

BIOGEN

A SPECULATION ON THE

ORIGIN AND NATURE OF LIFE

By PROFESSOR ELLIOTT COUES

MEMBER OF THE NATIONAL ACADEMY OF SCIENCES; OF
THE AMERICAN PHILOSOPHICAL SOCIETY; OF THE PHILOSOPHI-
CAL AND BIOLOGICAL SOCIETIES OF WASHINGTON; ETC., ETC.

Second Edition

"As thou art fitted to receive it, so shall the light be given thee"

THE DÆMON OF DARWIN



BOSTON
ESTES AND LAURIAT
1884

Copyright, 1884,
BY ESTES AND LAURIAT.



University Press :
JOHN WILSON AND SON, CAMBRIDGE.



TO

WILLIAM B. TAYLOR,

LATELY PRESIDENT OF THE PHILOSOPHICAL SOCIETY OF WASHINGTON,
LEARNED IN SCIENCE, WISE IN PHILOSOPHY,
FAITHFUL IN ALL LIFE'S RELATIONS,

This Volume is Inscribed

WITH RESPECT AND FRIENDSHIP

BY

THE AUTHOR.



© 7-14-29 H.E.M.



Likar
Miles
2-12-29
18167



CONTENTS.

| | PAGE |
|------------------------|------|
| PREFACE | 7 |
| INTRODUCTION | 13 |
| BIOGEN | 19 |
| APPENDIX | 61 |





"The most general truth, not admitting of inclusion in any other, does not admit of interpretation. Of necessity therefore, explanation must eventually bring us down to the inexplicable. The deepest truth we can get at must be unaccountable."

H. SPENCER.

"He who supposes, therefore, 'that the information of the senses is 'adequate (with the aid of mathematical reasoning) to explain phenomena of *all kinds*,' who refuses to admit 'that there are physical operations which are and ever will be incomprehensible by us,' betrays a very imperfect idea — no less of the impassable limitations of finite intellect, than of the fathomless profundity of Nature's system. He who thinks that by formally repudiating the mysterious, and confidently discarding the unknown, he thereby abolishes or in the slightest degree diminishes his insuperable nescience of the ultimate, — but imitates the ostrich, and deludes himself."

W. B. TAYLOR.





P R E F A C E.

IN the spring of 1882 I was honored by an invitation, which I did not feel at liberty to disregard, from the President of the Philosophical Society of Washington, to address that learned body upon the general problem of Life—Whence, What, How, and Why.

The fascination of these questions, perpetually asked and unanswered, is due to the fact, that we know them to be unanswerable, yet feel that they will be answered somewhere, somehow, sometime, by every human being, each for himself.

The situation at the Philosophical Society I was given to understand to be this: The retiring President had in his last address discussed biology, contending that a certain "vital principle" caused Life, or was at any rate necessary for the purposes of Living. This would seem to be a reasonable proposition; but it had been regarded as more or less unphilosophical or unscientific, because the Society had not succeeded in finding out what the vital principle was, or indeed, where to find it at all. Mathematics had failed to find it at any point in the known dimensions of space. Physics

had failed to find it in any kinesis of attraction and repulsion. Chemistry had failed to find it in any atomic or molecular combination. Then Biology — "The Science of Life" — had come to the rescue with a substance known as Protoplasm; for Physics had proven that nothing existed but matter in motion; Chemistry had proven that protoplasm was matter in motion; Biology had proven that Life was a mode of motion of matter; *ergo*, protoplasm was the vital principle; and it had been just upon the point of being discovered by the Society, when the protoplasm, which the Society had examined, died. So the vital principle had given them the slip, and the Physico-chemical Theory of Life had been unable to recover the same. It having thus become evident that there was a difference between something alive and the same thing dead, the "previous question" had obviously recurred.

I prepared what I had to say on the subject to the best of my ability, and carried it to the Society with much misgiving. For I could not say what I truly thought — and what else should any man say? — without introducing strangers to a select body of Washington scientists — such as God, Spirit, and Soul, as factors in the problem of Life. Trusting, however, that their names were known, at least, I delivered the address subsequently entitled "Biogen."

No one who has frequented scientific societies can have failed to observe how naïve and natural are our exhibitions of human nature. We "elder children" cannot be outdone by the youngest in our harmless vanities. When some one is speaking, for example, we who are listening are busy with our pencils and note-books. To put down the best things he says? To put down the good

things even? Why should we? These things take care of themselves, do they not? We watch him like a hawk, to pay ourselves for having to listen; to catch him tripping, and find fault with him afterwards, and have an excuse for speaking ourselves. We are all too full of our own ideas to listen to any one's else for any other purpose, or on any other terms. We immediately rise to compliment the speaker with the most glittering generality, before confounding him with the utmost particularity. What could be more simple, more natural, more human, more child-like?

On the occasion to which I refer, for example, a philosopher said that he had listened to the, etc., address of the, etc., with the greatest, etc. But the speaker had adduced the consensus of mankind in support of his views, and the consensus of mankind was demonstrably erroneous in many particulars. For example, take the rainbow, which mankind had for years believed to be set in the sky by the Deity, as a thing of beauty, and a token, and a promise. Whereas the triumphant progress of modern science had shown its shape to be due to the circular equality of angle in this locus of the water-spherules, and its color to the varied refraction of light. For the rest, he could only refer the speaker to the well-known properties of protoplasm, and the modern theory of evolution.

A philosopher, waiving the usual opening formula, stated without reserve that there could not be anything in anything he had heard me say, because nothing existed but matter in motion.

A philosopher said that he could not imagine how the speaker could seriously ask such a question as, What is the difference between a dead *Amœba* and a live *Amœba*? He should be almost

ashamed to be called upon to answer such a simple question. From his manner I gathered that he wished I had asked him something hard.

A philosopher hoped that Professor Coues did not teach such heresies at the college where he habitually lectured.

A philosopher of an inquiring turn of mind, apparently, said that I had spoken of "soul" and "spirit" as of things whereof a man might possess more, or less; but that, if so, my views would remain without scientific basis until the invention of a "biometer" to measure the cubic contents or avoirdupois of a man's soul-stuff. Upon which I could not help thinking, and saying, that an instrument for measuring the soul should be the last thing some philosophers should wish to see invented—and applied.

A different kind of a philosopher spoke for a few moments. I will not transcribe his remarks. Our eyes met, and I knew he understood me. But the pertinence of most of the remarks which followed the delivery of "Biogen" must be left to the reader to discover, upon perusal of the published minutes of the meeting (see Introduction). The general sense of the meeting was probably reflected in the remark made privately to me by one of my friends: "Damn good English, Coues, and damn poor sense. You ought to get to be a good square flat-footed atheist, and then you won't take these fits."

When the question of publishing "Biogen" came up, I asked the advice of one who I knew would endeavor to dissuade me, in order to learn his reasons. He begged me not to publish it, for my own sake, because it would "injure my scientific reputation." Acting

upon this advice, and wishing to discover, if possible, how an honest expression of honest convictions on any subject could injure any one's reputation for anything excepting insincerity, I immediately printed a small edition which was speedily exhausted.

The treatise having found favor in some eyes in whose penetration I have confidence is now republished without other change than the addition of this Preface, the following Introduction, an Appendix, and some foot-notes here and there. Should the line of thought presented be found to lead, or even to tend, in the right direction, it may be followed up hereafter; the Author being now in position to express himself more fully, freely and explicitly on the subject than he was when "*Biogen*" was first published.

Living as I have been for many years in a scientific atmosphere in which atheism and a very crass materialism are rife, as the fashionable foibles of many men otherwise really great, who almost hide their folly with their erudition, their good sense, their thousand manly and humane qualities, I am often told by scientists that they have no souls, and expect to die like dogs. What can I rejoin to such declarations from such sources? To such a one I can only answer evasively, that he must know his own nature, and probable destiny, better than he can expect me to; and that if he thinks he has no soul, and is to die like a dog, I have no means of proving him wrong; but that, speaking for myself alone, I know that I have a soul, and that I shall not die like a dog, because it is the nature of the soul God has given me to know its immortal self with a kind of knowledge in comparison with which the knowledge of material things acquired by the bodily senses is no knowledge,

but delusion only — with a kind of knowledge whose servant, not whose master, is reason — with a kind of consciousness which is self-conscious.

If my philosophy approves this consciousness, if my science supports and strengthens it, I am happy. If they do not, of what use are they to me? Idle, wasteful slaves, that eat into the life and substance of their master — not worth their keep.

Not many men, I fear, think; it tires them, and hurts their feelings; it strains their constitutions; a more or less sequential series of bodily sensations is an easier way through life, that “embarrassing predicament which precedes death,” and saves the trouble of thinking. A few men think, and their hard thinking hardens the brain, and sets it in a mould, and no thought of another shape can find fit or rest there. And the spider of vanity spins her web there, and nimbly traverses its geometric threads, and lo! a system of philosophy. But such shall pass also, brother philosopher; your science and mine must bend the knee to our common humanity, there to learn that knowledge is not wisdom till it becomes self-knowledge, nor this masterful till it has mastered self. *Then*, — forge the chains of your systems as you may; the veriest gossamer thread shall be stronger to bear you up than they to hold you down.





