Wt.	W. L.	Wt.	W. L.	Wt.	W. L.
2	6293·077	4	6722·005	1	7090·612
2	6296·066	3	6726·835	1	7122·431
2	6314·798	S	6750·325	1	7147·893
S	6318·160	4	6752·876	1	7148·276
S	6322·830	5	6767·945	1	7168·134
8	6335·479	5	6772·479	2	7176·279
8	6336·968	2	6787·051	1	7184·401
2	6344·297	2	6807·007	4	7184·705
5	6355·184	4	6810·432	2	7186·470
4	6358·834	4	6828·770	1	7194·805
2	6380·889	2	6841·518	1	7199·689
5	6393·751	3	6855·348	1	7200·673
2	6400·453	3	6867.382†	1	7216·693
5	6408·163	3	6867·717	1	7219·282
6	6411·793	2	6870·123	2	7223·830
4	6420·103	4	6875·742	1	7227·686
7	6421·498	2	6876·879	1	7232·419
6	6430·993	2	6877·797	S	7233·092
5	6439·224	6	6879·212	S	7234·868
2	6449·951	6	6880·102	S	7240·879
7*d*	6462·762	10	6883·992‡	2	7243·800
2	6471·805	6	6885·925	S	7247·590
2	6480·198	6	6886·898	1	7264·770
4	6482·031	1	6896·211	1	7265·750
5	6493·921	2	6897·103	2	7273·133
5	6495·127	2	6901·032	1	7287·590
4	6499·896	2	6909·597	1	7289·844
2	6516·246	4	6919·160	1	7290·621
3	6518·514	1	6923·488	2	7299·993
4	6532·496	4	6924·340	2	7304·382
4	6534·090	2*d*	6929·687	2	7318·678
5	6546·400	4	6947·685	1	7331·101
2	6552·758	4	6956·609	2	7335.532
S	6562·965*	4	6959·634	1	7442·574
S	6564·338	5	6961·437	2	7445.941
7	6569·360	2	6978·586	2	7495.248
2	6572·245	6	6986·755	1	7511.188
2*d*	6575·090	2	6989·172	2	7545·817
2	6592·725	3	6999·304	2	7593·975§
6	6593·068	2	7006·069	2	7621·183‖
8	6594·016	2	7011·481	2	7623·425
5	6609·253	3	7015·253	2	7624·737
2	6633·898	3	7015·639	1	7627·259
6	6643·787	4	7016·616	1	7628·605
2	6663·601	S	7023·675	1	7659·550
6	6678·141	S	7027·659	1	7660·679
5	6703·719	S	7035·083	1*d*	7665·683
5	6705·262	2	7038·398	1*d*	7671.412
4	6717·833	S	7039·968		

* Fraunhofer's C.
† First line in what may be called the head of Fraunhofer's B.
‡ Single line between what may be called the head and tail of B.
§ Edge of what may be called the head of A.
‖ Single line between the head and tail of A.

SCIENCE AND IMMORTALITY.

The Christian Register Symposium,

REVISED AND ENLARGED.

EDITED AND REVIEWED

BY

SAMUEL J. BARROWS.

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PREFACE.

THE major part of the discussion which follows was published in the *Christian Register* of April 7, 1887. It attracted wide attention, and a desire has been expressed to have the "symposium" in a more permanent form.

In reprinting it for the present volume, the contributions have all been submitted to their authors for revision; and the work has been much enriched by additional contributions from Prof. A. Graham Bell, Gen. A. W. Greely, of the United States Signal Service, Prof. Joseph Le Conte, of the University of California, Prof. Ira Remsen, of Johns Hopkins University, and Prof. Edward C. Pickering, of Harvard Observatory. These new contributions give a fresh interest to the book.

In the "Notes on the Testimony" following the symposium, the converging and diverging lines of debate are indicated.

Interest in the discussion will be increased by the biographical notes which follow it, giving a brief outline of the scientific career of the writers of this volume.

S. J. B.

CONTENTS.

SCIENCE AND IMMORTALITY.

Wishing to obtain the opinions of some of the most prominent scientific men in this country concerning the relation of science to the question of immortality, the editor of the *Christian Register* submitted to them the following questions: —

1. Are there any facts in the possession of modern science which make it difficult to believe in the immortality of the personal consciousness?
2. Is there anything in such discoveries to support or strengthen a belief in immortality?
3. Or do you consider the question out of the pale of science altogether?

These questions are asked, not too strictly to limit the scope of reply, but to indicate the directions in which testimony is desired.

The answers to these questions are given in the interesting and important communications which follow.

I.

CHARLES A. YOUNG, LL.D.,

PROFESSOR OF ASTRONOMY IN PRINCETON COLLEGE, NEW JERSEY.

I understand that what is wanted is simply a brief statement of personal opinion upon the bearing of science on the credibility of the doctrine of immortality, without any extended discussion of the grounds for this opinion,— merely a juryman's verdict.

As to the first point raised in the editor's letter, I think it must be frankly admitted that what is known about the functions of the brain and nervous system does, to a certain extent, tend to "make it difficult to believe in the immortality of the personal consciousness." The apparent dependence of this consciousness upon the health and integrity of a material structure like the brain renders it, *a priori*, more or less probable that consciousness could not survive the destruction of that organism. But this difficulty is only the same it always has been from the beginning, and I cannot see that the newest

discoveries of science increase it in the least. And the difficulty, though real, is by no means extremely formidable. If we suppose, in accordance with the belief of the great majority, that the real man is not identical with his body, but only its inhabitant and ruler, the presumption that his conscious being ends with the destruction of the body falls at once.

Now, for my part, all the facts of science seem to me to be far better and more consistently represented by this hypothesis than by that which refuses to recognize in the man anything more than a congeries and organism of mere atoms of matter, under the control of purely physical forces.

The bridge between the mind and the brain has never yet been passed, or even found. When we trace the waves of light through the optical apparatus of the eye, and ascertain their work upon the retina, and follow up the propagation of the ensuing disturbance along the fibres of the optic nerve, and recognize the ultimate effect thus produced in certain cells of the brain itself, we have not explained *seeing*. The fact that, when I (*ego*) determine to raise my hand, a certain definite change takes place in certain brain-cells,

and a stimulus then sets out and makes its way from the brain along certain nerve-fibres, with an ascertainable speed, till it reaches certain muscular fibres, which in consequence contract and lift the arm, this is all interesting; but it neither proves that my brain is myself, nor does it in the least explain the nature of the connection between my will and the brain-cells where the physical chain of action seems to originate. The logical hiatus between the psychological and the physiological phenomena yawns to-day just as *impassably* as it ever did, if not quite as *widely*. And so I cannot accept the materialistic hypothesis as scientifically satisfactory, and am forced to consider it as much more probable that the man is more than his body, and likely to survive it.

As to the second and third points raised,— "whether there is anything in the discoveries of science which would support or strengthen the belief in immortality," or whether, on the contrary, I should "consider the question out of the pale of science altogether," — I lean strongly to the latter opinion. I think it is true that certain scientific facts and general laws — such as the indestructibility of matter, the conservation of energy, and the apparent sameness of physical

law and material substance in all parts of the universe which we can reach with our investigations — make it easier to accept the idea of human immortality than it would be if no such facts were recognized. But they amount to nothing more than a faint corroboration. In my judgment, the knowledge of "life and immortality" comes only by revelation, like our knowledge of the moral character and attributes of God.

II.

JAMES D. DANA, LL.D.,

OF YALE COLLEGE, AND EDITOR OF THE "AMERICAN JOURNAL OF SCIENCE AND ARTS."

I am pleased to have my words used as you propose, if you think that they will be of service to the cause of truth. I have the fullest confidence that there is nothing in science, or in any possible results from investigations of Nature, against immortality.

III.

ASA GRAY, LL.D.,

PROFESSOR OF NATURAL HISTORY AND DIRECTOR OF THE HERBARIUM OF HARVARD UNIVERSITY.

I can merely say, for myself, that I do not know of "any facts in the possession of modern science which make it" *more* "difficult" than under science of older date "to believe in the immortality of the personal consciousness." This is a world of difficulties, and it is a question of the more or less in the endeavor to evade them. I suppose that, though it is not science — certainly not physical and physiological science — that brings immortality to light, modern science does not really tend to put out that light. Yet, if that light were quenched, "I know not where," in modern science alone, "is that Promethean heat that can *that* light relume."

Yet I would not quite, in the language of your third alternative, "consider the question out of the pale of science altogether." In the interpretation of Nature — therefore not beyond the highest scientific consideration — there are two

consistent hypotheses, that of theism and that of non-theism. The former of these is the best I know of for the explanation of the facts: the latter does not try to explain anything. Immortality of the personal consciousness is a probable, but not an unavoidable inference from theism.

IV.

JOSEPH LEIDY, M.D., LL.D.,

PROFESSOR OF ANATOMY (MEDICAL DEPARTMENT) AND DIRECTOR AND PROFESSOR OF ZOÖLOGY AND COMPARATIVE ANATOMY (BIOLOGICAL DEPARTMENT), UNIVERSITY OF PENNSYLVANIA.

I write, in reply to your letter of 11th inst., with the following questions: —

1. "Are there any facts in the possession of modern science which make it difficult to believe in the immortality of the personal consciousness?"

Personal consciousness is observed as a *condition* of each and every living animal, ranging from microscopic forms to man. The condition is observed to cease with death; and I know of

no facts of modern science which make it otherwise than difficult to believe in the persistence of that condition, — that is, "the immortality of the personal existence." Science has learned no more than is expressed by Solomon in Eccl. iii., 19: "For that which befalleth the sons of men befalleth beasts; even one thing befalleth them: as the one dieth, so dieth the other; yea, they have all one breath; so that a man hath no pre-eminence above a beast."

2. "Is there anything in the discoveries of science which would support or strengthen the belief in immortality?"

This question is in a measure answered with the first one. I know of none that sustain the doctrine. I apprehend that the theory of the conservation of force gives no support to it, for the consciousness of an animal is only a manifestation of force which ceases with the death of the animal.

3. "Or do you consider the question out of the pale of science altogether?"

