without making one or two remarks, which I trust you will not consider irrelevant, on another passage. He says, towards the end of his lecture :—

"If a man asks me what the politics of the inhabitants of the moon are, and I reply that I do not know ; that neither I nor any one else have any means of knowing ; and that, under these circumstances, I decline to trouble myself about the subject at all, I do not think that he has any right to call me a sceptic. On the contrary, in replying thus, I conceive that I am simply honest and truthful, and show a proper regard for the economy of time. So, Hume's strong and subtle intellect takes up a great many problems about which we are naturally curious, and shows us that they are essentially questions of lunar politics, in their essence incapable of being answered, and, therefore, not worth the attention of men who have work to do in the world. And he thus ends one of his essays :—'If we take in hand any volume of divinity, or school metaphysics, for instance, let us ask : Does it contain any abstract reasoning concerning quantity or number ? No. Does it contain any experimental reasoning concerning matter-of-fact and

existence? No. Commit it, then, to the flames, for it can contain nothing but sophistry and illusion.'"

Now, no doubt Hume was a man of great intellect; but this passage which is quoted by Professor Huxley, shows that he was a very bad logician. If any volume of divinity or metaphysics is to be rejected because it does not contain "abstract reasoning concerning quantity or number," or "experimental reasoning concerning matter-of-fact and existence," then, *à fortiori*, all books which do not contain these matters must be treated in the same manner. Take the histories of Julius Cæsar or of Napoleon Bonaparte; they do not contain any abstract reasoning concerning quantity or number, or experimental reasoning concerning matter-of-fact and existence, but they contain much important information. Or take any other history containing information concerning the past ages of the world. All these works must go into the fire, and lastly also, the Bible itself, containing the history of God's dealings with the world, as revealed to man by God Himself; and the life and doings of our Lord, as given to us in the New Testament. All these works contain no abstract reasoning concerning quantity or number, and no experimental reasoning concerning matter-of-fact and existence, and, therefore, they must at once be rejected. No doubt Hume wrote his celebrated History of England, as a matter of amusement and interest, but I would ask, according to his own view, why, when he had written it, did he not put it behind the fire? (Laughter.)——

Mr. REDDIE.—Is it certain that that quotation from Hume is given with exactness?

Mr. BROOKE.—Here is the quotation, which a foot-note declares is from Hume's essay "Of the Academical or Sceptical Philosophy," in the *Inquiry Concerning the Human Understanding*——

A MEMBER.—But does Hume refer it to works of history?

Mr. BROOKE.—Works of history must certainly be included within its scope——

A MEMBER.—But he says, "Any volume of divinity or school metaphysics."

Mr. BROOKE.—But if the argument is worth anything, it must apply to other books as well. If any volume of divinity or school metaphysics is to be rejected because it does not contain any abstract reasoning concerning quantity or number, or any experimental reasoning concerning matter-of-fact or existence, all other books which come under the same category must also be rejected for the same reason; that is the only logical conclusion: it is a universal logical consequence——

The CHAIRMAN.—And that is the use which Professor Huxley makes of the passage, or else it would be irrelevant.

Mr. BROOKE.—Quite so; that is why it is introduced here, and it is clear that the logic is exceedingly bad. Professor Huxley goes on to say, "Permit me to enforce this most wise advice." Now I have a very great respect for the talents of Professor Huxley, but I should have been very sorry to have

imputed to him an accordance with such a miserable piece of logic as that which I have just read. Now in this lecture which I have been commenting upon, he is quite correct upon some points; and that is what is calculated to mislead the intelligence of others upon other points. He is quite correct in saying that protoplasm is produced only under the influence of living protoplasm, but he makes no allusion to the indispensable influence of the pre-existing germ or organism of the living being. He makes no allusion to that necessary antecedent; it would not suit the gist of his argument.