INTRODUCTION.

*(Extracted from the Bulletin of the Philosophical Society of
Washington, vol. v, pp. 102-105.)*

"217th MEETING.

MAY 6, 1882.

"President WM. B. TAYLOR in the Chair.

"The first communication was by Mr. ELLIOTT COUES,

"ON THE POSSIBILITIES OF PROTOPLASM.

"The following is an abstract of this communication which has
"been published at greater length under the title—'Biogen: a
" 'Speculation on the Origin and Nature of Life.' Abridged from
"a paper on the 'possibilities of protoplasm,' read before the Philo-
"sophical Society of Washington, May 6th, 1882. Washington:
"Judd & Detweiler. 1882. 8vo, pp. 27.

"Referring to previous papers on the subject of Life, by Mr.
"WOODWARD and Mr. WARD, the speaker opposed any purely
"physico-chemical theory, and adhered to the doctrine of the actual
"existence of a 'vital principle.' Granting that all substances, in-

cluding protoplasm, have been evolved from nebulous matter; that evolution to the protoplasmic state is necessary for any manifestation of life and even that life necessarily appears in matter thus elaborated, it does not follow that the result of the processes by which matter is fitted to receive life is the *cause* of the vitality manifested. For all that is known to the contrary protoplasm and vitality are simply concomitant; or if there is any causal relation between them, vital force is the cause of the peculiar properties of protoplasm, not the result of those properties. There really exists a potency or principle called 'vital,' in virtue of which the chemical substance called protoplasm manifests vitality, that is to say, *is alive*, and in the absence of which no protoplasmic or other molecular aggregation of matter can be alive. The chemico-physical theory simply restates abiogenesis, or 'spontaneous generation,' of which we know nothing scientifically. The grave doubt that 'life is a property of protoplasm' will persistently intrude until some one shows what is the chemico-physical difference between living and dead protoplasm; none being known.

The speaker argued for the existence of the soul as something apart from and unlike matter, defining 'soul' as that quantity of spirit which any living body may or does possess. No idea can attach to the term 'spirit,' from which all conceptions of matter are not absolutely excluded. Spirit is immaterial self-conscious force; life consists in the animation of matter by spirit.

The substance of mind and the substance of matter were noted as equally hypothetical. To the former was given the name *Biogen*,

"or soul-stuff, and it was defined as spirit in combination with the
"minimum of matter necessary to its manifestation. The analogy
"between biogen and luminiferous æther, or the hypothetical sub-
"stance of light, was discussed. The drift of the speaker's specula-
"tion on the vital principle as an *ens realissimum* was toward a
"restatement, in scientific terms, of the old *anima mundi* theory.
"Modern materialistic and atheistic notions about life were de-
"nounced as every one of them disguises of the monstrosously absurd
"statement that a self-created atom of matter could lay an egg that
"would hatch.

"The whole matter being beyond the scrutiny of the physical
"senses is remote from the scope of exact science; but it is irra-
"tional and unscientific to deny it, as is virtually done when science
"excludes it from any share in life-phenomena, by presuming to
"explain life upon purely material considerations. No chemico-
"physical theory of life is tenable which does not satisfactorily ex-
"plain the difference between, for example, a live amoeba and a
"dead one; an explanation which has never yet been, and probably
"cannot be, given.

"A general discussion of the points involved in this paper fol-
"lowed. Mr. POWELL pointed out what he regarded as a funda-
"mental and fatal error in the reasoning, viz., that the axiom that
"the whole equals the sum of all its parts, had been assumed
"throughout to be true *qualitatively* as well as quantitatively. Fur-
"thermore, he maintained that logical consistency required that
"those who believed in force should also believe in the vital prin-
"ciple, and *vice versa*. As for himself, however, there was neither

"force nor vital principle, but only matter in motion. Three relations are always to be borne in mind, viz., quantity, quality, and succession, whereas the physicist falls into error by considering only the quantitative relation.

"So much of the support of the views of Mr. COUES as might be derived from the common consensus of mankind was criticised by Mr. GILL as unsound, since the common consensus of mankind has often been found at fault; the supposed flatness of the earth, the motion of the sun around the earth, etc., are examples where this criterion fails. Paraphrasing an eminent philosopher's dictum, he thought there was a tendency of biologists ignorant of philosophy and philosophers ignorant of biology to make a distinction between organic and inorganic matter, and call in a 'vital force.' He likened living and dead protoplasm to an electric battery in action and at rest, and maintained that life is a property of matter, and that it cannot be conceived of separated from matter.

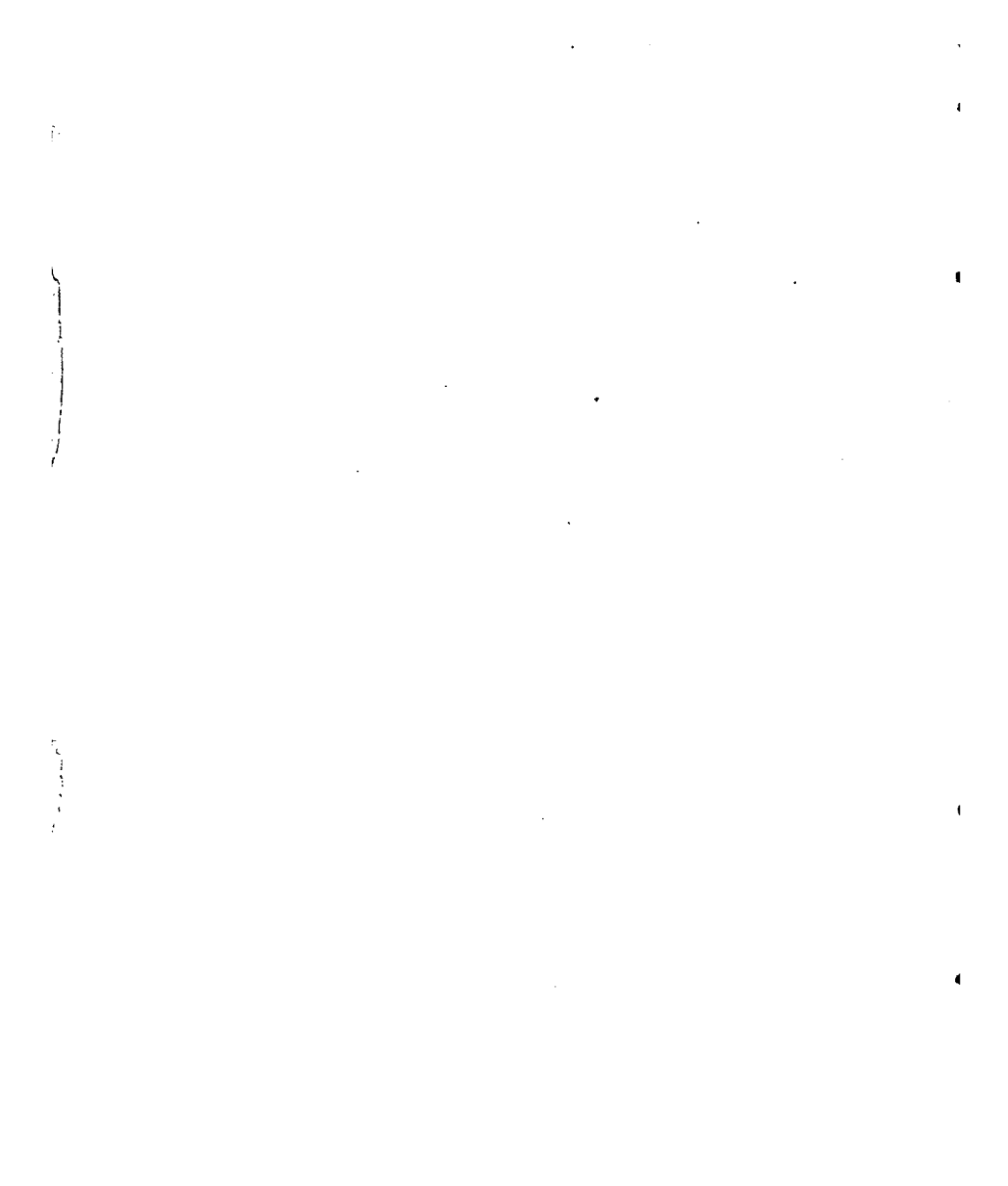
"Mr. HARKNESS avowed his belief in force, and hence in vital force, and further in a little religion, and was, therefore, moved to make inquiry concerning the chemical difference between living and dead matter.

"Mr. WARD pointed out that very diverse views were held upon this subject by two classes of thinkers who do not come into intellectual contact. Furthermore, while not asserting that vital force was a superstition, attention was drawn to the fact that infantile races attribute all phenomena to supernatural agencies, and that, with increasing knowledge, there is a decrease in the number of these appeals to supernatural agencies.

"The corner-stone of modern science, said Mr. DOOLITTLE, is *measure*. We must have a biometer. What electrical science would be without ohms, astronomy without graduated circles, chemistry without the balance, such is biology without a *measure*. Is there more life in two mice than in one mouse? In a horse than in a mouse? Until we can answer these questions substantial progress in biology is not to be expected.