I think no question out of the pale of science; though this one may obtain no answer, like those in regard to space, time, matter, and the nature of the supreme intelligence or primary cause of everything.

In conclusion, while I have no disposition to deny what we have been taught, — the doctrine of the immortality of the soul, — in my personal experience, I have not been able to discover the slightest natural evidence of its truth. If I could resolve that the state was a more desirable one than is made to appear, I would wish that evidence of any kind was more satisfactory than it is. I, however, can conceive of no adequate compensation for an eternity of consciousness.

V.

SIMON NEWCOMB, LL.D.,

WASHINGTON, D.C.

1. I am inclined to regard the question as lying wholly without the pale of science, properly so called. The latter, in my opinion, concerns itself only with those conceptions and relations of things which are directly or indirectly the result of experience. But no one now living has had any experience on the subject in question; and, even if we admit the hypothesis of immor-

tality, it is difficult to see how we could ever reach any proof of it derived from experience. Our nervous systems are so constituted that they can perceive only the material in form; and thus, even if disembodied spirits exist, there is no way in which they could make their existence known to us.

2. It does not seem to me that modern investigation has brought to light any new facts which really bear upon the question. The widest generalizations of modern science, in so far as they have modified the older theories of the nature, origin, and destiny of man, are, I think, reached by looking upon well-known facts from a different point of view rather than by discovering new facts. For example, I do not think the new facts tending to uphold the doctrine of evolution are any more convincing than well-known facts which have always been within the reach of everybody.

3. Still, it seems difficult to avoid the conclusion that belief in immortality may be affected by the generalizations in question by leading men to think differently. Especially is this the case with the theory of the continuity of organic life. So long as it was held that man and the lower

animals were separated from each other by an impassable gulf, existing from the beginning, so long was it easy to imagine for them destinies which had nothing in common. A consciousness which can survive the dissolution of the material organism and a consciousness which cannot are of two distinct orders, between which no connecting link is possible. If man, as now constituted, is only the last in a series of forms of organic existence, starting from the lowest, and if consciousness itself has been a gradual development, akin to that of awaking slowly and gradually from a profound sleep, then it seems difficult to assign any link in the series at which we can suppose so great a break to have occurred as is implied in the passage from mortality to immortality.

In all this, I do not wish to be considered as either claiming or admitting that the theory of evolution or of development is a scientific conclusion rather than a philosophical theory.

VI.

J. P. LESLEY,

STATE GEOLOGIST OF PENNSYLVANIA.

The question of immortality can hardly be said to be affected at all by the methods and results of the physical sciences as pursued and reached by men of our day, who busy themselves solely with material forms, growths, changes, dissolutions, reproductions, weights, measures, attractions and repulsions,—in a word, with what is called matter and what are called its forces, the life-force and the mind-force included. The ideas of unchangeability and immortality are not only repugnant to physical science, but inconceivable by it, and therefore (and only therefore) repugnant. The fundamental ideas of physical science are (1) uniformly and ubiquitously operating forces; (2) stable universal elements; (3) combinations of these elements in established natural proportions; (4) living forms too small to be seen, but mathematically conceivable, molecular, and protoplastic; (5) living forms subject to view, appearing, growing, and disappearing, (6)

metamorphosis of forms, both crystalline and animated (plants and animals); (7) incessant movement of all the constituents of the universe, observable now, evidences of it in the past abundant, in the future logically certain, no beginning to the movement discoverable, no end to it reasonable, no cause for it assignable, except a vague suspicion that it is analogous to the human will-power, the nature of which is not known, nor the manner in which it accomplishes its effects. We call our will-power "soul": we may call the world will-power "God."

If this analogy be accepted as a corollary of science, it must be accepted at the logical expense of the doctrine of human immortality. For we know the World-power only by the universal and perpetual movement; and we judge it to be eternal merely because we can discover no beginning, nor reason to no end, of the movement. But, as we see both the beginning and the end of a man's will-power action, the analogy suggests a beginning and an end to the will-power itself, —*i.e.*, to man's soul.

Beyond this, no real man of physical science will allow himself to go in dealing with the things of science pure and simple. But as a man of

family has a right, and sometimes of necessity, to go into politics, and as the citizen of a State may and often must think and act as a philanthropist and cosmopolite, so men of science have other faculties and duties than those of mere investigation and classification. The will-power is not the whole man: besides "soul" there is "spirit." The top and front of the brain have as much work and right to work as the back of it or the base of it. That God is eternal and man's soul perishable may be a perfectly good and logical conclusion from a comparison of the endless *movement* of the whole universe and the short *movement* of a part of it (a man); but that God is *nothing but* the will-power of the whole is as little proved thereby as that man is *nothing but* the encased will-power of a part. Man wills, but he also loves and thinks: therefore, it follows that God must also think and love. As we see the trinity in man, we must imagine the trinity in God; as the world-movement must be guided by world-thought and generate world-love, so man's fanciful desires prompt and his reason directs the actions of his will.

These actions are directly related to man's present situation, are fitted for it, and will stop

when the situation ceases; that is, at death. But that is no argument for the cessation of the inspiring fancy, the judging reason, the affectionate spirit. Give these a new situation (another life), and they will find a power to fit new movements to the new situation. In fact, this is the conviction of all human spirits,— namely, that the present life is not their only chance, is, in fact, only one section of their eternal life; and the doctrine of metempsychosis is merely a form which this conviction has assumed, and still wears, for perhaps a majority of the individuals of our race.

Science cannot possibly either teach or deny immortality; but every man of science must acquiesce in the fact of the general conviction, and in its probable ground in some persistent part of our nature. Whether we own this persistent part, not in severalty, but in commonalty with all other men,— in other words, whether we are only *individuals* as to our will-power, or soul (or whatever we please to call that which produces the phenomena of our present life), and *not individuals* as to our other powers (or original and central nature), and so, in fact, are parts of God,— is quite another question, still farther removed from the neighborhood of the workshop of science; and its answer will give a different aspect to the question of man's immortality.

VII.

LESTER F. WARD, A.M.,

SMITHSONIAN INSTITUTION, WASHINGTON, D.C.

In reply to your note of March 23, inviting an expression of my views on some questions in regard to the relations between "science and immortality," I submit the following as the best I can do in the limited space allowed:—

To your first question, as to whether there are "any facts which make it difficult to believe in the immortality of the personal consciousness," I give an affirmative answer, which may be briefly set forth under two heads, as follows:—

I. The consciousness, when scientifically examined, reveals itself as a quality of brain, or mode of manifestation of the molecular activities of the organized brain substance.

It is a universal induction of science that modification of brain is accompanied by modification of consciousness, and that destruction of brain

results in destruction of consciousness. No exception to this law has ever been observed. The conclusion is, therefore, almost a necessary one that brain is the cause of consciousness, and that consciousness depends upon and varies with the nature and condition of the brain.

The facts in support of this are multitudinous, not only as derived from exhaustive experiments in psycho-physics, conducted expressly for that purpose, but also as derived from common observation on the effect of drugs, intoxicants, poisons, and of various injuries and diseases of the brain.

It follows that, so far as science can speak on the subject, the consciousness persists as long as the organized brain, and no longer.

II. A second class of facts, which are irreconcilable with a belief in the indefinite persistence of consciousness, is found in the inability of all minds to recall states of consciousness and events antecedent to the present life. For immortality can have no claim to the consideration of rational beings, unless it means absolute independence of time and causation. All things that have a beginning must have an end. The law of the material world is change, which implies both begin-

ning and end of all phenomena. A phenomenon that is assumed to begin at some given point of time and to continue thenceforth forever is, to the logical mind, and especially to the scientific mind, a palpable absurdity. Therefore, for immortality to be believed in by rational beings, it must be shown to embrace an eternity *a parte ante* as well as *a parte post*. It might be conceded that no evidence of the latter was to be expected; but, when we contemplate consciousness as the immortal part, it should certainly carry constantly with it the evidence of antecedent states. And, if it be urged that memory is not necessarily involved in consciousness, then it must be answered that its persistence is no more to us than its renewal would be through other individuals, as in reproduction, since it is through memory alone that a consciousness of identity in different states can exist.

To the second question, as to whether there is "anything in the discoveries of science which would support or strengthen the belief in immortality," I must answer that none of the alleged facts of this class have thus far presented themselves to my observation or reason in such a manner as to justify me in accepting them as facts.

My answer to your third question, whether I consider such inquiries "out of the pale of science altogether," naturally flows from the foregoing. I certainly do consider the question of the continuous existence of a consciousness which began with birth or conception, or at any point of time, as not only out of the pale of science, but as belonging to the *limbus fatuorum* of mythology and magic; for it would be nothing less than an *eternal phenomenon*, which involves a flat contradiction of terms.

I would not have it inferred from the above that science is sceptical as to the immortality of the soul. Science postulates the immortality, not of the human soul alone, but of the soul of the least atom of matter. Consciousness results from the eternal activities of the universe, is their highest and grandest product, and not one atom nor one atomic movement is ever lost. The immortality of science is the eternity of matter and its motions in the production of phenomena, and science will always object to all unphilosophical attempts to confound phenomena with these.

VIII.

EDWARD S. MORSE, PH.D.,

SALEM, MASS.

I have tried in vain to find the time to answer your inquiries, but have found it impossible to do so as I would wish. Nevertheless, I must say that, as an evolutionist, I have never yet seen any sentiment or emotion manifested by the species man that was not in some degree, however slight, traceable in animals below man; and immortality of the personal consciousness for one would, to my mind, imply immortality for all, to the bottom round. And why certain early protoplasm should have been left out in the cold by being diverted into the plant road I never could understand, and hence there should be some chance for every toad-stool and thistle.

I have never yet seen anything in the discoveries of science which would in the slightest degree support or strengthen a belief in immortality.

As to the third question, it strikes me that, in the interests of morality, science must ultimately

grapple in earnest with telepathy and other occult matters, so that the people will cease making investments in companies who attempt to quarry spiritual gold from the unknowable, and who pay in dividends script which, as Tyndall might say, lacks the congruity necessary to commend it to an intelligent man as genuine.