Rev. J. MANNERS.—I should like to say a word or two with regard to Professor Huxley's theory. I should like to give him this simple equation to solve: let him take C H O N—call them definite, indefinite, or variable quantities, or what you like,—and from these quantities let him find me ζωή, or life. Let him do it as a sort of algebraic problem: given four unknown quantities to find a known positive quantity. Let him have C H O and N, or protoplasm, and from that let him tell us what is life. We know that carbon, hydrogen, oxygen, and nitrogen form various combinations; but how do they form what you call protoplasm? Where did you get that name from? Why do you introduce it? You tell me it is the basis of life—the basis or foundation of life. But I must first know what you mean by "foundation"; we must have no mistake about our words; and then I must know what you mean by "life." I say that all these arguments seem to me, after all, to involve the great truth which they appear to deny. But let us come back to this most interesting paper of Mr. Wheatley's. The term "life" we know requires an adjective to qualify it in order to give us a proper idea of what we mean by it; but at the same time the word itself lies very deep, deeper far than any mere matter of history, or any mere matter of form, or of materialism. It seems to me that the origin of life must *be* life, whether in the beautiful forms of the vegetable world or of the animal kingdom. The origin of intelligence, the origin of the will, the origin of thought, the origin of desire, the origin of love,—all these must be anterior to that which is the manifestation of these various principles; and therefore we come at once, as a matter of sound, common, inductive reasoning, to the conclusion that the origin of all these principles which we find manifested in creation must be life. In inorganic matter, when we wish to resolve it into its primitive elements, the chemist comes in to our assistance. He takes a drop of water, for instance, and he says, "I find it is composed of oxygen and hydrogen"; and if he takes these elements, and passes an electrical spark through them, he immediately obtains water. But when we have got so far, I want to know the cause of all this. I want the cause of this living, essential, vital, wonderful, and beautiful power, which has not only brought these things about, but which preserves them, and gives them their beauty and form in their present manifestation. It seems to me, therefore, that all true science must have its basis, not in what is commonly called inorganic or dead, insensible materialism; the cause for all these things must be found in the spiritual and eternal. There will be no advance in true science; there can be no real

cause assigned for anything until we come to the spiritual—to the Word that said, "Let there be light, and there was light."

Dr. ORD.—It seems to me that this lecture of Professor Huxley's is rather usurping the place of the paper which we came here to listen to, but quite unavoidably; for Mr. Wheatley's paper, having been written some months ago, naturally could not take cognizance of Professor Huxley's important lecture, and no one can wonder that Professor Huxley's lecture should have set men thinking. For myself, a young student of physical science, I feel that if I accept Professor Huxley's paper, I am placed in a very unhappy position. If I reduce myself to a mass of matter, I can only hope to live and have intelligence so long as that matter continues living. It seems the logical conclusion of the lecture, that all our aspirations and thoughts—all that we usually attribute to the soul—are bound up in matter, and can only exist so long as that matter exists in the form of protoplasm. On that subject I think both Mr. Wheatley's paper and Mr. Brooke's remarks have hit the point involved. Professor Huxley, in his paper, has said nothing of the origin of life: he has simply brought us to the point, that we are made up of what he calls protoplasm. He takes us down to the simplest form, that of the foraminifer—a mere mass of matter of the lowest organic type, and points out that it has certain properties associated with a certain quaternary chemical constitution, of carbon, hydrogen, oxygen, and nitrogen, properties usually called vital, but which the Professor assumes to be merely the reactions of protoplasm. But he has not told us that protoplasm is formed without the intervention of pre-existing living organism, and that I take to be the weak point of his paper. I wonder that he has said nothing of the theory of spontaneous generation, which is now being again put forward here and on the Continent. Some people think that the advocates of that theory—MM. Pennetier and Pouchet—have the advantage; but the more I read of it, the more I am confirmed in the belief that spontaneous generation never occurs. Another weak point in the argument is, that we have no indication whatever of the way in which these different masses of protoplasm—in the corpuscles of the blood, for instance—are enabled to act in concert, so as to keep the whole body going. How protoplasm is to work in that way, I confess I cannot understand. We are told that everything must be rejected as unworthy of notice which cannot be subjected to demonstration, or has not predicables of number, or shape, &c. We are to believe only in what we can comprehend and master. But I think we may, even from aspects of our own consciousness, show that there are things which we know to exist, and yet which we cannot comprehend. One of the earliest puzzles to me when I began to think, and before I knew that the world was round, was—where it ended. I used to wonder where I should find the end, and what was beyond. So it is now with regard to the infinity of time and space—the same feeling comes over me. I know the thing must exist, but I cannot conceive it, and I feel an awe before it like that which I feel when I think of my Creator. It is the same with regard to our existence. We must add a great deal to what Professor Huxley has said before we can have done with this question.