.
"After some further defultory discussion the Society adjourned."







BIOGEN.

Mr. President and Gentlemen of the Society :

ANY reason I might have found for declining your invitation to speak on this subject could only have come from moral cowardice. I should have had, therefore, no alternative to compliance, even had I had no courage to proceed but that of conviction. But I was given to understand that you might neither be unwilling to have the general biological problem reopened, nor indisposed to hear with forbearance at least from any one of your number who might have ideas upon the subject, with a view to discuss such propositions as he might be willing and able to advance.

So far am I from supposing that the *crux* of the life-problem will be solved to-night, I do not hesitate to declare my belief that it has been resolved neither by science nor by philosophy, and that it is insoluble in any royal water that can be

compounded of to-day's science and philosophy. Confronted as I am with something I believe to be inscrutable to man's unaided reason—opposed as are my convictions to some of the brave theories which have been advanced in this Society respecting that something—profoundly unknowing as I am of the origin and nature of Life, I should desist with this honest confession of ignorance and seek its asylum, were I not also convinced that much truth in the matter of the life-problem is to be had for the asking by any one who makes full use of *all* his faculties; were not my views in the main those which, in substance, under whatever form of expression, have been affirmed by the consensus of mankind since when the human creature became possessed of a rational soul; and were I not satisfied that anything I could say, seeming new and being true, would be no news, but something as old as the mind of man.

In expressing one's self upon matters which are rather those of reasonable inference than of demonstration, there is danger of dogmatizing just in proportion to strength of belief; but that unscientific, unphilosophical, and offensive practice is avoided when individual convictions are given with the reasons upon which they are based, with perfect intellectual candor, with deserved contempt for mere logomachy, and with due deference to those different opinions which may be

but varying views of a single many-sided truth. In such spirit as this, I beg your indulgence in a train of thought not put together to sustain any theory of my own, but to discover truth, if possible.

It cannot be amiss to bring up certain papers lately laid before the Society, and treat them as if under discussion to-night. One of these is Dr. J. J. Woodward's address, as the retiring President, on "Modern Philosophic Conceptions of Life," and others are Mr. Lester F. Ward's, on the "Evolution of the Chemical Elements" and of the "Organic Compounds." If I correctly appreciate their respective significance, they embody opposite and probably irreconcilable views — Mr. Ward setting forth the chemico-physical theory of life, and Dr. Woodward inclining to what may be termed the vitalistic theory.*

* The speaker quoted as follows from Dr. Woodward's published address:—

P. 18. "I have already asserted that there are whole groups of phenomena characteristic of living beings and peculiar to them, which cannot be intelligently explained as the mere resultants of the operation of the chemical and physical forces of the universe. These phenomena I refer — I own it without hesitation — to the operations of a vital principle, in the existence of which I believe as firmly as I do in the existence of force, though I do not know its nature any more than I know the nature of force."

P. 20. "I willingly admit that, in view of our present notions of the

As a master of many departments of science, and in a masterly manner, Dr. Woodward appears to have reviewed much that is actually known of the conditions and manifestations of life, with a fair statement of much that is unknown, arguing against the adequacy of the chemico-physical theory, maintaining the existence and operation of a "vital principle," and declaring that while the idea of a universal creative mind has claims to be a tenable scientific hypothesis, neither science nor philosophy affords any proven basis for the most universal

cosmogony, it is impossible to believe that life always existed upon this planet. I willingly admit that life on the earth must have had a beginning in time. But we do not know how it began. Let us honestly confess our ignorance. I declare to you I think the old Hebrew belief, that life began by a creative act of the Universal Mind, has quite as good claims to be regarded a scientific hypothesis, as the speculation that inorganic matter ever became living by virtue of its own forces merely."

P. 20. There is . . . "a philosophy which recognizes the validity of the mind's self-consciousness as at least fully equal to the validity of its consciousness of the conditions of the body by which it obtains a knowledge of the external world. By this self-consciousness I know, with a certainty which no doubt can ever disturb, that I have a mind; and by rightly applying my reasoning powers to the data of my self-consciousness I can learn much that will be useful to me with regard to my mental processes and the methods of applying them. But here I have to stop. I can learn nothing, whether by consciousness or by reasoning, with regard to the real nature of my conscious mind, and however much it may long for immortality, neither philosophy nor science afford any foundation of proof upon which it may rest."

of human beliefs — the existence in man of an immortal soul. Passages that have been quoted show their author to be satisfied of the insufficiency of science and philosophy to explain the mystery of life, and so explain himself to himself ; so that, if he desires that which most men desire, he must look elsewhere for the satisfaction of that desire. I doubt not most honest thinkers have found precisely the same difficulty. It is a very grave one, which usually increases, instead of diminishing, the farther we go in the curriculum of the natural sciences in our reliance upon "pure reason" — a lamp which finally serves not to light the way, but only to make the darkness visible.

I recur in the sequel to what I understand the "vital principle" to be. But first to touch upon the "chemico-physical theory of life," as maintained by Mr. Ward, who needs no reassurance of the profound respect I have for his intellectual processes, widely as we differ respecting the validity of his results ; whose logic is so clear and cogent, whose illustration is so lucid and copious, that his conclusions would be inevitable were his postulates admissible. The flaw seems to be in the indictment by which matter may literally be said to be put on trial for its life. The central idea of his papers on the evolution from nebulous matter of the chemical elements and all other known forms is, — progressive increase in complexity of the molecular units of all substances, with correspond-

ing increment of molecular mass and corresponding decrement of stability of combination * — such molecular aggregates progressing in instability until a stage is reached where the resulting aggregations, no longer molecular, but rather molar, are so unstable that new and higher activities become possible, and perceptible molar movements may take place; these actually occurring at the stage of aggregation reached by the substance called "protoplasm;" life consisting in such mode of motion as the particles of protoplasm manifest, and being therefore a property of protoplasm, an essential or intrinsic quality of matter, in virtue of its own mechanical and chemical forces; in other words, that life inheres in matter, and is simply the resultant of material forces; "the most profound truth, both of biology and of chemistry," being, in Mr. Ward's view, "that life is the result of the aggregation of matter." †

* The expression of this idea ascribed to Socrates by Plato is, — that compounded things, or such as are compoundable, *admit of being dissipated at the same rate that they were compounded.*

† The propositions above stated are summed in their author's own words as follows: —

"The general law above stated, that in the progress of the evolution of matter from the simplest elemental state to the most complex organic compound, there has constantly been increase in the mass and decrease in the stability of the molecules, holds good throughout; and to it may now be added a third principle, obviously correlated to the above and constituting merely a corollary to it, that *pari passu* with these changes there has

I have never seen elsewhere so fair a statement of the chemico-physical theory, so ably supported; and the chain of reasoning by which diffuse nebulous matter is linked to the tissue of living things appeals to my mind with great cogency. But I think the lurking fallacy is no less dangerous than deplorable.

For, granted that all substances, including protoplasm, have been evolved from nebulous matter; granted, that evolution to the protoplasmic state, and in the very manner claimed, is

been an increase in the activity of the properties manifested. . . . In protein bodies these molecular activities are much more extensive and varied than are those of simpler bodies. The molecular units are so much larger that their motions must be, as it were, *molar* in comparison, while within these larger primary units there are lesser units of different orders of aggregation, each of which manifests its own appropriate activities, and thus modifies the general properties of the whole. . . . From the molecule of hydrogen to that of albumen the process of evolution has been uniformly the same, namely, that of compounding and recompounding, of doubly and multiply compounding: in short, it has been the process of molecular aggregation. It would be contrary to the law of uniformity in natural phenomena, upon the recognition of which modern science is based, to assume an abrupt change in the process at this point; and upon those who maintain such a *saltus* must rest the burden of proof. . . . That the recompounding of the protein bodies should result in a new form possessing the quality of spontaneous movement is *à priori* just as probable as that the addition of a molecule of oxygen should convert the hydrides into alcohols."

required for any manifestation of life ; granted even, that life always appears in matter thus elaborated ; it does not follow, that the result of the process by which matter is fitted to receive life is the *cause* of the vitality it manifests. Sequence is not necessarily consequence ; and in this case it does not seem that even a *post hoc*, much less a *propter hoc*, can be maintained. For all that is known to the contrary, protoplasm and vitality are simply concomitant. If any causal relation is to be established, it must be upon other considerations than have been presented. I believe the relation to be causal, but the reverse of that claimed ; vital force being the cause of the peculiar properties of protoplasm.