That my position may not be misunderstood, let me quote from a recent article in the *Fortnightly Review*, entitled "Science and Morals," by that prince of agnostics, Huxley: "If the diseases of society consist in the weakness of its faith in the existence of the God of the theologians, in a future state, and in uncaused volitions, the indication, as the doctors say, is to suppress theology and philosophy, whose bickerings about things of which they know nothing have been the prime cause and continual sustenance of that evil scepticism which is the Nemesis of meddling with the unknowable.

"Cinderella is modestly conscious of her ignorance of these high matters. She lights the fire, sweeps the house, and provides the dinner, and is rewarded by being told that she is a base creature, devoted to low and material interests; but, in her garret, she has fairy visions out of the

ken of the pair of shrews who are quarrelling downstairs. She sees the order which pervades the seeming disorder of the world. The great drama of evolution, with its full share of pity and terror, but also with abundant goodness and beauty, unrolls itself before her eyes; and she learns in her heart of hearts the lesson that the foundation of morality is to have done, once and for all, with lying, to give up pretending to believe that for which there is no evidence, and repeating unintelligible propositions about things beyond the possibilities of knowledge.

"She knows that the safety of morality lies neither in the adoption of this or that philosophical speculation nor this or that theological creed, but in a real and living belief in that fixed order of Nature which sends social disorganization upon the track of immorality as surely as it sends physical disease after physical trespasses; and of that firm and lively faith it is her high mission to be the priestess."

When doubts are expressed in regard to these and kindred matters, or an appeal is made to Nature and her immutable laws, it is customary for the theologian to ask, How do you know that there are not higher laws which, after all,

may in some way interfere with present laws, and sustain the dreams of credulous persons which occurred in an epoch of superstition? Huxley says the plain answer to such a question is, "Why should anybody be called upon to say how he knows that which he does not know?"

IX.

JOSIAH PARSONS COOKE, LL.D.,

PROFESSOR OF CHEMISTRY AND MINERALOGY IN HARVARD UNIVERSITY.

[Prof. Cooke refers us to his work on "Religion and Chemistry," p. 329, and authorizes this quotation.]

In the first place, then, I believe that the existence of an intelligent Author of Nature, infinite in wisdom and absolute in power, may be proved from the phenomena of the material world, with as much certainty as can be any theory of science. In the second place, I am of opinion that the facts of Nature are throughout consistent with the belief that the Author of Nature is a personal being, and the one only and true God

revealed to us in the Bible. Lastly, I think that the relations of human mind to the material world, viewed in the light of modern science, give us strong reason to believe, on scientific grounds alone, that the universe is still sustained in all its parts by the same omnipotent and omniscient Will which first called it into being.

To the extent I have indicated, I regard the argument of natural theology as logically valid. Moreover, I am persuaded that science confirms and illustrates the priceless truth which Christ came on earth to reveal; but I do not believe that the unaided intellect of man could ever have been assured of even the least of these truths independently of revelation.

X.

EDWARD D. COPE, A.M., PH.D.,

PHILADELPHIA, PA.

Your inquiries respecting the relations of scientific knowledge to the problem of human immortality fall under three heads, which I will take up in the order which permits of most easy discussion.

1. Do I consider the question beyond the pale of science altogether?

Evidence on the question of immortality can scarcely be obtained by us by direct observation, by any mode known to us, excepting in the usual way, by death. But it is within the pale of scientific processes to employ legitimate inference from observed facts. That there are facts bearing on this question there can be no doubt, and that our knowledge of such facts will increase I have no doubt. Inference will then be likely to give some valuable results.

2. "Are there any facts in the possession of modern science which make it difficult to believe in the immortality of the personal consciousness?"

There are such facts. Assuming, as I do, that mind, or its raw material,—consciousness,—is a property of some kind of matter, since the only matter which we know to exhibit this phenomenon or class of phenomena has a nearly fixed chemical composition, it appears extremely reasonable to suppose that, on the destruction or decomposition of this compound, its property above mentioned would disappear with it. And the fact is that this substance is of so unstable a

character that very slight changes in the environment suffice to bring about this decomposition and the death of the person which it composes. Our customary failure to discover any traces of mind in persons so dead, after their death, is a fact in support of the idea of the extinction of personal consciousness so far as it goes.

3. "Is there anything in the discoveries of science which would support or strengthen the belief in immortality?"

There is evidence in support of the idea of immortality as well as evidence against it. And any positive evidence must be regarded as of far greater value than negative evidence in this question, as in all others.

The evidence for immortality is, of course, dependent on our knowledge of the relations of mind to tridimensional matter. Thus, if we can prove that mind does or can, within certain limits, dominate matter, or direct its movements, we have rendered certain the existence of mind as capable of persistence in and of governing matter in such wise as the axiomatic properties of matter will permit. We thus render probable the existence of a supreme mind, which is immortal; and, from that premise, we may infer that, under

proper conditions, our own minds are or may be immortal also. As to the character of that immortality, something may be said later.

The side from which to approach this problem is that of *creation*, or evolution rather than that of functioning, or physiology. Functioning, be it living, or chemical reaction, or mechanical movement, is a process of decomposition, solidification, or dissipation,—processes exactly the reverse of creation, which is a building up. It is the observation of this class of phenomena, in the sciences of biology, chemistry, and physics, which has led some persons to anticipate ultimate extinction of all the activities comprehended within the scope of those sciences. And such would be a correct inference, were it not that the opposite process of creation, or lifting up and building, is going on at the same time.

Three sources of evidence from the nature of creation are open to us. These are the control of mind over animal movements, the direction of organic evolution by consciousness, and the direction or inhibition of chemical energy by vitalized energy. I take up these propositions successively.

First, as regards the control of mind over ani-

mal movements. It is well known that animals and some plants (probably all primitively) move under the influence of stimuli of different kinds. It is also well known that these movements are not aimless, but have reference to the accomplishment of some object; namely, the good of the mover. In other words, the movements of conscious beings display design. We have no reason to suppose that the movements of any other class of beings display this design; for, although it is exhibited by living beings while unconscious of the act, or altogether unconscious, we are sure that the movements could never be executed under these circumstances unless they had been previously learned by a process of education, and this process requires consciousness. If we trace the history of the designed act, we find that the energy which is expressed in the act receives a special direction in the living tissue, which causes it to accomplish the end in view. In other words, *will* is displayed at a point in the history of the passage of energy through a living being. No animal or other being can create energy, but it can direct it. This is clearly a case of the control of mind over energy, and through it over matter. This is displayed in the

selection of food by the lowest animals, as it is seen by the selection of words by the highest. We have here the power by which mind maintains itself, and the organic forms which it inhabits, in the midst of antagonistic forces which constantly threaten it with destruction. We are easily led to inquire how far this power may extend, and what may be its scope.

Second, the direction of organic evolution by consciousness. Paleontological research has shown that the most important characters of animals consist of stages in the gradual development of machines for the performance of certain motions: as, in limbs, of running, flying, swimming, digging, etc.; or of teeth, of grinding, cutting, etc.; and of the respective functions of the various organs of the body, as of the brain for perceiving, thinking, etc. Some other less useful characters may be regarded as necessary consequences of these changes, due to the special location of nutrition or to the peculiarities of the environment. Thus, plants probably early lost consciousness; and their characters, mostly symmetrical or nearly so, have been produced by physical causes, combined with the uses to which they have been put by animals, especially by in-

sects. Assumption of a perfect habit has been, in both plants and animals, the condition of the loss of consciousness as to that kind of action; and, if all life motions should be so reduced in any being, life would become entirely unconscious. It is easy to believe that this is the history of most plants, and perhaps of some animals.

Without going further into the numerous questions pertaining to the evolution of organic machines, it is easy to perceive that we have here another evidence of the control of mind over matter. Structure is produced by motion (kinetogenesis); and motion is, through consciousness, directed by will.

Third, the control of vitalized energy over chemical energy. It is, perhaps, necessary to explain the use of the term "vitalized energy" before going farther. The old "vital force" is not thereby resuscitated, for that expression covered so many various factors as to be quite useless to exact thought. Many of the energies of animals and plants are, of course, not different from those displayed by non-living substances. But there is a kernel of truth in the old idea. Energy which is or has been controlled by con-

sciousness, so that it bears the stamp of "design," may be said to have been and to remain "vitalized." Automatic energies may be cast off, so to speak, from a vital source, and may run down part of the gamut of possibility, and still show marks of intelligent or "vital" origin. Such are probably some of the energies displayed by plants in their laboratories, where they make organic compounds only second in complexity to their own living protoplasm.

The central fact of this part of the evidence is the creation of protoplasm, the only substance which is known to us to live and be conscious. Animals can only make it out of other protoplasm or nearly allied substances. Plants make it from the inorganic materials of the world and its atmosphere, but they must have protaplasm to do it with. Whence, then, came the first protoplasm? Light is cast on the subject by a consideration of the nature of this substance itself. Protoplasm cannot exist by virtue of chemical energy alone. Within certain ranges of temperature, it exists only by virtue of the life that is in it. Let it die, and chemism resumes its sway; and it is quickly resolved into simpler and more stable compounds. This fact is only one illus-

tration of the character of chemism. It is well known that, other things being equal, this form of energy acts by "integration of matter and dissipation of energy." It forms such substances as require for their making the greatest dissipation of heat, thus always approaching, if not attaining, the solid state. This material condition is, of course, the most antagonistic to life and incapable of exhibiting its phenomena. We cannot then but suppose that some form of energy accompanies the phenomena of life, which is not chemical, although it is evident that a certain amount of chemism is necessary to its activity; or rather, as with animal electricity, the living energy only requires enough control for its purposes, and not the extinction of other forms of energy in its physical basis. What may this energy be? It is safe to presume that it is one of the vital group. Now, the only essential of that group which we have been able to discover is that it bears the stamp of consciousness.