Accepting his arguments in other papers, we must acknowledge that man and some of the highest order of animals are organized in the same way, and are made of the same material. If we compare man and some of the higher apes, we shall find no difference between them organically; and yet, what an immense difference we shall find in their endowments! I do not think any one has ever attributed to the animal the possession or consciousness of any sort of abstract thoughts or ideas. I have never seen any indication that an animal has been found to have any sense of absolute right or wrong, or idea of geometrical abstractions or abstract beauty. I cannot imagine a dog or an ape admiring scenery, and, although they have tongues like our own, you never find these tongues used for the purpose of articulate language. Articulate speech may be mocked by animals, as in the case of parrots, but it is never used by animals themselves in communication with one another. Such language as animals do possess is always the same for all times and all purposes. Cocks crow and dogs bark now just as they did when they came out of the Ark; but man, even in the lowest stages of barbarism, forms a language suitable to his own purposes, and always changing. Professor Max Müller tells us that where there are no written documents to keep language together,—as among some of the tribes of Africa, for instance—language changes its form in twenty years. Words which are, as it were, the slang phrases of one generation become embodied in the ordinary language of the next, and take the place of other words which had been used before. This changeable articulate speech, and these powers of perceiving moral ideas and abstract truths, constitute, to my mind, differences as great as any of the structural or chemical differences by which great groups of animals are separated from one another. I cannot help believing, therefore, that there is some higher faculty implanted in man than you find in the lower animals, and I cannot understand how mere protoplasm, without some higher power, should have made all that difference. With regard to Mr. Wheatley's paper, there are so many interesting remarks in it, so many glimpses of truth, that one feels disinclined to say anything hard of it; but the way some of the questions of fact have been handled by the author illustrates the danger of people taking up subjects like this without the fullest information. In several instances Mr. Wheatley should have learnt a little more of what I may call the grammar of the subject; but it would be unkind to say more than that, inasmuch as our Vice-President (Mr. Brooke) has drawn attention to one of the most glaring instances of that kind.

The CHAIRMAN.—As no one seems willing to continue the discussion, I will now bring it to a close. The last time I was here I said so much on this subject that I hardly know how I can supplement it now, although I know it is one which is capable of the widest discussion. I think a great deal of obscurity arises in these matters from the necessary imperfection of the words we use. For instance, the whole of this discussion has had relation to the existence of a certain matter called vitality, as opposed to inorganic forces. It is admitted that the particles of matter composing the