I adhere without reservation to the doctrine that there really exists a potency or principle called "vital," in virtue of which the chemical substance called protoplasm manifests the rudimentary phenomena of life ; that is to say, *is alive* ; and in the absence of which no protoplasmic or other molecular aggregation of matter can or does manifest such phenomena ; that is to say, *be alive*. Chief among the impossibilities of protoplasm appears to me to be the spontaneous generation of life by any method of chemical or mechanical movement impressed upon matter by the operation of forces inherent in itself. That the chemico-physical theory is merely a restatement of the theory of "spontaneous generation" is

self-evident, and the difficulty is increased by the assumption that mechanical and chemical conditionings of matter are adequate to result in life. It is an unquestionable scientific fact that spontaneous generation has never been demonstrated to have occurred in a single instance, with or without the operation of a vital force in addition to purely physical forces, though every supposed condition of vitality has been artificially brought about. The scientific fact is—and by scientific fact I mean something positively known to be true—that life has never been ascertained to have any other origin than in antecedent life. For all that is known to the contrary, such antecedent is no less necessary to the existence of vitality than is protoplasmic matter necessary to the manifestation of vitality. The grave doubt that “Life is a property of protoplasm,” resulting from the way in which the particles of that substance are aggregated and arranged, will persist obtrusively, I think, until the chemico-physical theory accounts for the difference between a live amoeba and a dead amoeba. I should say there is all the difference in the world, and that this difference is just the point at issue. Until that explanation is forthcoming, the theory mentioned remains not a logical inference, but a pure assumption—a hypothetical link in a chain of being found just too short by one link.

I recognize the fact, which no biologist questions, that life

may and does precede "organization," and therefore exists in matter independently of organization. Since an amœba exhibits the rudiments of organization, having a nucleus and often a membrane in addition to its substance proper, let us take a still simpler living thing—a plasmon-body, which is merely a particle of animated matter, shapeless, structureless, unorganized, and absolutely homogeneous; yet manifesting, for an allotted period, the phenomena necessary to any predication of life, namely: it moves, it feels, it feeds, it propagates, it may be killed; and these things could not be were it not alive. The physical properties of a plasmon-body, which is simply unorganized protoplasm, are well known to you. Its chemical composition, as given on good authority, is, in 100 parts, 54 of carbon, 21 of oxygen, 16 of nitrogen, 7 of hydrogen, and 2 of sulphur. But, has a *living* plasmon-body ever been resolved into its chemical elements? I should think it would be thoroughly killed before the analysis were over. If so, living protoplasm has never been and cannot be analyzed, and its composition remains unknown. For, according to the chemico-physical theory, it lives only in virtue of its peculiar chemical and physical constitution; it lives necessarily, simply because it *is* protoplasm; but, if so, protoplasm is only itself when it is living; when it is dead, it is something else; therefore, this something else is what is analyzed; and in

what life consists has eluded the process. A contradiction in terms is here implied, and an absurdity is made manifest; for if there be any knowable difference in chemical and physical constitution between a living and a dead cell, or other simple protoplasmic body, such difference is unknown; to all physical and chemical tests that have been applied, they are identical. I anticipate the ready reply, that chemistry only claims to know what elementary substances, in what proportions, constitute protoplasm, not pretending to say what particular manner of aggregation of their molecular units results in life. But such answer, so far from doing away with a physical difficulty, seeks refuge in a metaphysical subtlety. For if life necessarily resulted from the compounding of certain elementary substances in certain proportions, and in a certain way, there is present and operative *something* adequate to effect such result, absence or non-operation of which something results in death. Because, the moment these identical elementary substances, combined in the identical proportions, slip into any other way of molecular interaction and molecular inter-adjustment, they cease to manifest the phenomena of life. What holds them just as they are in life, neither chemistry nor physics shows. I give reasons, beyond, for assuming that the *something* is that particular thing called vital force. This hypothesis is *a priori* as legitimate and reasonable as

any other can be in a case where all is as purely speculative as any metaphysical question can be. For all that relates to the ultimate atoms of matter — supposing any such things to exist — to their number, size, shape, mass, distance apart, mode of motion and interaction, is beyond human scrutiny, and, therefore, remote from the domain of exact science.

If such considerations have any weight, the theory under discussion would appear to proceed in a logical manner from purely speculative premises to an equally satisfactory conclusion. It is not on scientific ground until it explains what physical and chemical difference there is between a living and a dead passion-body; for the difference must be physical and chemical only, since only physical and chemical forces are admitted to be concerned in its production. Chemistry and physics finding no difference, we may be permitted, indeed we are obliged, to look elsewhere for explanation of the very great difference obvious between a thing alive and the same thing dead.

Numberless organic compounds have been manufactured in the laboratory which differ in no wise from the same compounds effected in nature by vital force, excepting that they have never shown a trace of life; so that I should say that the absence or presence of that essence is precisely the difference between the artificial and the natural product. In

short, physics and chemistry have combined to manufacture an egg which will do everything you could expect of an egg, excepting hatch. Pardon me if I go a step further, and sum the charge thus :

The atheistic physicist, denying mind in nature, declares that matter alone exists. Where it came from is no matter. It exists ; it is matter in motion. Matter in motion is all there is in the universe. The Cosmos is matter in motion, in virtue of its material forces alone.* But does it occur to such a physicist that he has invented just what he has always declared to be a physical impossibility ? For he has simply invented a huge "perpetual-motion" machine, which runs of itself until it wears out or breaks down. Worse than this, he literally forgets himself, the inventor, for he says his machine

[* "Give to the ambitious kinematic artist his cloud of sand, — or if he prefer the outfit, let him be furnished with an indefinite quantity of a perfectly continuous incompressible fluid — bound up if you please in a chain of 'vortex rings,' — by no motions or compositions of motions — continued through the æons of eternity — could he ever manufacture therefrom either a lever or a rope. The kinematic gospel of a *mechanical* theory of primæval motion is therefore a sophism and illusion. It is founded on a misconception of the very *essence* of true mechanics. And the system that would proudly aspire to an architecture of a Kosmos from the elements of matter disrobed and denuded of every quality but motion, would achieve as its highest triumph and product — a universe of dust and ashes." — TAYLOR, *Bull. Philos. Soc. Washington*, v, p. 167.]

invented itself and set itself a-going. Then the materialistic chemist takes this self-invented perpetual-motion machine, and declares that it has laid an egg that will hatch.

Thus far we have only stood on the threshold of life, to witness such faint beginnings of vitality as a speck of protoplasm exhibits. On any theory that the physical forces inherent in matter are alone concerned, the way darkens as we proceed from moner to man. Few persons are more thorough and consistent Evolutionists than I may claim to be, and if you give me a *live* plasmon-body I will engage to make a living human body out of it on the most approved biological principles. In fact, we know that the physical bodies of all organized beings consist either of a single cell or of a multitude of cells, each of which is, in effect, an individual plasmon-body, born of a parent like itself, living for a while in the enjoyment of its appropriate activities, and then dying. The human body consists of a myriad such plasmon-bodies, not all alike, indeed, but become very different in form and function in their descent with modification from their common progenitors, the female ovum and the male spermatozoon — the differentiation of structure and specialization of function of the various tissues of the body being such that the result may be aptly compared to a society of different species of amoeba-like animals, — bone-amoebas, brain-amoebas, muscle-amoebas, and the rest;

all the individuals of which species of animals are in ceaseless process of birth, growth, maturation, decay, and death. Such language is, of course, not figurative illustration of an idea, but simple statement of observed fact. I am ready to believe, and I do, that the chain of life is unbroken from moner to man, missing links being only hidden links, so far as the genetic relation of the physical body of a man to the same of a moner is concerned. But now I find myself not only tossed from one horn to the other of a dilemma, but lost in the intricacies of a polylemma, to extricate myself from which all the natural potencies to be found in the physics and chemistry of matter have, in fact, proven their inadequacy.

First, if the chain of living being has a beginning and an end, anywhere, anyhow, at any time, the links overhauled fall short in both directions. For, at one end, the original arch-amœba is as much of a mystery as ever; we know not where he came from, how he got there, or in what the essence of his passionality subsists. At the other end, we find our bodies to be a menagerie of amœbas, which we cannot dispose of intelligently, and the finale of which is as much a mystery as their origination; seeing that we know not what, if anything, will happen when our death disperses them.

Second, if the chain of living being is endless, it necessarily

returns upon itself, and all reasoning upon its course is reasoning in a circle. We simply say that if A is B, B is A ; which proves nothing as to the nature of A or B.

Thirdly, no whole can be greater or less than the sum of its parts, or quantitatively different from such sum. But a particle of living plasma is greater than the sum of all its known parts, possessing that which none of its known parts possesses, — Life. And, *à fortiori*, the highest and most complex organism, man, possesses many things that none of its protoplasmic parts possess, unless such things as will, memory, and understanding—such things as faith, hope, and conscience, are properties of protoplasm ; it being indisputable that such qualities and attributes do reside in human beings, if our consciousness and our senses have any reliability ; and if they have not, we know nothing whatever.

Once more, and especially, if the universe is a self-invented perpetual-motion machine—if matter has always and alone existed, and has always had the self-determining potency of life, and at length did so determine itself to become living, and if man, the final outcome, is self-determined protoplasmic material only, a God is not only superfluous but impossible. Yet the result of the alleged self-evolution of self-created primordial matter through chemical elements to organic compounds has been the creation of a protoplasmic mind, so con-

stituted that in the overwhelming majority of instances it can and does, and must, believe in a God. If matter be that God, matter contradicts itself, for the constitution of the human soul requires that its God shall be other than its protoplasmic self. If matter be not that God, there must be some other. A protoplasmic mind can only escape that conviction by denying that itself exists; which would be absurd, were it not impossible.