If we now turn to the problem of the origin of the first protoplasm, our safest course is to believe that it was effected by a form of energy similar to that which now manufactures it from the raw, inorganic materials. It is the only form

of energy which we know of which is competent to perform that function. And it does it in very imposing fashion. The vegetation of the earth is manufacturing it everywhere by thousands of tons a day. In like manner, in primitive ages, this energy made the first protoplasm.* But it is obvious that at that time it had a different physical basis than it has now. Perhaps the temperature was too high for the sufficient stability of protoplasm. In any case, we have here a clear view of vital energy as a property of some physical basis not protoplasm. And if, as I believe is demonstrable, that "vital energy" is only such by virtue of the stamp of consciousness, past or present, we have here evidence of primitive consciousness before the days of protoplasm. We thus destroy the evidence against the possibility of immortality as presented by its strongest antagonist, chemism. And a physical basis of consciousness other than protoplasm is the essential of a belief in a Supreme Mind, and in the persistence of human consciousness.

As to the nature of this supposed immortality, science can have little to say. One thing, how-

*The intervention of chlorophyll in this process in plants must be regarded as a complication of a later origin.

ever, may be asserted. We cannot be sure of retaining our personality intact, although a great change might not be any cause for regret. As we change our personality in the course of time during this life, we cannot be sure of retaining it in another. But we do not always regret the change which time produces here; in fact, we may generally rejoice in it. Then there is a question as to the necessary isolation or distinction of consciousnesses from each other, all which may be relegated to the region of speculation. But one thought has often seemed to me to be of value. It is this: Beware of automatism.

XI.

SIR J. WILLIAM DAWSON, LL.D., F.R.S.,

PRINCIPAL AND VICE-CHANCELLOR McGILL UNIVERSITY, MONTREAL.

[Sir William Dawson refers us to the tenth chapter of *Fossil Men and their Modern Representatives*, and authorizes the following quotation.]

What shall we say, then, of this instinct of immortality handed down through all the generations of prehistoric and savage men, and prompt-

ing to costly funeral rites? Is it a mere fancy, a baseless superstition? Is it not rather a God-given feature of the spiritual nature yearning after a lost earthly immortality, and clinging to the hope of a better being in a future life? And is it not, after all, inseparable from the belief in a God, whose children we are, and who can transfer us from this lower sphere to better mansions in his own heavenly home? Is the "Monist" or materialist, who looks with indifference on death as the close of certain physical changes, and nothing more, or who shrinks from it as a hopeless annihilation, on any higher mental or moral platform than the savage who departs chanting his death song, and looking forward to meeting with the shades of his fathers in the happy hunting grounds? Is he not rather on a level with those more degraded savage tribes, if there are such, who have lost the prehistoric faith without receiving anything better, and who regard the future either as a mere blank or as an unknown and terrible mystery? How much happier than either are those on whose last days shine the brighter hope of the light and immortality revealed by the gospel!

In the present state of religious opinion among

ourselves, and in view of the strange and absurd logomachies which have raged as to the doctrine of a future life in the Old Testament, it may be necessary to refer to the actual connection between the doctrines of the Holy Scriptures and the instinct of immortality referred to in the preceding pages. In Genesis, man appears at first as endowed with an immortality both physical and spiritual. This tradition of primitive immortality, and the instinctive longing for an immortal life implied in it, the Christian should hold as not a possession of the Hebrews only, but of the whole human race; and it should be, as it is, next to the belief in God, the second great doctrine of universal religion. The promise of a Redeemer to restore the immortality lost by the fall, is the next doctrine of the revealed religion, and, as we have seen, this also is embodied in all the creeds of the nations, though in strangely distorted forms. The translation of Enoch in antediluvian times is another primitive testimony of the Old Testament, which, if we regard it as an historical fact, must have served to deepen the belief in the future life both of body and soul. It is to be observed that all these primitive testimonies go to establish not only the immortality

of the soul, but also of the body; that is, the doctrine of the resurrection. It is clear, therefore, that these doctrines lie at the base of the religion of the Old Testament, and that without them it would be nothing. If they are not often dwelt upon in the Hebrew Scriptures, this is because they were not doubted or disbelieved, even by the heathen, and because there was more need to insist on the immediate beliefs and duties of life.

At the same time, in the ancient Hebrew Church, and still more among the heathen, much obscurity hung over the immediate future of the human soul. Death was ever a patent fact, and what the state of the disembodied soul in "Sheol," and how or when it would be reunited to a body, were not known to man. Job might believe, notwithstanding the decay of his body, that with his own eyes he would see God, but this would be in the latter days. Martha might know that her brother would rise again at the last day. This was the common-sense faith of readers of the old Testament before the Christian era; but it remained for Jesus to raise the veil from the intermediate state, and to bring "life and immortality to light." This he does by his

own teaching that the believer in him can "never die," — that is, that to him death is not really death, but the entrance at once into a higher and broader life in and with Christ, who is himself the "resurrection and the life"; by his declaration to the thief on the cross, "To-day shalt thou be with me in Paradise"; and by his own personal resurrection as the "first-fruits of them that sleep." Thus, to the Christian, not only are the future life and the resurrection more sure and plain than they could be to the Jew, but all the terrors of the intermediate state are taken away, — the soul unclothed by death is at once "clothed upon," to be absent from the body is to be "present with the Lord," to leave the earthly tabernacle is to enter a "mansion in the Father's house" prepared by the risen Saviour. True it is that these doctrines are yet only partially received by many calling themselves Christians; but, surely, happy are they who believe, and whose lives are heightened and ennobled by such belief. Yet it is well for them to remember that, to some small extent, these beliefs have been shared by the pious souls of all ages and peoples, and that the existence of the belief in God and immortality, even among the lowest

races, is an element of hope, as presenting some opening and implying some capacity for higher truths.

XII.

T. STERRY HUNT, LL.D., F.R.S.

Your note of March 6, with a request for a brief statement of my views as to the relation of natural science to the doctrine of a future life, is before me; and, had I leisure, I would gladly write you at length thereon. Just now, however, the press of literary work is so great that I cannot take the time which the subject demands, though I hope I may do so ere long.

I think the arguments from the facts of modern science are rather contrary than favorable to the doctrine of a future life. Nevertheless, I believe in a conditional immortality, in an eternal life begun already in this world, which is not man's birthright, but the gift of God. My reasons for this belief are, however, psychological, and not physiological, and to set them forth in order and do justice to the great theme would require more time than I can at present command.

XIII.

WILLIAM JAMES, M.D.,

PROFESSOR OF PHILOSOPHY IN HARVARD UNIVERSITY.

The whole of my philosophy of immortality is contained in a few words of Lotze's, which you may like to print: —

"We have no other principle for deciding the question than this general idealistic belief: that every created thing will continue whose continuance belongs to the meaning of the world, and so long as it does so belong; whilst every one will pass away whose reality is justified only in a transitory phase of the world's course. That this principle admits of no further application in human hands need hardly be said. *We* surely know not the merits which may give to one being a claim on eternity, nor the defects which would cut others off." (*Metaphysic*, § 245.)

XIV.

BENJAMIN APTHORP GOULD, LL.D.,

CAMBRIDGE, MASS.

I wish it were in my power to comply with your request, by giving you some definite statements of my opinions regarding our immortality, and the influence of scientific studies upon these opinions. But, to my regret, time and opportunity are at present wanting for any fit expression of them, notwithstanding they are so deeply rooted as to have become part of my nature, and are confirmed by each successive step in my studies.

The relations between the physical and the spiritual universe cannot, from their very nature, be made a subject for what the mathematician calls demonstration. Yet, even here, opportunity exists for such near approach to demonstration as is afforded by the *reductio ad absurdum*. And the immanence of Deity in all physical phenomena, as well as the permanence of the individual through and beyond all physical changes which may affect him, seem, to my mind, to

afford the only logical escape from a myriad of otherwise hopeless inconsistencies and difficulties.

This I believe to be the legitimate and natural consequence of an earnest study of Nature's laws. Were it not that some of those fellow-men whom I most honor and respect have not yet arrived at the same result, I should have been disposed to regard it as the inevitable one.

In my belief, dogmatic theology has, through all the history of science, been its worst foe; and the minds of conscientious and otherwise sound investigators have been sadly warped and disturbed by the ecclesiastical denunciations of all who should dare to avail themselves of their reasoning powers,—the only means vouchsafed them for arriving at any honest opinions whatsoever. For ages, the doctrine has been instilled into Christians, with their mother's milk, that investigation into what were claimed to be religious matters was among the worst of crimes; and that any disbelief, or even doubt, of certain theological dogmas was a rejection of divine revelation,—in fact, the unpardonable sin. Emancipation from the shackles of such ingrained ideas has been difficult and slow, and with its arrival

comes the natural tendency to reaction in the opposite direction.

That a profound and unbiassed study of any branch of natural science should lead to disbelief in immortality seems to me preposterous. Chemistry affords no basis for the supposition that human aspirations, affections, yearnings, can be evolved from mere combinations of nitrogen, carbon, phosphorus, oxygen, metals, and the like. Physical laws, whose workings are of course as clearly traceable in our mortal frames as in any other aggregations of matter, cannot be made applicable to what is not matter. Nor do I see how modes of action can be confounded with the agent, in any process of legitimate reasoning. Whether the masses of matter considered be below the reach of the microscope, or vast beyond telescopic measurement, makes not an iota's difference for any of the questions involved. It is strange, to be sure, that any one acquainted with the rudiments of physiological chemistry, or who has seriously considered the relations between spirit and matter, should not recoil with horror from such a doctrine as that of a resurrection of the body; but such a dogma as this has nothing to do with faith in the im-

mortality of the individual, who has been for a season clothed in and hampered by the fleshly garb from which death frees him.

Assuming the existence of spirit, as distinct from matter, it would be absurd to suppose it limited by physical laws, except in so far as it might employ matter as an implement. In considering things spiritual, there is no opportunity for inferences or analogies drawn from the laws of matter. And until the physical investigator can show the possibility of evolving, from a combination of atoms and a development of cells, devotion and gratitude to God, love to man, self-sacrificing disinterestedness, self-surrender to the idea of duty, and that innate faith in reunion with our beloved, which pervades every human race,—all of which seem to form an integral part of the spiritual constitution of mankind,—it seems a waste of words to base arguments on the subject upon physical data.