inorganic world have certain forces bound up with them ; but the question is, whether that which we call vitality is a different force bound up in us, and which we cannot obtain from that which is not vital. The question is whether there is any difference whatever between the organic and the inorganic world. If we take the views of Professor Huxley and Dr. Odling on life, we are bound to maintain that there is no such thing as life at all, for vitality and life express the same thing, and that therefore it is altogether absurd to make the distinction between organic and inorganic bodies ; that an organic body is that which possesses life, while an inorganic body is that which does not. We are told that the life in an inorganic body is nothing but the action of inorganic forces. But still a great deal of the effect of which I have spoken lies inherently in the ideas which we have of force ; and here I must say that I venture very humbly to differ from Mr. Brooke in his illustration of force. I know it is the popular illustration which is given by many in the present day, and which is considered philosophical ; but when we use words in natural philosophy, before we can apply them to the purposes of mathematical demonstration, we have to give them a strictly defined meaning. Now I complain that the illustration drawn from the action of the cannon-ball and the gunpowder—that the gunpowder possesses force, and that the cannon-ball does not—differs altogether from the definition of force in natural philosophy. The old-fashioned definition of force was, whatever was capable of producing or had a tendency to produce motion in matter was force. The thing moved was matter ; the thing that moved it was force ; and there were as many different forces in nature as there were kinds of matter. We know there are several different forms of matter, which chemists can analyze in detail, and dissociate and combine, and that which combines or unites these things we call force, because it moves those material particles and re-arranges them. The force is that which moves the particles of matter and arranges them anew. There are two things in nature which present themselves to our analytical investigation, two distinct bodies, the one called inorganic or dead bodies, and the other a different series of bodies, called living bodies. Now is there any distinction between a living and a dead body ? Here we may enlarge our terms, and force may mean power. Sometimes you may have something which you cannot exactly call force, but which is power, and I will give you an illustration of this to make it clear. I differ in regard to the illustration of the cannon-ball, because when the ball leaves the gun and goes against a hard body, it does produce motion, and I do not call that energy, I call it force. It may be convenient to introduce a new term, but do not let us confound that with our old definition, force. I have seen a wonderful piece of machinery which was invented by a man named Schutz, and which is now in Somerset House—a calculating machine. No doubt its originator, though not actually its parent, is the celebrated Mr. Babbage. This machine was made by a man who was only aware that Mr. Babbage was engaged in making a machine that should calculate logarithms and different things that required extensive powers of calculation, and which should do what the human brain could not do—go on

making calculations without tiring; and not only that, but this machine supersedes the work of the compositor and corrector for the press, by impressing its calculations, when made, upon paper in such a manner that they appear printed. If you go to Somerset House, and put in certain figures and make certain arrangements with the machinery, you can make the machine turn out square numbers or cube numbers, or fourth powers, or sixth powers. I can do all that by putting in for the square numbers two or three figures, for cube numbers a few more, and so on, and I can produce all the results I want by the turn of a handle. At the same time I put in a piece of soft paper, and that soft paper comes out impressed with the figures 1, 2, 3, 4, and opposite these figures as they appear I get the squares or cubes of these numbers as I want them. Well, now, what is there if I examine the machine? What force is acting there? There is simply the force of my arm turning a handle, which then puts a series of wheels in motion, and the effect of that force is to produce the complicated calculation of which I have spoken. But is that force,—which I could employ by means of a steam engine instead of my arm, or by simply letting a weight fall to the ground—I want to know, is that force the source of the calculating power of that machine? I say that to call that mechanical force which turns that wheel the calculating power of the machine would be to fall into the very error which is contained in the paragraph quoted by Mr. Wheatley from Dr. Odling as to the power of cosmical force:—

"That all actions of the animal body are traceable to cosmical force; that in living, as in dead matter, there is no creation of force; and that any explanation of the phenomena of life which recognizes the agency of vital force is simply no explanation at all."