The evolution of human reason and human faith, in short, of a "rational soul," being among the possibilities ascribed to protoplasm, or some ulterior compounding of matter, a train of consequences ought logically to follow, which, in point of fact, do not follow. The almost universal sentiment of mankind is religious in some kind or degree, and certain aspirations are the common endowment of our race. Those whose Deity is protoplasmic probably never worship that substance, and in fact appear quite indifferent to its divinely transcendent attributes; yet some form of worship is omniprevalent; and if protoplasm be not a proper object of worship as a creative omnipotence, and be not capable of satisfying the aspirations it has evoked, it is fallacious and delusive, through failure to fulfil its own conditioning of human reason and the faith of mankind. In a word, it gives the lie to its own logic.

How it may appear to others, I, of course, cannot say; appeal to the data of my own consciousness decides the real gravamen of the objections I have raised. Argument is futile. I can only declare that I do not believe my mind to be matter-made only, because it is so made that I cannot so believe, feeling not the slightest reason therefor. If I be wrong, it is some consolation to reflect, that so far from my being peculiarly deceived, the consensus of mankind has reached the identical conclusion; so that any required asylum of ignorance proves to be the common refuge of humanity. Nevertheless, such views as these, however useful or even precious to myself, remain mere professions of faith, of little or no consequence to others, until reasons are adduced in their support; and iconoclasm has but its trouble for its pains, if it replace no broken images. I think it will be conceded that all the conceptions of life which have swayed the scientific and philosophical minds of men, are more or less hypothetical, and in their essence purely speculative. This seems necessary when, in the nature of the case, no theorem is demonstrable, and degrees of reasonable probability are the uttermost approaches to the heart of this fascinating inscrutability, respecting which the *credo ut intelligam* of the theologian complements the *cogito ergo sum* of the metaphysician; belief being no less postulated by reason than is being affirmed in think-

ing. Such apology, if any be needed, is all I have to offer in opposing the spontaneous generation speculation by the vitalistic theory, and proposing to recognize the hypothesis of a God-made cosmos, instead of the hypothesis of a self-made perpetual-motion machine.*

Life in the concrete is, of course, the sum of the phenomena manifested by animated nature. Of life in the abstract, of the essence or nature of that peculiar attribute of plants and animals, apart from its material manifestations, no knowledge whatever seems possible. Yet, while I cannot even imagine

[* "This ultimate and highest induction of scientific thought — the Inscrutable made Absolute — is restful and satisfying. This ultimate and highest induction — as highest and ultimate — cannot be manipulated as a 'working hypothesis.' This ultimate and highest induction — as such — cannot be subjected to the subsequent verification of mathematical deduction. This ultimate and highest induction detracts nothing from the certainty of orderly sequence so irresistibly impressed upon us by every deepening channel of research, but gives us rational ground and guarantee of such unfailing regularity. This ultimate and highest induction, accepting to the uttermost the mechanical interpretation of nature's administration, — whose ceaseless Evolution seems ever opening up new vistas of automatic teleology, — gives significance to our imperfect conception of a regulated system, (so necessarily involved in the very existence and operation of a 'machine,') and accounts consistently for the unfaltering obedience and instantaneous response of all the countless atoms of the universe to the reign of 'law,' by positing behind such law — an Infinite LAW-GIVER." — TAYLOR, *loc. cit.*, p. 173.]

what life is or may be, apart from matter, so far is it from being impossible for me to conceive of life as an existent reality apart from any *known conditions* of matter, that it is impossible for me not to form that conception. This is of course to invoke the "vital principle," to postulate the reality of a kind of force called "vital," as a veritable Biogen or life-giver, which may be where no known form of matter is, and can, therefore, exist apart from such matter, and not as a resultant of any material forces. Though this is pure speculation, I am forced so to speculate, in the impossibility of conceiving the contrary. The conception does not imply that vital force differs from other forms of cosmic energy otherwise than as different branches form one stream; for all force is one, however diverse its ulterior operation; the kind of force called "vital" being that special potency under the agency of which matter assumes the form and functions of life in the concrete. Force cannot act where it is not; neither can it act with nothing to act upon; its presence in and operation upon matter are, therefore, necessary conditions of its manifestation; all the manifestations of life are ultimately resolvable into modes of motion, and in the particular modes of motion exhibited by living things, *and by no others*, are evidenced the presence and operation of the vital principle, the energy of which differs from other energies precisely as the modes of motion

of living things differ from those of all things that do not live. This is not a verbal distinction merely; if it seems so, the fault is in the obscurity of my expression of the perfectly clear idea every one has of the difference between that which is alive and that which is not. It subsists in the presence or absence of something — some real entity, which defies observation by the senses, and, therefore, cannot be described; but the results of which are exhibited in the most unequivocal manner. If pressed for more concise statement, I may turn the expression, saying that life, so far from being the *result* of the aggregation of matter, in consequence of any conditionings known as chemical or mechanical, exists apart from matter, as a *vera causa*, preceding the organization of matter; life being, in short, the *cause*, and not the consequence, of organization. It certainly precedes organization and exists in unorganized matter, as any scrap of living plaston demonstrates. Furthermore, the highest known grade of organization, as the body of a man, though never attained except through vital force, may and does exist without life, as any corpse mutely testifies until decomposition or disorganization sets in. If life inhered in matter as the necessary result of any particular composition of matter, death would follow decomposition, and be otherwise impossible; but in fact the reverse is the actual sequence of events.

If there be any truth in the statement that life is an entity, a reality, apart from any known forms of matter, it is perfectly logical to speak of its presence in or absence from any given mass of matter; and this was my idea when I noted the sum of a living being as greater than the sum of its dead material parts. I also used the word "God" when satirizing the apotheosis of protoplasm. I have thus far purposely refrained from using the word "spirit." But I cannot proceed with my idea of life without introducing that term, to which I am aware much of the accredited science and philosophy of the day objects, as being "sound without sense." Yet no scientist who acknowledges the validity of the science of psychology, and no philosopher who recognizes the validity of abstract ideas, objects to the word "mind." I must therefore be permitted to speak of spirit, or "soul," if you please, as something which, like mind, is a legitimate subject of inquiry: first, as to whether it exists or no; second, if it exists, whether it be of protoplasmic nature or no; third, if it be not that product of the aggregation of matter, what sort of a product it may be; for I consider this inquiry especially pertinent to any discussion of life. Our alternative, you know, is, that all vital phenomena, all manifestations whatsoever of life, are to be counted among the accomplishments of protoplasm, or are to be otherwise accounted for.

Much difference of opinion as to the reality of "foul" might be reconciled if disputants could catch each other's meaning and agree upon a definition of the term. But this is very difficult, though we all think we know what is meant when a human foul is in mention. Many deny there to be any such thing; many waive the question, neither affirming nor denying; most ascribe a foul to man alone; some concede a foul to every atom of inorganic matter as well as to all organized bodies. My view defines foul as the quantity of "spirit" which any living being may or does possess at any time. But this requires a definition of "spirit," some quantity of which is to make a foul, just as some amount of matter makes a body. I can attach no idea to the term "spirit," from which all conceptions of matter are not absolutely excluded. Spirit is nothing if not immaterial. Force is likewise immaterial; but I think nearly all persons recognize a distinction between spirit and any mechanical force, such as gravitation. My mind affords no definition of spirit, if I may not call it *self-conscious force*. Self-conscious force being illimitable in time and space, and its sum being, in a word, infinite, I am unable to draw any distinction between spirit in its totality and that Universal Mind, or Supreme Intelligence, which we mean when we speak or think of God.

To my mind, "mind in nature" is a self-evident propo-

tion — a logical necessity. The simple fact that we can *think* a God, necessitates the conclusion most men have reached, of the existence in nature of other than what are called “natural forces ;” of the reality of the existence of spirit as self-conscious force ; though I do not see why it is not as “natural” a force as gravitation. It is certainly not unnatural ; and to call it “supernatural” only exposes our ignorance of Nature — Nature being, on any theistic hypothesis, simply the sum of the manifestations of the will of God. The French epigram, “If there be no God man must invent one,” may be paraphrased to say, “If there were no God man could not invent one.” I cannot suppose my mind to be peculiarly constituted ; and, as I find the conceptions just noted present in it, as propositions which are nothing if not self-evident, if not axiomatic data of consciousness, I presume the same idea can or does present itself to most other persons. But by our definition, “soul” is a portion of spirit, and spirit is self-conscious. I am likewise self-conscious ; and by that quality of being I know, with a certainty no doubt can disturb, with a certitude no argument can increase or diminish, that I have a soul. For to doubt is to judge ; to judge is to reason ; while the knowledge I have of my own soul comes not by taking thought ; it is the soul’s self-consciousness. Some call it “faith ;” I have no objection to that term ; it is something so

precious, so superior to reason, though never irrational, that I would greatly prefer to recognize it as a property of protoplasm than to lose it.