It is true that all this is but an expression of personal convictions, and scarcely to be given as a presentation of reasons for such convictions. But I can only end, as I began, by saying how much I regret my present inability to prepare for you the statement which you ask.

XV.

ALFRED R. WALLACE, LL.D.

Outside of modern Spiritualism, I know of nothing in recognized science to support the belief in immortality; and, though I consider Spiritualism to be as truly an established experimental science as any other, it is not recognized as such.

[With the consent of Mr. Wallace we present here an extract from an article written by him a year or more ago on "Science and Spiritualism."]

It is a common but, I believe, a mistaken notion that the conclusions of science are antagonistic to the alleged phenomena of modern Spiritualism. The majority of our teachers and students of science are, no doubt, antagonistic; but their opinions and prejudices are not science. Every discoverer who has promulgated new and startling truths, even in the domain of physics, has been denounced or ignored by those who represented the science of the day, as witness the long line of great teachers, from Galileo, in the Dark Ages, to Boucher de Perthes, in our own times. But the opponents of Spiritualism have

the additional advantage of being able to brand the new belief as a degrading superstition, and to accuse those who accept its facts and its teachings of being the victims of delusion or imposture,— of being, in fact, either half-insane enthusiasts or credulous fools. Such denunciations, however, affect us little. The fact that Spiritualism has firmly established itself in our sceptical and materialistic age; that it has continuously grown and developed for nearly forty years; that, by mere weight of evidence and in spite of the most powerful prepossessions, it has compelled recognition by an ever-increasing body of men in all classes of society, and has gained adherents in the highest ranks of science and philosophy; and, finally, that despite abuse and misrepresentation, the folly of enthusiasts and the knavery of impostors, it has rarely failed to convince those who have made a thorough and painstaking investigation, and has never lost a convert thus made,— all this affords a conclusive answer to the objections so commonly urged against it.

Science may be defined as knowledge of the universe in which we live,— full and systematized knowledge leading to the discovery of laws and the comprehension of causes. The true student

of science neglects nothing that may widen and deepen his knowledge of nature; and, if he is wise as well as learned, he will hesitate before he applies the term "impossible" to any facts which are widely believed, and have been repeatedly observed by men as intelligent and honest as himself. Now, modern Spiritualism rests solely on the observation and comparison of facts in a domain of nature which has been hitherto little explored; and it is a contradiction in terms to say that such an investigation is opposed to science. Equally absurd is the allegation that some of the phenomena of Spiritualism "contradict the laws of nature," since there is no law of nature yet known to us but may be apparently contravened by the action of more recondite laws or forces. Spiritualists observe facts and record experiments, and then construct hypotheses which will best explain and co-ordinate the facts; and, in so doing, they are pursuing a truly scientific course. They have now collected an enormous body of observations tested and verified in every possible way, and they have determined many of the conditions necessary for the production of the phenomena. They have also arrived at certain general conclusions as to the causes of these

phenomena, and they simply refuse to recognize the competence of those who have no acquaintance whatever with the facts to determine the value or correctness of those conclusions.

Just as there is behind the visible world of nature an "unseen universe" of forces, the study of which continually opens up fresh worlds of knowledge often intimately connected with the true comprehension of the most familiar phenomena of nature, so the world of mind will be illuminated by the new facts and principles which the study of Spiritualism makes known to us. Modern science utterly fails to realize the nature of mind or to account for its presence in the universe, except by the mere verbal and unthinkable dogma that it is "the product of organization." Spiritualism, on the other hand, recognizes in mind the cause of organization, and, perhaps, even of matter itself; and it has added greatly to our knowledge of man's nature, by demonstrating the existence of individual minds indistinguishable from those of human beings, yet separate from any human body. It has made us acquainted with forms of matter of which materialistic science has no cognizance, and with an ethereal chemistry whose transfor-

mations are far more marvellous than any of those with which science deals. It thus gives us proof that there are possibilities of organized existence beyond those of our material world, and in doing so removes the greatest stumbling-block in the way of belief in a future state of existence,— the impossibility so often felt by the student of material science of separating the conscious mind from its partnership with the brain and nervous system.

On the spiritual theory, man consists essentially of a spiritual nature or mind intimately associated with a spiritual body or soul, both of which are developed in and by means of a material organism. Thus, the whole *raison d'être* of the material universe — with all its marvellous changes and adaptations, the infinite complexity of matter and of the ethereal forces which pervade and vivify it, the vast wealth of nature in the vegetable and animal kingdoms — is to serve the grand purpose of developing human spirits in human bodies.

This world-life not only lends itself to the production, by gradual evolution, of the physical body needed for the growth and nourishment of the human soul, but by its very imperfections

tends to the continuous development of the higher spiritual nature of man. In a perfect and harmonious world, perfect beings might possibly have been created, but could hardly have been evolved; and it may be well that evolution is the great fundamental law of the universe of mind as well as that of matter. The need for labor in order to live, the constant struggle against the forces of nature, the antagonism of the good and the bad, the oppression of the weak by the strong, the painstaking and devoted search required to wrest from nature her secret powers and hidden treasures,—all directly assist in developing the varied powers of mind and body and the nobler impulses of our nature. Thus, all the material imperfections of our globe — the wintry blasts and summer heats, the volcano, the whirlwind and the flood, the barren desert and the gloomy forest — have each served as *stimuli* to develop and strengthen man's intellectual nature; while the oppression and wrong, the ignorance and crime, the misery and pain, that always and everywhere pervade the world, have been the means of exercising and strengthening the higher sentiments of justice, mercy, charity, and love, which we all feel to be our best and

noblest characteristics, and which it is hardly possible to conceive could have been developed by any other means.

XVI.

REV. THOMAS HILL, D.D.,

EX-PRESIDENT OF HARVARD COLLEGE.

If you will allow me so to do, I will, in my reply to your three questions, transpose their order.

If by science, in the third question, we understand physical science, the question of immortality is without her pale. The whole field of science, in that sense, is bounded by space and time, is occupied simply by geometrical forms and modes of motion.

But, by the terms of the first question, immortality is predicated or denied of our personal consciousness. If we appeal to the facts of science for premises, in arguing upon immortality, they must therefore be supplemented by a more direct appeal to consciousness for additional premises, before we can use them. Many facts in the pos-

session of modern science make it difficult to believe in immortality. But these facts present no difficulties essentially different from those presented by the familiar fact that all manifestations of life cease with the death of the body. Science simply invalidates a large part of what was once thought evidence for the reappearance of spirits after death.

In reply to the second question, however, I would emphatically affirm that every discovery in science is a fresh demonstration of the immortality of the soul.

By personal consciousness, I understand you to mean a person,— a being who not only knows, but knows that he knows; who not only acts under the impulse of sensations, as Huxley supposes his crayfish may do, but who has the power of distinguishing himself from his objects of thought, generalizing and setting forth abstract ideas. Man finds these general and abstract ideas embodied in the creation around him; but it is evident that he could not find them there, were he not preadapted to find them. The eagle's sight is incomparably sharper than a man's, but no one dreams that the eagles ever saw or ever will see the likenesses and differences between

the three willows on the summits of the White Mountains. The hypotheses which the animals frame and test never relate, as far as man sees, to anything beyond the individual thing before them, and its relation to their desires or their fears. But, with man, the train of thought is habitually and constantly a process of framing and verifying hypotheses, with reference to wider and more general relations. In science, *a priori* conceptions are brought to the test of comparison with observed facts. Every child is scientific in applying his *a priori* ideas to the interpretation of Nature, and always finds them to be a key letting him into more or less of her mysteries.

There is but one solution of this great fact. It is that man is in communication with the Creator of the universe. What clearer proof can there be, as Joseph Henry said in his letter to Mr. Patterson, that we are in direct communication with a Person than receiving intelligible replies to intelligent questions? But all intelligent questioning of Nature receives an intelligible reply. We may therefore apply to this case the answer of Jesus to the Sadducees. They erred, not understanding the Scripture nor considering

the majesty of God. Nature is an "elder Scripture," full everywhere of illustrations of those thoughts which we carry to it, and which empiricism in vain endeavors to reduce to mere generalizations from sensations. The progress of modern science, reducing the universe more and more completely to an intelligible order and rhythm, is an ever-accumulating demonstration that the source of all being is in a Person. The human mind, in the growth of science, even more effectively than in the ordinary contemplation of Nature, has direct evidence that it is in communication with the personal Author of Nature. Hence, as Jesus told the Sadducees, if we consider the majesty of God, we shall see that he has made us immortal: he would not thus hold converse with beings whom he had doomed to perish.

XVII.

ASAPH HALL, LL.D.,
WASHINGTON, D.C.

Science does not, I think, give a positive answer to questions concerning the immortality of the human soul; and a belief or disbelief in such

an immortality will be a personal matter. Speaking, therefore, only for myself, my reply to the first question is that, so far as I know, the facts of modern science do not make it more difficult to believe in the immortality of the personal consciousness. The metaphysical arguments and analogies of Spinoza, Butler, and Kant may be repeated to-day with as much force as ever; and the answers and discussion must be essentially the same.

In reply to the second question, I think the discoveries of modern science strengthen the belief in immortality. During the last three centuries, these discoveries have greatly changed the position of man with respect to the objects of nature. They have enlarged the domain of investigation, so that now the thought of man and his theories range throughout our solar system, and through stellar and nebular systems far beyond. Our physical and chemical theories are penetrating the recesses of nature, and are continually furnishing us with more powerful instruments of research. By means of these, scientific knowledge will be increased. In all branches of science, we shall learn more and more that the universe is ruled by the laws of a wise and an

almighty Creator. It is true that the Christian Church has opposed, sometimes with threats and sometimes with persecution, the advancement of knowledge, fearful lest some of her cherished creeds might be overthrown. But, generally, the creeds have given way at the right time, or have been remodelled and improved to suit the new conditions. In all this change and progress there does not seem to me any degradation of the position of man. On the contrary, I think the soul of man, being capable of such flights of imagination and such trains of reason, shows itself worthy a continued existence. Such considerations do not, of course, amount to a proof; but they strengthen my belief in immortality.