And he goes on to trace the whole of that force to solar force. According to Dr. Odling, all my life and all my thought are only manifestations of solar force; while, according to Professor Huxley, all my mind, all my thought, all my power of calculating and power of action, are simply the result of protoplasm, acted upon by the combinations and combining powers of C H O and N. When I come to animal chemistry, I find the operation of the problem: I find that C H O and N are capable of giving us an infinite series of combinations, and may have almost any numbers and almost any powers applied to them. Now when I go as a thinking being to that calculating machine, I should consider the man unphilosophical and absurd who told me that the calculating power consisted simply in the inorganic force or the organic force which caused the handle to revolve. Am I to suppose that so much mutton or beef eaten by me, and converted into so much protoplasm, has produced that thought and calculation? I will take a man to turn the handle who is quite incapable of ascertaining a square or a cube, and another man, who never heard of logarithms, shall put in the figures, and still the machine shall turn you out any number of logarithms, squares, and cubes. Or suppose I take so much water, and so much fuel, and produce so much steam to do the work for me—

will any one tell me that that steam is the calculating power of the machine? The man who made the machine says he derived the idea from hearing that Mr. Babbage was making one like it. But what did that man possess? He possessed wonderful powers of calculation; but, more than that, he also possessed mechanical genius: he possessed the knowledge and power which were necessary to enable him properly to combine and arrange all the different materials for his machine. And now I will tell you a very curious thing with regard to that machine. The godfather of that machine, who was most concerned in its manufacture, told me that he asked one of the most distinguished mathematicians of our day—one of the best calculators in the country—to go and see the machine, but he replied: "It is perfectly useless for me to see it, for I should not be able to comprehend it at all. I should see nothing but so many wheels, and iron and steel bars, and so on; and they would give me no notion at all, because I cannot understand mechanical combinations." One of the first machines of that kind which was ever constructed went to Paris, and was exhibited there; and Professor Babbage said that none of the Frenchmen comprehended it, and that he got it a gold medal simply on his statement, that it was sound and good, and would do its work properly. The Frenchmen said: "Well, you understand it; and upon your testimony we will give it a gold medal. It is a most wonderful thing; and you can make it turn out millions and millions of square roots and logarithms, and other calculations. It is a great work of human intellect; and no one could have made it without exerting the power of human intellect to cause all those dead particles of brass, and copper, and zinc, and wood, to be so arranged as to produce certain arithmetical combinations." But all these materials would be totally useless unless you had a skilled hand to direct it, and to know what figures are to be placed in it to produce those results. Now we find the same difference between the organic and inorganic bodies with which we deal. I grant that if you investigate the matter, the laws which regulate the inorganic world are quite as marvellous, quite as incomprehensible, and go as far beyond man's limited powers of reason and understanding, as the laws of the organic world. The laws and arrangements of the one are as marvellous and as incomprehensible as the laws and arrangements of the other. But there are marked distinctions between them, which are perfectly comprehensible to mind, reason, and intellect, and perfectly conformable to true scientific induction and scientific analysis. Let me take a hen's egg. You have there a most marvellous structure: you have first a marvellous outside casing of carbonate of lime, not arranged according to the forms of crystallography, in which the particles of carbonate of lime would fall if allowed to arrange themselves, but built up and arranged in as wonderful a manner as the bricks and stones which form the dome of any great building, just as you see in such a wonderful structure of human intellect as Westminster Abbey or St. Paul's Cathedral. But, passing by the shell, you find that that wonderful case contains within it as good an example of pure protoplasm as any of the substances which Professor Huxley has called our attention to. When we come to analyze it, we find not