Finding myself also in possession of a body, of the actual existence of which body few persons, excepting some German metaphysicians and their suckling converts, are in doubt, and also observing that this body is alive, that is to say, that it manifests all the phenomena necessary to our conceptions of life, I am bound to infer, and I do infer, that in my own case at least, life subsists in the union of soul and body; that life consists in the animation of matter by spirit; that life is God made consciously manifest. If there be any truth in this, I suppose it is equally true of other human beings, though I only answer for myself.

My mind refuses to believe, what some may object, that such expressions as I have used respecting the reality of spirit are mere abstractions—mere metaphysical subtleties metaphorically expressed—in other words, mere figments of the imagination. I would sooner grant, what some metaphysicians fancy they have proved, namely, that we have no bodies. To do away with the body altogether—at any rate, with every body excepting one's own, appears to be one of the accomplishments of some schools of thought. Such exploiting in the saw-dust of an intellectual gymnasium seems to me

a simple and easy trick, in comparison with the effort to deny the foul; for the body is but an accident of matter, and the process of annihilating it in imagination only anticipates a natural process by a brief span of time, and time is nothing but a sequence of events which cannot occur if there be nothing to happen. But to do away with spirit, even in imagination, is not naturally possible. It is futile to attempt, as some "philosophers" have done, to avoid all possible contradictions, and evade the possibility that "pure reason" may be fallible or fallacious, by denying the existence of the subject of every possible predication, thus evolving a "philosophy" of which universal negation is the sole final outcome. What philosophy — what "love of wisdom" — is here, when we are left nothing to love! For the act of denial, or even refusal to affirm, implies a denier or a refuser, as an existent reality, and the denial or refusal is itself an existent reality. True it is, and dismally true, that the philosophy of universal negation, by some called "criticism of pure reason," is intellectual nihilism — a sort of philosophic fool's paradise, or earthly Nirvana, where one has not even the Buddhistic privilege of mumbling "Aum," for fear there may be some mistake about it. Such a state of mind is not even an asylum of ignorance in which poor humanity may take refuge; it is an asylum in which intellectual impotency holds not the mirror up to nature but to its confessed self.

But this is unpremeditated digression. The point I wished to make, when those contemptuous thoughts obtruded, is, that as denial implies a denier, and as both are real entities, though denial is an absolute immateriality, the real entity of such an equally absolute immateriality as I hold spirit to be is not *à priori* impossible. It *may* exist therefore; I have postulated that it actually does exist, and defined it as self-conscious force; I have speculated that a living body results from the action of spirit on matter, and that life subsists on the union of the two. To bring the question into some scientific shape — to put it on the border-land between metaphysics and psychology, if not really in the domain of the latter science, let me say a few words respecting the connection between mind and matter.

The only points toward which all differences of opinion in this vexed question converge are the intimacy of the connection and the intricacy of a relation in which the two factors — mind and matter — are inter-dependent and inter-active. For even those who hold, as I do, that mind does not depend upon matter for its existence, but only for its manifestation, if they know anything of anatomy and physiology, know how powerfully physical states affect mental operations. Those who maintain the chemico-physical theory of life necessarily consider all mental, like all physical phenomena, as the re-

sultants of the play of mechanical forces, and as ultimately referable to mere motion of material particles — such mental endowments as will, memory and understanding, judgment, intuition, perception, conception, conscience and consciousness itself depending for their existence upon how stands the parallelogram of forces, how goes the balance of power in the mad clash of blind atoms. My hypothesis, which recognizes the existence of spirit as determining life, and makes life the cause instead of the consequence of organization, enables us to reconstruct the parallelogram of forces, and strike the balance of power not between the mechanical forces of the material particles themselves, but between these and the conscious power of spirit — the Will of the Ego. This is the resultant which apparently constitutes “mind.” Viewing the intense and vivid molecular activities, the combustion and deflagration of tissue, which attend the generation of every thought, and are necessary to the manifestation of thought, though in no sense its originators, it is scarcely using metaphorical language to say that mind resides at the melting-point of matter in spirit.*

[* See Appendix, 6th paragraph. In penning “Biogen” for oral delivery, I purposely followed that common usage of the words “spirit” and “soul” which makes these two terms nearly synonymous, or at any rate alternative, expressions for all that there is of a man which may survive

To illustrate such fusion as I have imagined, let us consider the two opposite things which, according to universal experience, concur in the alembic of mind. I refer, of course, to any subjective and any objective cognition. Let us formulate any subjective cognition in the general expression "I will," and any objective cognition in the term "I see."

Aside from the summary cognition "I am," nothing can be conceived more original, spontaneous, independent, and self-determining than "I will." This cognition affected, at whatever expense of brain-tissue, *will-power* has been consciously called into being; it has been created; it exists as a real entity, at the service of its originator, to be utilized as he determines. This seems to be the purest example of *force* of which any one can be conscious. To think "I will" is to command force. But so long as this conscious determination remains inoperative, it is only potential energy or latent force, which may or may not become active and effectual. If it do not act effectively upon *something*, no manifestation of power is possible, and the very existence of the energy is unknowable,

the death of his body; not desiring to open any discussion of the point involved here. The distinction I make is formulated and definitely set forth in the Appendix, where also will be found some further reflections upon the meaning of the word "mind" — mind not being a thing which thinks (for that would be spirit), but the expression of what is thought.]

excepting to its creator; it is only self-existent, in short. *Once translated in terms of matter*, with motion or any other cognizable effect, the existence, operation, and result of a cause are discovered. If we knew how this translation is accomplished, we should know exactly how the connection between mind and matter is made; but we do not, and can only rest in the knowledge that somehow the brain is the material mechanism by which the will of the owner of that apparatus is primarily manifested. Will-power is carried out further by the rest of the bodily machinery, and may be finally accomplished in a thousand ways. But observe, that all such manifestation of force is the manifestation not of mechanical or chemical force merely, but of *intelligent volition*; that is to say, of self-conscious force; which, according to our definition of spirit, is spirit.

To many minds it might be to sow the seeds of reverence for the exalted dignity of humanity to reflect that such mental operation as I have described is the counterfeit, in the finite human microcosm, of the described creation of the macrocosm by infinite power divine. The Universal Mind, the Supreme Intelligence, the great I Am, which was and is and shall be always, determined, it is said, to become manifest. He said "let there be," and there was, as He willed. And man is said to be made in His image.

Now let us glance at the other chain of sequence—that involved in the term “I see,” as the general expression for all sense-concepts. One would think this a very simple proposition; so it is, if its full meaning be grasped; but half grasped, or even only just missed, the proposition is unintelligible. Such appears to be the difficulty with those who, for the simple truth “I see,” try to substitute the untruth “the brain sees;” for they fail to see at all through the mass of squirming brain-amœbas which are tormented to death in the process of their reflections on the subject. No one supposes the eye sees, any more than any other optical instrument sees; nor the optic nerve, any more than the eyeball; nor the corpora quadrigemina than the nerve; yet there is a blind kind of physiology which seems to think that vision, the faculty of seeing, which cannot be found at the outer end of the optical instrument, must lurk about the inner end of that exquisite apparatus. But I must believe, as I do, that, trace the nervous threads as far back as you please, and locate the exact spot in the brain where they end, there would be no *seeing* done if some Ego—that identical spiritual Ego I postulate—were not looking through the telescope life has organized for the purpose, and as fully conscious of seeing as I am at this moment. In fine, I know that it is *I* who does the seeing, with the same certitude that I know who is speaking; and I

do *not* believe any one of you to be differently constituted in this respect. Truly, the difficulty of understanding *how* the physical terms of a retinal image can be translated into the mental terms of conscious vision, has never been overcome; our ignorance is absolute; if it ever is overcome, no doubt we shall learn what and where is the connection between mind and matter.

I speculate that not only is it among the possibilities of living protoplasm to establish that connection, but that among the qualities of that pregnant substance, or of some of its material derivatives, is one adequate to the establishment of the required relation. Chemistry has shown the composition of the dead substance — the number and proportion of the elements composing it — even the mode in which its molecular units are, or may reasonably be inferred to be, compounded. The extreme instability of the resulting combination, and the extraordinary activities acquired, are well-known. If we can be permitted to vivify such a dead substance as this with biogen or any thing else, it is difficult to set any bounds to its possibilities as a mediator or go-between mind and matter — in short, between the spirit and the body. I hypothecate for living protoplasm — for the dead substance the chemist knows *plus* biogen, a vastly greater degree of molecular instability, and immeasurably more ener-

getic molecular or perhaps atomic activity, than have been ascribed to the dead tissue, simply as an extension of the conditionings which have been ascribed to dead protoplasm as laws of its chemico-physical being. I speculate upon the reasonable probability that under the influence of vital force protoplasm may and does acquire such tenuity of substance, such mobility and activity, as to be fairly describable as matter at a minimum of density combined with force at a maximum of intensity; and to be comparable in such vital stage of its evolution to that interstellar fluid which is scientifically recognized as the medium of the transfer of force everywhere. If the undulations of a luminiferous æther — a substance vastly more tenuous than any we know by our senses, yet substantial still, and perhaps still far from the dividing line between matter and spirit, where pure spirit is purged of the last dregs of materiality — if such an æther, the very existence of which is hypothetical, yet an accepted scientific fact, because no other effort of the imagination supplies so good an hypothesis on which to explain the phenomena of light — if this æther can be logically inferred to exist, it is no romance of the imagination to infer that matter may be animated to the degree of sublimation required for its vibration to will-power — its thrilling to a thought.