To the third question, my reply is that I do not consider the question of immortality out of the pale of science. All branches of speculation and knowledge are bound up together; and it is on the whole evidence, derived from the most complete information, that the final judgment must be based. We are continually having examples in science of the danger of drawing conclusions from partial and insufficient evidence. Thus, the geological question of the glacial epoch has been investigated from an astronomical and

mathematical stand-point. This method is excellent; but, although the array of formulas may be imposing and their logic unimpeachable, a result obtained in this way is no more certain than the physical assumptions made in the investigation. Again, attempts are made to compute the age of our sun; but it must be admitted that the result depends rather on our ignorance than on our knowledge. The differential calculus is a powerful instrument; and it is very sure to lead us astray, if we make false assumptions.

It is not necessary to speak of the methods peculiar to science, and of the testing of hypotheses by observation and experiment. These methods do not, I think, include the whole of human knowledge. Underneath our mathematical and scientific theories lie metaphysical questions. We do not proceed far, even in elementary geometry, without meeting difficulties of this kind. These difficulties should not be evaded, but should be fairly met and considered. It seems to me, therefore, that science should share in all branches of thought and investigation.

XVIII.

ELLIOTT COUES, M.D., PH.D.,

MEMBER OF THE NATIONAL ACADEMY OF SCIENCES.

1. There are no facts known to modern science which make it difficult to believe in the survival of individual consciousness after the death of the body. On the contrary, what is positively known of the constitution of human beings approaches nearly to a demonstration of the fact that what St. Paul called the "spiritual body" is a substantial entity, which the death of the natural body does not destroy, and which is capable of sustaining consciousness and exercising the faculties of volition, memory, and imagination. The "material" of this psychic organism is what I have called "biogen."

2. There is much in the discoveries of psychic science not only to support or strengthen the belief in immortality, but to convert that belief into knowledge. It is simply a passing fashionable "fad" on the part of orthodox agnostic materialistic scientists to ignore or deny the evidence, because they do not want to have their

self-love wounded by being convicted of having cherished egregious errors.

3. These questions are quite within the pale of scientific investigation, and susceptible of being answered by science in a way which goes far toward justifying faith by knowledge of the truth.

When our scientists as a body shall have recognized the reality and grasped the significance of the alleged phenomena of so-called "modern Spiritualism"; of telepathy; of mesmerism or hypnotism; of clairvoyance and clairaudience; of phantasms of the living and phantoms of the dead; of sundry other occurrences already well known and to some extent understood by competent psychic scientists,— then, and not till then, will formal science furnish the natural basis of religious belief. In my judgment, that time is nearer than many of us suppose.

XIX.

HERBERT SPENCER.

COMMUNICATED BY REV. M. J. SAVAGE.

If he has changed his opinion since then, I do not know; but I can tell you what were the views of Mr. Herbert Spencer three years ago last summer. At that time, I had a conversation with him in one of the rooms of the United Service Club in Pall Mall. He was kind enough to submit to be catechized, and my report is based on his definite answers to my questions.

I told him that I wished him, first, to give me his opinion as to the bearing of science (and particularly the theory of evolution) on the question of personal immortality, and, secondly, his own individual belief.

As to the first, he said he thought it did not touch the problem either way, but left it substantially where it was before.

As to the second, he said he was inclined to doubt. That is, he was not aware of anything that he could regard as satisfactory proof.

XX.

CHARLES S PEIRCE,

MEMBER OF THE U.S. NATIONAL ACADEMY.

What is the bearing of positively ascertained facts upon the doctrine of a future life? By the doctrine of a future life, I understand the proposition that after death we shall retain or recover our individual consciousness, feeling, volition, memory, and, in short (barring an unhappy contingency), all our mental powers unimpaired. The question is, laying aside all higher aspects of this doctrine, its sacredness and sentiment,— concerning which a scientific man is not, as such, entitled to an opinion,— and judging it in the same cold way in which a proposition in physics would have to be judged, what facts are there leading us to believe or to disbelieve it?

Under the head of direct positive evidence to the affirmative would be placed that of religious miracles, of spiritualistic marvels, and of ghosts, etc. I have little to say to all this. I take the modern catholic miracles to be the best attested. Three members of the English Psychical Re-

search Society have lately published a vast book of fourteen hundred pages, large octavo, under the title of *Phantasms of the Living*. This work gives some seven hundred cases of apparitions, etc., of a dying person to another person at a distance. The phenomenon of telepathy, or perception under conditions which forbid ordinary perception, though not fully established, is supported by some remarkable observations. But the authors of the book I am speaking of — Messrs. Gurney, Myers, and Podmore — think they have proved a kind of telepathy by which dying persons appear to others at great distances. Their most imposing arguments are based upon the doctrine of probabilities, and these I have examined with care. I am fully satisfied that these arguments are worthless, partly because of the uncertainty and error of the numerical data, and partly because the authors have been astonishingly careless in the admission of cases ruled out by the conditions of the argumentation.

But, granting all the ghost stories that ever were told, and the reality of all spiritual manifestation, what would they prove? These ghosts and spirits exhibit but a remnant of mind. Their stupidity is remarkable. They seem like the

lower animals. If I believed in them, I should conclude that, while the soul was not always at once extinguished on the death of the body, yet it was reduced to a pitiable shade, a mere ghost, as we say, of its former self. Then these spirits and apparitions are so painfully solemn. I fancy that, were I suddenly to find myself liberated from all the trials and responsibilities of this life, my probation over, and my destiny put beyond marring or making, I should feel as I do when I find myself on an ocean steamer, and know that for ten days no business can turn up, and nothing can happen. I should regard the situation as a stupendous frolic, should be at the summit of gayety, and should only be too glad to leave the vale of tears behind. Instead of that, these starveling souls come mooning back to their former haunts, to cry over spilled milk.

Under the head of positive evidence apparently unfavorable to the doctrine, we may reckon ordinary observations of the dependence of healthy mind-action upon the state of the body. There are, also, those rare cases of double consciousness where personal identity is utterly destroyed or changed, even in this life. If a man or woman, who is one day one person, another day

another, is to live hereafter, pray tell me which of the two persons that inhabit the one body is destined to survive?

There is certainly a large and formidable mass of facts, which, though not bearing directly upon the question of a future life, yet inclines us to a general conception of the universe which does not harmonize with that belief. We judge of the possibility of the unseen by its analogy with the seen. We smile at Aladdin's lamp or the elixir of life, because they are extremely unlike all that has come under our observation. Those of us who have never met with spirits, or any fact at all analogous to immortality among the things that we indubitably know, must be excused if we smile at that doctrine. As far as we see, forms of beauty, of sentiment, and of intelligence are the most evanescent of phenomena.

"The flower that once has bloomed forever dies."

Besides, scientific studies have taught us that human testimony, when not hedged about with elaborate checks, is a weak kind of evidence. In short, the utter unlikeness of an immortal soul to anything we cannot doubt, and the slightness of all the old arguments of its existence, appear to me to have tremendous weight.

On the other hand, the theory of another life is very likely to be strengthened, along with spiritualistic views generally, when the palpable falsity of that mechanical philosophy of the universe which dominates the modern world shall be recognized. It is sufficient to go out into the air and open one's eyes to see that the world is not governed altogether by mechanism, as Spencer, in accord with greater minds, would have us believe. The endless variety in the world has not been created by law. It is not of the nature of uniformity to originate variation, nor of law to beget circumstance. When we gaze upon the multifariousness of nature, we are looking straight into the face of a living spontaneity. A day's ramble in the country ought to bring that home to us.

Then there is the great fact of growth, of evolution. I know that Herbert Spencer endeavors to show that evolution is a consequence of the mechanical principle of the conservation of energy. But his chapter on the subject is mathematically absurd, and convicts him of being a man who will talk pretentiously of what he knows nothing about. The principle of the conservation of energy may, as is well known, be

stated in this form: whatever changes can be brought about by forces can equally happen in the reverse order (all the movements taking place with the same velocities, but in the reverse directions), under the government of the same forces. Now, the essential of growth is that it takes place in one determinate direction, which is *not* reversed. Boys grow into men, but not men into boys. It is thus an immediate corollary from the doctrine of the conservation of energy that growth is not the effect of force alone.

The world, then, is evidently not governed by blind law. Its leading characteristics are absolutely irreconcilable with that vie . When scientific men first began to understand dynamics, and had applied it with great success to the explanation of some phenomena, they jumped to the anticipation that the universe could be explained in that way; and thus what was called the Mechanical Philosophy was set up. But a further study of the nature of force has shown that it has this conservative character, which absolutely refutes that mechanical notion of the universe. As well as I can read the signs of the times, the doom of necessitarian metaphysics is sealed.

The world has done with it. It must now give place to more spiritualistic views, and it is very natural now to anticipate that a further study of nature may establish the reality of a future life.

For my part, I cannot admit the proposition of Kant,—that there are certain impassable bounds to human knowledge; and, even if there are such bounds in regard to the infinite and absolute, the question of a future life, as distinct from the question of immortality, does not transcend them. The history of science affords illustrations enough of the folly of saying that this, that, or the other can never be found out. Auguste Comte said that it was clearly impossible for man ever to learn anything of the chemical constitution of the fixed stars, but before his book had reached its readers the discovery which he announced as impossible had been made. Legendre said of a certain proposition in the theory of numbers that, while it appeared to be true, it was most likely beyond the powers of the human mind to prove it; yet the next writer on the subject gave six independent demonstrations of the theorem. I really cannot see why the dwellers upon earth should not, in some future day, find out for certain whether there is

a future life or not. But at present I apprehend that there are not facts enough in our possession to warrant our building any practical conclusion upon them. If any one likes to believe in a future life, either out of affection for the venerable creed of Christendom or for his private consolation, he does well. But I do not think it would be wise to draw from that religious or sentimental proposition any practical deduction whatever,—as, for instance, that human happiness and human rights are of little account, that all our thoughts ought to be turned away from the things of this world, etc.,—unless such deduction has the independent sanction of good sense.

XXI.

DANIEL COIT GILMAN, LL.D.,

PRESIDENT OF JOHNS HOPKINS UNIVERSITY.

[President Gilman refers us to the concluding portion of his annual report for 1886.]