only the carbon, hydrogen, oxygen, and nitrogen, but we find it contains lime, ready to make the bones of the future chicken. The white and the yolk of the egg contain within them every material constituent and ingredient which goes to form the material body of the future chicken. If we wish the chicken to be formed, we have only, by a well-known law of science relating to the inorganic elements, to apply a sufficient amount of heat in order to hatch the egg. It may be solar heat, or heat from combustion, or even heat from the human body; for I know an invalid lady who has lately herself been hatching eggs for her husband's scientific pursuits. (Laughter.) The heat evolves the chicken, but does that heat produce the chicken? Is the heat in any way the producer of the chicken? I say emphatically, no. You might just as well say that the mechanical force used in turning the handle was the power of making the calculation in the calculating machine. But I will go further. It may be said, "Yes, your argument suits us very well. Your machine contains nothing else but inorganic particles, and nothing but inorganic force is required to act upon it. All we would say is, that the egg contains certain combinations so beautifully arranged that they will go on working until they evolve a chicken, in a manner similar to the working of the arrangements which you have made in your machine." Well, I should not quarrel with you so much if that were your view, but what is the object of Professor Huxley and Dr. Odling? Their object is to eliminate all idea of design—to eliminate in some way or another all idea of a Creator. You find that lying at the bottom of their views. That is why we put on our "theological war paint," and protest against such views, and inquire whether they are scientific or not. Now, truly scientific men cannot be but observers of the facts of nature. Now we learn by observation that certain forces, called inorganic forces, and belonging to the inorganic world, are capable of producing certain results. We find, however, that they are comparatively limited in their action, and we can never get them to combine so as to produce a living soul. Professor Huxley has never grappled with that point; Mr. Darwin even did not venture to go with his theory further than to that moment when life was furnished by the Creator. Supposing we go with Darwin, why are we to limit the Creator's power of furnishing that life to one single monad? But let us go back to our egg. I find that that egg has certain powers as a living egg which distinguish it from a dead one. Place it in a freezing mixture, and if it is alive it will resist an amount of cold that a dead egg cannot resist. That is a fact of nature—a fact brought forward originally, I believe, by John Hunter, and confirmed by Mr. Paget in a paper read before the Royal Society. There is a power in the living egg of resisting cold which distinguishes it from the dead egg. If you increase the temperature in an incubator, you can destroy the life in the egg as surely as by increasing the coldness in the freezing mixture beyond the point which life can stand. We know, as a fact, that living matter can withstand degrees of cold that dead matter cannot withstand, and in the same way it can withstand degrees of heat which dead bodies cannot sustain. That was proved by the celebrated

experiments undertaken by John Hunter, when he went into an oven heated to such a degree as to fry a piece of beef placed in with him, and which he and his friends afterwards ate. That dead matter consisted, like himself, of protoplasm, but that experiment showed the difference between living and dead protoplasm. But when we come to the structure of our chicken, we find it is a most marvellous structure. We find much more wonderful things in it than in our calculating machine. We find it has an eye, a heart, a skeleton; and that the heart is placed in connection with the arteries, and circulates the blood throughout the system. All those things are formed with a knowledge of the laws of mechanics, of hydrostatics, and of optics, which it takes all man's wisdom imperfectly to find out. Now, I want to know whether all that comes out of the inorganic dead matter, or whether we must refer it to some other power, not even produced by the power of vitality, for vitality is of but little account in doing that. We must at last confess, with Newton, that the eye was not formed without skill in optics; and I do not believe that that skill is contained in innumerable particles of carbon, hydrogen, oxygen, and nitrogen, or that those things can produce such a marvellous piece of mechanism as my eye or the eye of a chicken. But, supposing all this is admitted, and that you say that any amount of protoplasm has in itself the power of reproducing its own species. You have yet to come to the marvellous fact that there are certain beings in the world which require the conjunction of two agents for the production of their species; while there are others which evolve their kind from themselves without such co-operation. Why does not the egg evolve chickens without this aid, when the acorn has in itself the power of producing an unlimited number of forests of oak trees? We find, as a scientific fact, that there is something—you may call it force or what you like—that there is a power of structural formation possessed by organic bodies which you do not find existing in inorganic bodies. Nowhere yet have we perceived in nature any instance in which the inorganic world has been able to acquire that power without coming in contact with that power previously existing. We may go back for an almost infinite series, but we must come to the time when that power was first given, and then the Bible reveals to us one great fact, not only that there is a Creator of all things but a Sustainer of all things. The modern so-called philosophy, which is endeavouring as far as it can to ignore the Creator, to push Him farther back, and to hide from us the knowledge of the wisdom which we can read in His works; that same philosophy is totally and entirely ignorant of this; that all these things require not only an Almighty Creator, but an Almighty Sustainer; and the Bible shows us how all these things are perpetually under the eye of the Heavenly Father. Two sparrows may be sold for a farthing, but not one of them can fall to the ground without His knowledge. That is told to me as a proof of that Heavenly Father's power and care and love for me; and I protest against this so-called philosophy not only as unsound, not only as unscientific, as I most thoroughly believe it to be, but also as ungodly, denying God's sustaining power, and it would also deny, if it could, His creating power. That is the reason why we