Such state of matter as I imagine and describe would satisfy

at least one of the important factors of the life-problem, by establishing a connection between mind and matter. The thing is already done when a single atom of matter is moved in the least by the slightest conscious force.

I have often thought that the phenomena of life may be instructively compared with those of light, there being some highly suggestive parallelisms between the two things. Life and light are curiously coupled in vulgar parlance, an unphilosophicated mind vaguely perceiving some similarity, just as it couples the corresponding negations, death and darkness. Old and early as is light—not possibly antedating most other cosmities or orderings of things—how new and late are not the conclusions of science respecting its physical basis! Light was only dissected yesterday, to discover all prior textbooks of its anatomy to be wrong. To-day no one questions the existence of luminiferous æther as a real substance, in the vibrations of which the quality of light subsists and is manifested. But this state of matter is impalpable, invisible, inaudible, inodorous, and insipid—in short, inappreciable to the physical senses. We know nothing about it, as matter; we only know it is a mode of motion of matter in an unknown state. Force is obviously present and operative; matter is only an inference. But a substantial æther is a dictum of science, signed, sealed, and delivered. A vivid exercise of the

imagination it must have originally been, and a lively act of faith in the evidence of things unseen, to set the matter before the reason, judgment, or critical faculty in such shape that the mind could not only affirm the verity, but be unable to deny the truth, as to the nature of light. How many men, in the history of intellectual achievement, are found capable of such splendid believing that they may understand — yet *credo ut intelligam* is required to unlock any of the great secrets of Nature, no less than is it necessary to penetrate the world of spirit. In the nature of the human mind such rational faith is the key of discovery. Imagination engenders, belief cherishes, observation nourishes, reflection educates, and judgment approves — then the result takes care of itself, as a mature scientific truth. The accepted theory of light, in simplest expression, is, an unknown but believed-in state of matter in a known mode of motion — it is matter at an inestimable minimum of density moving with extraordinary velocity under a force of enormous intensity.

On the other hand, the grossly material basis of life is perceived by all experience — the body of any plant or animal shows what number and kind of known states of matter may be informed and instinct with the life-principle, among which are sand and lime and iron, and many others, besides those composing the supposed ultimate physical basis of life, proto-

plasm; while what amount of motion is imparted by what kind or degree of force has proven thus far inestimable. What may actually be the facts in the case, however, so far from being inconceivable, is to my mind a very thinkable proposition, with the possible truth of which no known phenomena of life are necessarily irreconcilable.

Thus, since I cannot imagine force primarily acting upon matter in bulk — like kicking a stone — it is necessary to infer, for the validity of the vitalistic theory of life, an excessively tenuous state of matter set in motion by an excessively active force — just as I did when speculating upon the connection I imagined to exist between mind and matter. Such conditioning of matter and force would be strictly comparable to what is known of the nature of light. It would be the analogue of — perhaps the homologue of — possibly identical with — that interstellar fluid which is recognized by science as the universal medium of transmitting energy. It would, however, differ from light in several important and essential particulars. To satisfy the conditions of the theory, the substance or physical basis of biogen would be perhaps as much more tenuous than luminiferous æther as is the latter more fluidic than hydrogen; it would be at the actual minimum of density at which it is possible for force of any kind to be transmitted, and so operative and manifest. The velocity

of motion would be only less than infinitely greater than the known velocity of light, for it would be at the rate of speed at which thought can be transmitted. And as to the kind of force which would effect such motion of such matter, it would differ from any kind generally recognized, in that it would be self-conscious; that is to say, it would be pure spirit.

According to the terms of my speculation, the vital principle is a real entity — an *ens realissimum*, the incorporation of which in protoplasm or any other combination of gross matter makes such matter “alive,” and the dissolution of which from such matter leaves the latter “dead.” Biogen itself, of course, is alive; it *is* life; and biogen may be defined as spirit in combination with the minimum of matter necessary to its manifestation. Biogen is simply soul-stuff,* as contradistinguished from ordinary matter; it is the substance which composes that thing which a well-known and very frequently quoted writer calls the “spiritual body.”

I have spoken to little purpose, and my expressions have been ill-chosen, if what I have said seems novel to you; if you do not discover in what I have said simply a restatement,

[* “Mind-stuff,” and the “hypothetical substance of mind,” are expressions already in current usage among scientific writers of repute. What is meant by these terms I cannot imagine, unless indeed it be that very real thing which I here call “soul-stuff.”]

in somewhat "scientific" language, of one of the oldest, and I think one of the wisest, of the world's conceptions of the life-principle, as a direct effluence of the Deity. It is the old *anima mundi*, soul of the world, "workshop of nature," where the will of God is first fashioned in form and substance to receive the breath of life. And it is instructive to note, that in the whole history of human notions respecting the origin and nature of life, the theory of spontaneous generation, which the strongest science of to-day most strongly disclaims, is the one which has taken the least hold upon the human mind. Biogenetic speculation has almost invariably flowed in the stream which bears the idea of father and son upon its bosom. Let us not deceive ourselves with the giving new names to old things. Call them what you please—modern materialistic and atheistic notions about life are every one of them disguises of the plain statement that a self-created atom of matter lays an egg that will hatch. Call this a monstrous absurdity, an instigation of the devil, if you choose; I can call it neither science, nor philosophy, nor religion, nor anything that is learned, wise, or true.

To my mind the *anima mundi* belief, as I restate it in terms of the biogen theory, acquires color from the consideration that it is exactly the complement, and perhaps the natural antinomy, of generally received views respecting the evolution

of chemical elements and chemical compounds from indifferent states of nebulous matter ; and not unlikely to be quite as true. The progressive consolidation of matter, during which the most diffuse, most tenuous and indifferent substances are gradually differentiated and then combined to form the various products known as "elements," to be recombined in endless diversity to form "inorganic" and "organic compounds"—such process would seem to involve as its necessary conditioning the universal antinomy, that at a certain stage of molecular aggregation reached by certain forms of matter, the counteractive vital principle comes into operation to arrest the consolidation, to bring matter out of the depths of gross materiality it has reached to the sublimity of effectual contact with spirit. Whence emanated matter in the beginning is inscrutable ; from nowhere, certainly—if not from the self-conscious, self-determining universal Mind which willed to so become manifest. Where to? Nowhere, certainly—if not to whence it came, to complete the circle, symbol of infinity, whose quadrature is unknown.

Equally unknown are the time, the place, the circumstance of the origination of life. We may learn of these things when we discover what is matter divorced from force ; for of neither of these things, apart from the other, if they be not one in essence and that essence pure spirit, do we know

anything at all. The vital principle, which I must incessantly invoke to satisfy the fundamental data of my consciousness, is equally inscrutable; but it is peculiar, in that it is not known to be manifested except in consequence of itself, or to reside long in any one glomeration of gross matter, or to ever die. I am bound to consider it as the most direct and immediate natural manifestation we have of the Great First Cause, and consequently to refer it at once far back of any such secondary cause as a mechanical or chemical law. I cannot suppose it will ever be determined either to originate in protoplasm or any other material compound, or to permanently reside in anything that retains the least vestige of materiality. Being absolutely beyond the scrutiny of the physical senses, it would scarcely appear to fall within the scope either of science or philosophy; and I doubt that human reason, unenlightened by revelation, can learn much about it; for that would be to find out God by taking thought.

Since the retiring President of this Society has declared that neither science nor philosophy affords any foundation of proof upon which my conscious mind may build hopes of that immortality of the soul which is to that same mind a necessary conditioning of its existence, it is to be hoped that science may yet discover facts enough, and philosophy find truth enough, to render that happy result possible; for until they

do, they are together obviously incompetent to deal with the life-problem ; and until they do, fellow-men must be permitted to interpret the great secret each after his own methods, as best suits his own necessities ; even should these force him to take refuge in some credible formulation of faith, as in something which certainly promises more than science and philosophy have accomplished, and may contain the germs of a good working scientific hypothesis.

But there is science and science, more or less intelligent or intelligible. There is philosophy and philosophy — that of Socrates, and that of Kant, for example. In such wealthy embarrassment, the real lover of wisdom may be inclined to seek the truth in ways that vex his mind least, and at least leave him at peace with his soul, ignorant though he be of its origin, nature, and destiny.

Here, gentlemen, I should cease speaking. But my speculations have been surrendered to your criticism ; and, as I know that many colors are reflected in the mental spectrum of the philosophers present, I beg you, in the discussion about to ensue, to resolve my doubts in the following particulars :

What is the difference between a Godless, self-created, always-existent cosmos of matter-in-motion alone, and any

perpetual-motion machine which men have dreamed of inventing, but which philosophy declares impossible?

What is the difference between any mechanical or chemical theory of the origin of life, and that spontaneous generation of life which science declares to be unknown?

What is the chemico-physical difference between a live *amœba* and a dead one? And if there be no chemical or physical difference, in what does the great difference subsist?