The progress of science does not touch, or touches only to fortify, the citadel of man's spiritual nature. On themes like these, one should

speak with the reserve which belongs to all that is most sacred; yet I do not hesitate to express the conviction that man's consciousness of his own personality, with its freedom and its responsibility, his belief in a Father Almighty, his hopes of a life to come, his recognition of a moral law and of the authority of an inward monitor, will stand firm, whatever discoveries may be made of the evolution of life, the relation of soul and body, the nature of atoms and of force, and the conceptions of space and time. Science shows us that all knowledge proceeds from faith,—the assumption of premises in which the investigator believes. Indeed, if I may use the words of another, "some of these very discoveries, on closer and larger view, seem destined to be the chief support of those cherished convictions to which they at first seemed hostile." I anticipate that the day is not distant when apprehensions now felt will be felt no more, and when science will be openly proclaimed the handmaid of religion and the ally of good government.

XXII.

PROF. T. H. HUXLEY.

With respect to immortality. As physical science states this problem, it seems to stand thus: Is there any means of knowing whether the series of states of consciousness, which has been causally associated for threescore years and ten with the arrangement and movement of innumerable millions of successively different material molecules, can be continued, in like association, with some substance which has not the properties of "matter and force"? As Kant said, on a like occasion, if anybody can answer that question, he is just the man I want to see. If he says that consciousness cannot exist except in relation of cause and effect with certain organic molecules, I must ask how he knows that; and, if he says it can, I must put the same question. And I am afraid that, like jesting Pilate, I shall not think it worth while (having but little time before me) to wait for an answer.— *Fortnightly Review, December*, 1886.

XXIII.

GENERAL A. W. GREELY, U.S.A.,

CHIEF OF THE SIGNAL SERVICE.

The belief in personal immortality rests so generally on instinctive hope or faith, associated with belief in a personal God, that I doubt if all the magnificent results of scientific research have in this day directly affected this belief, either for or against, in one man out of ten thousand.

In my opinion, however, the result of modern science is rather to confirm than to weaken such a doctrine. Further, the astounding advances in knowledge continuing must eventually result in the acutest minds formulating nature's most abstruse laws. This, — to me, at least, — on the basis that natural laws apply equally to spiritual as to physical matters, gives grounds of hope, faint though they are, that some day the proving of immortality may be as possible and satisfactory as is now the demonstration of certain physical theories which are generally admitted to be truths.

If scientific truths have weakened in some this hope of personal immortality, yet in others such revelations as the immensity of the universe, the indestructibility of matter, and the conservation of energy have strengthened it.

We have lately learned the chemical constituents of planets so far from us that, by the standard of the ancients, their distances are infinite. When man has read the whole history of matter in the universe, must we not indirectly know more of the living energy which has been behind this chemical energy through the ages?

XXIV.

PROF. JOSEPH LE CONTE, LL.D.,

UNIVERSITY OF CALIFORNIA.

There are two widely distinct views concerning the relation of man to nature, the one as old as the history of human thought, the other only now urged upon us by modern science. According to the one, man is the counterpart and equivalent of nature. He alone has — in fact is — an immortal spirit, and therefore belongs to a world of his own. According to the other, man is but

a part, a very insignificant part, of nature, and connected in the closest way with other parts, especially with the animal kingdom. He has no world of his own, nor even kingdom of his own: he belongs to the animal kingdom. He has no department of his own, — he is a vertebrate; nor class of his own, — he is a mammal; nor order of his own, — he is a primate, and shares his primacy with apes. It is doubtful if he may enjoy the privacy of a family of his own, the hominidæ. The structural differences between man and the anthropoid apes are probably not so great as between the sheep family and the deer family.

Now, of these two views, the latter has been in recent times enormously productive in increasing our knowledge. Anatomy has become truly scientific only through comparative anatomy, physiology through comparative physiology, embryology through comparative embryology. Is not the same true also of psychology? Will not psychology become truly scientific only through comparative psychology, — *i.e.*, by the study of the spirit of man in its relation to what corresponds to it in lower animals? But this view, when pushed to what seems to many its logical conclusion, ends in identification of man with

mere animals, of spirit with mere physical and chemical forces, immortality with mere conservation of force, and thus leads to blank and universal materialism. Is there any escape? There is. The two extreme views given above are not irreconcilable. They are only views from different points physical and structural, and therefore equally one-sided and partial; and true philosophy in this as in all other vexed questions is founded only in a view which combines and reconciles mutually excluding extremes. Can we find such a view? I think we can.

Let us, however, first trace some of the stages of this scientific materialism. I pass over, with bare mention, the physiological argument, which to many seems to identify thought with brain-changes and psychology with brain-physiology, and take up at once the argument from evolution, which concerns us more nearly, and is also more easily understood.

Man, we say, is endowed with, is, in fact, an immortal spirit. What is spirit? We know things only by their phenomena. What are the phenomena of spirit? Consciousness, will, intelligence, memory, love, hate, fear. Surely, these are some of them. Now, has not a dog or a mon-

key all these? If man is immortal, are not these also? Pressed by this difficulty, some have indeed accorded immortal spirit to higher animals. But we cannot stop here. If to these, then to all animals; for we have here only a sliding scale without break. Can we stop now? No; for the lower animals and plants approach each so nearly that no one can draw the line between them. We must extend it then to plants also. Shall we stop here, and make immortal spirit co-extensive with life? We cannot, for life-force is certainly transmutable into and derivable from physical and chemical forces. Therefore, everything is immortal, or none. Our boasted immortality resolves itself into indestructibility of matter and force, but not of form nor of consciousness and personality. Such an immortality is of no value to us.

Or, again, each one of us individually was formed gradually, by a process of evolution, from a microscopic spherule of living protoplasm undistinguishable from the lowest forms of life. Now, in this gradual process of evolution, when did spirit come in? Was it in the germ cell? Then why deny it to the protozoan? Was it at the quickening or at birth or at the time of first

self-consciousness or at some later time of complete responsibility?

Again, when it did come in, was it something superadded? or did it grow out of something already existing?

Or, still again, the evolution series from protozoan to man is similar in outline to the embryonic series just mentioned. Now, in the gradual evolution of the animal kingdom terminating in man, where did immortal spirit come in? Did it enter with life or with sensation? or somewhere in the ascending animal scale? or with the advent of man? If with man, was it a new thing added, or did it grow out of something already existing in animals?

I believe that this last is the only tenable view,—the only view that can effect that reconciliation which is the only test of a true philosophy. I believe that the spirit of man was developed out of the *anima*, or conscious principle, of animals, and this again out of the lower forms of life-force, and this in its turn out of physical and chemical forces; and that at a certain stage in this development it acquired the property of immortality, precisely as in a still higher stage it now acquires the power of abstract thought. But,

understand me, this is my own view only. It appeals, therefore, not to authority, but only to reason. I wish now to present it as briefly as possible.

First, then, I draw attention to the fact that there is nothing wholly unique in this transformation. In the history of the evolution of the cosmos, the forces of nature have all appeared successively, as conditions became favorable. There was a time in the history of the earth when only physical forces existed, chemical affinity being held in abeyance by intensity of heat. By gradual loss of heat, the conditions became favorable; and chemical affinity came into being,—a new form of force, though doubtless derived from the preceding. Ages upon ages passed away, until the time was ripe and conditions were favorable, and life appeared,—a new and higher form of force, producing a peculiar group of phenomena, but still, I suppose, derived from the preceding. Again, ages upon ages passed away, during which this life-force took higher and higher forms, foreshadowing and simulating even reason itself, until finally, when time was fully ripe, spirit, self-conscious, self-determining, rational, and moral, appeared,—a

new and still higher form of force, but also still, I believe, derived from the preceding.

But some will ask, "How is this consistent with immortality?" In answer, I beg you to remember the relation of God to nature already explained. Remember that the forces of nature are naught else than different forms of the one, omnipresent, divine energy. This divine energy, in a generalized condition, unindividuated, diffused, pervading all nature, is what we call physical and chemical force. The same energy in higher form, individuating matter, and itself individuated, but only yet imperfectly, constitutes what we call the life-force of plants. The same energy more fully individuating, and itself more fully individuated, we call the *anima* of animals. This *anima*, or animal soul, individuates more and more, until it resembles and foreshadows the spirit of man. Finally, still the same energy, completely individuated as a separate entity, and therefore self-conscious, capable of separate existence and therefore immortal, we call the spirit of man.

According to this view, the vital principle of plants and the *anima* of animals are but different stages of the development of spirit in embryo in

the womb of nature. In man, it came to birth. Before man, it was in deep embryo sleep, unconscious of self, unviable, incapable of independent life, with physical, umbilical connection with nature; but now at last in man separated from nature, capable of independent life, born into a new and higher plane of existence.

Although birth is its true correspondence and best illustration, we may vary the illustration in many ways. In animal, spirit is deep submerged in nature, as beneath a water surface, unconscious of any higher, freer world above. In man, spirit emerges above the surface, into a higher world, looks down on nature beneath him, around on other emerged spirits about him, and up to the Father of all spirits above him.

Or, again, as a planet must separate from physical, cohesive connection with the central sun (planet birth), in order to enter into higher gravitative relations, which thenceforward determine all its movements in beautiful harmony; as the embryo must break away from physical connection with the mother, in order to enter into higher spiritual bonds of love,—even so spirit must break away from physical and material connection with the forces of nature, which are the gen-

eralized forms of divine energy, in order thereby to enter into higher relations of filial love with God and brotherly love with man. Finally, as the new-born child differs little in grade of physical organization from the mature embryo, but at birth there is a sudden and complete change in the whole plane of life, a change absolutely necessary for farther advance, even so, at the moment of the origin of man, however this may have been accomplished, there may have been no great change in the grade of psychical organization, and yet a complete change in the whole plane of psychical life,—a change absolutely necessary for farther advance. According to this view, man alone is a child of God, capable of separate spirit,—separate, but not wholly independent. Nature is no longer gestative mother, but still nursing mother of spirit. We are weaned only by death.