have put on our theological war-paint in order to fight these scientific gentlemen step by step, to meet their arguments by our arguments; and to show them that there is not in their views—at least so far as the views of Dr. Odling and Professor Huxley are concerned—that there is not one single fact brought forward to prove that there is no such thing as life, or that there is not a power in organic nature which is not to be found in inorganic nature. Man has the greatest manifestation of God's power in his own body—manifestations which altogether transcend his intellect. No man could make his own eye, or his own heart, or his own nervous system. The whole of the vital actions of man's body depend on a higher wisdom than he possesses. But man has something else totally and entirely distinct from all this vital power and force. This vital power and force he possesses in common with the plant and with the animal. But his higher mental powers and reason are totally and entirely distinct from his vital powers, though they may be bound up with them; and they have been given to him by his Creator, as the sign and mark of his having been created in the image of that Creator. (Applause.)

Mr. Brooke.—May I be allowed to say one word to supplement our Chairman's excellent illustration of the egg as an evidence of the existence of vitality? There is, on the surface of the yolk of the egg, a small microscopic speck, which is really the germinating spot from which the future chicken is evolved. Now, if you could only remove that speck from the egg, the egg might be sat upon until Doomsday, but it would never produce a chicken. There is a mass of protoplasm still left for the nourishment of the chicken during development, and that mass of protoplasm, if we eat it ourselves, will be assimilated by us and enter into our composition; but to produce a chicken, it is necessary that the little germinal spot should be there. That is the seat of vitality; and by vitality we mean the power of originating life, and generating a living organism out of the proper and convenient materials. In the same way, take a walnut, and plant in the earth under favourable circumstances, and a walnut-tree will spring from it. But if you remove from one end of the walnut a little particle of protoplasm which you find lying there, and which is the vital germ, if you make a little hole and scoop that out, you may then plant the walnut, but you will never get a walnut-tree from it. The vitality is not distributed indiscriminately over the whole walnut; it is in that one little particle; and if that particle be removed, there is no longer any power in the nut to reproduce its kind. The vitality is in that one little germ, and if that germ be removed, the mass of protoplasm which is left is incapable of producing its kind. That protoplasm is only capable of nourishing the little germ during the early period of existence, or of nourishing ourselves, if we eat it. Vitality does not exist in the mass of protoplasm, but only in the germ. (Hear, hear.)

The Chairman.—Let me supplement this again. When we refer to this little germ, let us see what modern hypothesis would have us conceive as existing in it. Let us apply it to that little germ of the egg. The pangenesis theory of Mr. Darwin would have us believe that there exist in that minute

germ of the egg myriads of gemmules derived from all the parents and predecessors—the grandfathers and great grandfathers of that egg. There are gemmules in that speck capable of producing every part of the eye; for instance, a gemmule for the transparent cornea, another for the opaque cornea, another for the sensitive iris, and so on. All the mechanism and all the geometrical appliances of the eye must also have their respective gemmules, capable of reproducing gemmules of their own, and all having come down from 50, 100, or 200 predecessors. Let us suppose that a man has a great variety of pigeons, separated into fantails, pouters, &c., and capable of reproducing the blue rock pigeon with its peculiar feathering. To ask me to stretch my faith into the existence of all these marvellous gemmules, is to require from me at least as great an amount of faith as to believe that all have been produced and sustained by one Almighty Creator.

The Meeting was then adjourned.