What is the principal difference between a living human being and his dead body, if it be not the presence or absence of the soul? And if it be nothing like this, what, then, is it more like?





APPENDIX.

A MAN'S "mind" is not a *thing*, in the ordinary sense of the word thing. It is a relation between two things. These two things are, his soul and his body. The mind is the result of the interaction between spirit and matter. It is what the spirit thinks in consequence of its connection with matter. It is the knowledge which the spirit acquires by its experience in contact with matter. It is what the spirit must become incarnated to discover and appropriate. It is what the spirit retains when it becomes disembodied. It is the knowledge of good and evil. It is the fruit of the tree of life.

Reason is the mistress of the mind, and its exercise is judgment, or the critical faculty. But its data are only those which it receives through the avenues of sense. The bodily senses are obviously and notoriously fallible. Reasoning upon such data as the bodily senses give may therefore be equally deceptive; and thus the results of reason are often fallacious, though its processes may be perfectly logical. Hence what any man *thinks*, *i.e.*, his mind, may be very wrong indeed, since it is necessarily based upon the experiences of his spirit with matter.

On the other hand, a man's soul is a thing, in a proper sense of that word. It is a substantial reality, an actual entity, a living being of knowable and recognizable qualities, attributes and potencies. It is not merely

a thought, or an idea, or any metaphysicality. It consists of a kind of semi-material substance, which is the body of the spirit, bearing much the same relation to pure spirit that the physical body bears to the soul itself. The substance of the soul is the means and medium of connection or communication between spirit and matter. Soul-stuff is animalized astral fluid; that is to say, some quantity of the universal æther, modified by vital force, individualized by a man's spirit, and appropriated to the uses of an individual spirit, just as a certain quantity of grosser matter is individualized and appropriated to the formation of the physical body. The substance of the soul, to which I apply the name 'biogen,' seems to correspond closely to what Prof. Crookes calls the 'fourth state of matter;' and some demonstrable activities of matter in this radiant state appear to be summed by him in the term 'psychic force.' It is the 'od' of Prof. Reichenbach, and many of the manifestations of its activities are grouped under the expression 'odic force.' It is what some appear to mean by the term 'hypothetical substance of mind.' It serves as an 'æsthetophore' — to borrow a word coined by Prof. Cope. One of its modes of motion was demonstrated by Galvani. The commonest and best-known exhibitions of its active agency are those of our bodily sensations and movements, its currents to and fro between a human spirit and that spirit's carnal envelope being described by modern physiologists as sensory and motor nerve-impulses.

Some modification of soul-stuff exists in all animals and plants — in all things which have life, if not also in those other things which we call inanimate. In the higher animals — in man at any rate — it becomes the vehicle, the envelope, and the instrument of spirit, indwelling in the physical body so long as that body is "alive," and leaving it at what is called death, which is when the spirit entirely withdraws from the physical body, carrying its soul-stuff along. Thus a man, in this world and in the flesh, consists of three different and separable things. 1st. His physical body, certain transient atomic and molecular aggregations of solid, fluid, and

gaseous matter. 2d. His soul, a certain substance temporarily in contact and very intimate connection with his body, on the one hand, and with his spirit, on the other, serving as a medium between the two. 3d. His spirit, of which he knows nothing, though his spirit knows itself perfectly well. "Death" is simply the disengagement of the third and second of these from the first. The deserted physical body, no longer animated by the spirit acting through the soul, is "dead"; it has lost its "vitality"; the "vital principle," which is simply the force by which the spirit acts upon matter through the medium of the soul, is no longer operative; and the body in this state, *i.e.*, dead, is only acted upon by physical and chemical forces. It then furnishes a very proper subject for the chemico-physical theory to explain and account for.

"Mind," as the expression of a relation between the soul and the body, necessarily disappears when that relation is discontinued. But a far higher order of intelligence, volition and will-power is manifested by the spirit as soon as it is separated from the physical body. Having then a dual being only, instead of a triple mode of existence; replacing mere mental reason with those higher spiritual faculties whose glimmerings and faint foreshadowings in this life it used to call "imagination"; contrasting more clearly than it could while in the flesh the meanness of the intellectual with the majesty of the moral faculties; appreciating the great gulf fixed between good and evil; limited in its activities neither by the three dimensions of space to which it was confined while in the body, nor by the modes of motion then known;—the human being has entered upon another sphere of existence by an evolutionary process as natural as that by which he passed from the womb to the world. The transition is probably less abrupt, in most cases, and there is no reason to suppose that the change is any greater. The body does not appear to be any more necessary to the existence of the soul in the other world than is the after-birth to the existence of the body in this one.

From what has preceded it is evident that what I mean by "soul" is

not exactly according to the general usage of the word; which usage commonly makes "soul" and "spirit" one and the same. Thus, when we speak familiarly of "a man's soul," we also say it is "his immortal spirit," meaning thereby, anything and all there is to a man which is capable of surviving death. But, as already stated, I draw a wide distinction between "soul" and "spirit." Spirit is nothing if not immaterial, and to "spirit" proper we can attach no significance if we do not consider it as divested of every trace of materiality. Soul, on the contrary, is substantial, and semi-material; it is the "body of the spirit," necessary, so far as we know, to all and every manifestation of the spirit. Spirit cannot act directly upon matter, but only through the intermediation of this soul-substance. A human being, after "death," consists of this substance, acted upon by his spirit, the two together constituting what is ordinarily called his "soul." To this substance, when acted upon by, and serving for the manifestation of, spirit, I give the name of biogen. The same substance (biogen) acted upon by the spirit before the death of the body, and serving for the operations of spirit upon matter, is the "vital principle," the action of which we call "vital force," and the results of which action we call "vitality" or "life."

I do not admit for an instant that biogen is merely an idea, or thought, of mine or any one else—a metaphysical abstraction, a mere mode of expression, or a mere mode of motion either. It is not, furthermore, a relation subsisting between two things. Nor is it a "force," in the ordinary sense of the term. It is a THING, a very real *thing*, an *ens realissimum*, possessed of sensible qualities and attributes which may be investigated by proper scientific methods, and by scientific experimentation, quite as readily as any other of the so-called "imponderables" of nature. It is as open to examination as luminiferous æther, and its properties, if not its substance, may be studied as we would study light, heat, or electricity; it is therefore not only a proper object of science, but a proper subject of philosophy.

Under ordinary circumstances, biogen is inappreciable to the physical senses, however manifest its effects. Under exceptional circumstances it acquires very sensible properties, the principal of which are visibility and tangibility. It may then be both seen and felt. Its modes of motion appear to differ in some respects from any of those known to us to be possible to gross matter, and to require for their complete exhibition more than three dimensions of space. Its excessive tenuity, extraordinary elasticity, compressibility, homogeneity and some other qualities, lead me to suppose that one great difference between biogen and most known states of matter may be, that it is not of atomic constitution. If hydrogen, the most subtle and tenuous gas known, cannot exist in a free state except two of its atoms be joined in a molecule — and this is good sound chemistry of the day — it may be that biogen consists of free atoms; that is to say, differs chiefly from other kinds of matter in having no molecular constitution. More probably, however, — viewing some of its properties and activities — it is to be considered not even atomic in constitution — having no atoms of any size or shape or distance apart — no fixed points of greater density than their intervening spaces. In this view, biogen would be simply *atomic matter* as distinguished from atomic matter; and to so regard it may be well, for the present at least.

During the earthly life of the individual, a person's biogen appears to be normally confined to the limits of his physical body; or at any rate to make but faint and feeble excursions therefrom during his waking hours. In sleep, however, when the spirit is temporarily withdrawn from the outer world by the closure of the usual avenues of the senses, the biogen is much freer in its excursions, and may almost entirely leave the body at the will, consciously or unconsciously exerted, of the spirit. Probably no person "is himself" so much as in his dreams, under these conditions; a fact which Shakespeare doubtless knew, familiar as he was with the properties of biogen, when he wrote that we are such stuff as dreams are made of. More obvious though less familiar exhibitions of the excur-

sions of biogen from its usual abode in the body are witnessed in various phenomena of somnambulism, spontaneous or induced; in clairvoyance, clairsaudience, trances of various kinds, religious ecstasy, some forms of catalepsy and epilepsy; and especially in what is called "suspended animation." Some persons are so constituted that they can project their biogen at will; others, that it flows from them unconsciously, against their will, during their waking hours; others again, that it can be drawn out of them neither by nor against their will, but under circumstances they have learned to recognize and to which they may voluntarily subject themselves. In highly exceptional cases, frequently but not necessarily preceding death, biogen may proceed from a person in such quantity and of such quality as to be visible and even tangible to another person. At death, it entirely withdraws from the physical body, with more or less rapidity; and the act of dying is not accomplished until this process is completed; when the individual is at length dead, his spirit continues to live in a body composed of biogen; and this "spiritual body" may, and frequently does, become visible and tangible to those whose souls still inhabit their physical bodies. The substance which I call biogen, therefore, is an available, a legitimate and an appropriate object of scientific inquiry, by no means to be ignored in any system of philosophy, and by no means to be mistaken for protoplasm.