The more we reflect on this, the more we shall see that completed spirit-individuality explains, as nothing else does, all that is characteristic of man. It is this which constitutes what we call personality. This also constitutes self-consciousness and free will and moral responsibility, and out of these again grow the capacity of voluntary

progress. This also means separate life, spirit viability or immortality. Self-consciousness especially seems to me the sign of the very act of spirit-birth. We may imagine man to have emerged ever so gradually from animals. In this gradual development, the moment he becomes conscious of self, the moment he turns his thoughts inward in wonder upon the mystery of his own existence as separate from nature, that moment marks the birth of humanity out of animality: moral responsibility, immortality, capacity for indefinite progress are all involved in this event. I am quite sure that if any animal, say a dog or a monkey, could be brought to the point of self-consciousness (which, however, is impossible), that moment it or he would become a moral, responsible being, and all that is characteristic of man, immortality, and capacity of indefinite progress and all, would necessarily follow.

Thus, then, nature, through the whole geological history of the earth, was the gestative mother of spirit, which after its long embryonic development came to birth and to independent life and immortality in man. Is there any conceivable meaning in nature without this consummation?

All evolution has its beginning, its course, its end. Without spirit-immortality, this beautiful cosmos, when evolution has run its course and all is over, would be as if it never were,—an idle dream and idiot tale, signifying nothing. In one word, without immortal spirit the cosmos has no meaning. Now mark: without this gestative method of creation of spirit, the whole history of the earth before man would still have no meaning.

He alone, therefore, is possessed of two natures,—a lower and a higher. The whole mission of man is the progressive and, finally, the complete dominance of the higher over the lower: the whole meaning of sin is the humiliating bondage of the higher to the lower. As the material evolution of nature found its goal and completion and significance in man, so must man enter immediately on a new and higher evolution to find its goal and completion in the ideal man, the divine man. As spirit, unconscious in the womb of nature, continued to develop by necessary law until it came to birth in man, so the new-born spirit of man, both in the individual and in the race, must ever strive by freer law to grow into a higher life and into a newer birth.

XXV.

PROF. EDWARD C. PICKERING.

HARVARD COLLEGE OBSERVATORY, CAMBRIDGE, MASS.

Your note regarding the relation of science to the question of immortality is at hand. In reply, astronomy appears to throw no light on this problem, one way or the other. Since it deals entirely with the material universe, it does not seem probable that such questions would ever be included in its pale. The same may be said of nearly all other branches of physical science. The study of nerve action by the aid of physiology, and the examination of so-called spiritual phenomena by the aid of physics, are exceptions to this rule. On the other hand, the question of immortality is clearly within the pale of the mental sciences, and the application to them of the rigorous and precise methods of physical science is most important. The results so far obtained by this method are negative; and the belief of a scientific man, like that of any one else, must be based entirely on faith.

XXVI.

IRA REMSEN,

PROFESSOR OF CHEMISTRY IN THE JOHNS HOPKINS UNIVERSITY AND EDITOR OF AMERICAN CHEMICAL JOURNAL.

I find it extremely difficult to answer the questions propounded by you, the chief difficulty arising from the fact that "personal consciousness" is an expression which cannot be defined. We do not know what it is. It is undoubtedly in some wonderful way connected with the workings of the brain. Whether it is something which is capable of existence independently of the existence of the brain is, it appears to me, the first point to be decided. I do not know of "any facts in the possession of modern science" which enable us to answer this question. If it could be shown that "personal consciousness" is necessarily connected with the workings of the brain, a strong argument would thus be furnished against its immortality. It seems to me possible that researches in the realm of psycho-physics, including observations on those whose brains do not

work normally, may eventually throw some light upon the subject of "personal consciousness." You will see, therefore, that I do not "consider the question out of the pale of science altogether."

As regards the question whether there is "anything in such discoveries to support or strengthen a belief in immortality," I can only say that the whole tendency of modern science is to show that immortality, not necessarily of "personal consciousness," but immortality in a broad sense, appears to be a necessary consequence of the workings of the laws of nature.

Investigations in every subject are leading us to a clearer recognition of the truth; and I have strong faith that the more clearly we recognize it, the better we shall be. Our views on many subjects are undergoing change,—in most cases, I am convinced, for the better. Should our views regarding the immortality of "personal consciousness" undergo a radical change, higher views of man's relation to the universe would take their place, and still stronger reasons for living honest, righteous lives would be recognized. I make these last statements to indicate my ideas in regard to the tendency of modern science in its bearing upon the subject you have brought under discussion.

XXVII

ALEXANDER GRAHAM BELL.

I understand that the object of your inquiry is to ascertain the bearing of scientific discoveries upon the question of immortality, and that you simply solicit my personal opinion upon the subject.

1. To my mind, the "Evolutionary Hypothesis" tends to weaken belief in the "immortality of personal consciousness" by revealing a cause for the growth of such an idea quite independently of its truth.

In the "struggle for existence," a fear of death would often operate to preserve life. Especially to early man would such a fear have been advantageous; for, in many cases, he was weaker than the formidable animals with which he had to cope, and inferior to them in ability to find safety in flight, so that he must constantly have escaped death only by the exercise of ingenuity. The inventive faculty would thus be stimulated by the fear of death, and those persons would survive who were intelligent enough

to adopt the weapons and devices that were best fitted to preserve their lives and destroy their enemies. As destructive power increased through invention and the survival of the intelligent, the mental faculties would be still further stimulated by the conflict of man with man.

Thus, in man, the fear of death, being advantageous, would be preserved and intensified by natural selection, and be correlated with his mental growth.

The idea of immortality would find in man a mental soil in which to take root and grow, for the desire for immortality would be strong in those who feared to die. The idea, once formulated, would be bound to the heart by the feelings engendered by the social state. Who would not cherish the thought that the dear ones who have left us still live, and think of us and love us as of old? And who would not cling to the hope that the affliction and misery and wrong that we see around us may be somehow righted in another life?

As a matter of fact, an instinctive fear of death has been handed down to us from the past; and mankind approaches the subject of your inquiry with an inherited *bias* in favor of immortality.

The emotions are so strongly enlisted as to oppose an obstacle to investigation; and the heart whispers to the brain, "Where ignorance is bliss, 'tis folly to be wise." An instinctive desire is felt to avoid issue with a blessed and consolatory belief, by considering the whole subject of immortality as outside the pale of heartless "science," which seeks truth, and truth alone, quite apart from any consequences that may arise.

"Personal consciousness"— or the perception of the "ego"— is one of the highest manifestations of thought.

The possibility of thought without a brain *whereby to think* is opposed to experience, but the persistence of "personal consciousness" after the death of the body involves this assumption.

Our asylums for idiots and insane are full of arguments favoring the hypothesis of a causal connection between the condition of the brain and the mind.

"*Mens sana in corpore sano*" was the experience of the past; and the verdict of modern science, I think, only adds confirmation. So dependent is "personal consciousness" upon bodily conditions that its loss may be caused by simple

pressure on the substance of the brain. Even under normal circumstances, we nightly lose consciousness in sleep. Syncope may result from a disturbance of the circulation of the blood, and unconsciousness can be produced at will by the employment of anæsthetics.

2. Such facts as these show that the individual may exist without self-consciousness; and if what we call "the soul" is a separate and distinct entity,— distinct from the body,— I can see nothing in science to *negative* the assumption of its immortality, while at the same time I can find nothing to support the hypothesis of personal consciousness without a body.

The perception of the "ego" does not necessarily prove the existence of a soul as a distinct entity, any more than our other perceptions prove that light, heat, and sound are entities. Indeed, we know that these are not; and the self-same movement of the luminiferous medium may be perceived by one sense as light, and another as heat,— a dual perception from a single cause.

While, then, it is true (so far as I know) that science cannot assert that there is such a thing as a soul at all, it is equally true that it cannot postulate its non-existence.

Some of the highest generalizations of science, the "indestructibility of matter" and the "conservation of energy," point to the immortality of the elements of which we are composed. If the "ego" is a distinct existence,—elemental in character,—every analogy would indicate its immortality.

This is the most, I think, that science can say in favor of immortality; but, if it favors the hypothesis at all, it does so *backwards* as well as forwards.

We have no personal consciousness of any prenatal existence; but, if an elemental (though unconscious) "ego" existed before birth, then we have proof from experience (in the fact of our present existence) that such a soul, under suitable conditions of environment, may acquire a body and the power of self-consciousness.

Embryology favors the belief that the wonderfully complex organism which we inhabit has arisen as a new creation out of an almost structureless mass of protoplasm, and it discredits the old idea that the perfect man was to be found in miniature in the embryo. The theory of epigenesis teaches that "the organs of the embryo arise *by new formation*, and not by mere enlargement out of a pre-existing invisible condition." In the egg of a bird, we can find, at first, no trace of bone or muscle or down; and yet the presence of a vitalized germ determines, in that egg, the formation of the living bird.

3. I do not think that any subject of fact can be considered as beyond the pale of science, although there are many subjects which cannot be directly investigated on account of lack of data from which to make deductions.

The question of what exists beyond death is like asking what there is on the other side of the moon. We can never know for certain till we go there! We may feel sure that something exists on the other side; and, while it may be impossible for us ever to obtain even a glimpse of the reality, we may hope to arrive at conclusions more or less probable by study of the side submitted to our view.

XXVIII.

F. A. P. BARNARD, S.T.D., LL.D.,

PRESIDENT OF COLUMBIA COLLEGE, NEW YORK.

After mature reflection, it seems to me that science has nothing whatever to say to the question. The only basis of our faith in immortality must be found in Revelation.

NOTES ON THE TESTIMONY.

BY SAMUEL J. BARROWS,

EDITOR OF THE "CHRISTIAN REGISTER."

THE notable expression of scientific opinion contained in the preceding pages furnishes fruitful themes for discussion to all who are interested in the great problems of human destiny.

From time to time, science has encroached upon the domain of religious tradition. It has not so much affected the substance of religious beliefs as it has compelled a change in the forms in which they have been held. One perishable dogma of the Church after another has gone to pieces under its hammer or been dissolved in its crucible. The doctrine of the literal resurrection of the body, though long held on the supposed authority of an infallible revelation, was inevitably doomed by the discoveries of science. The literal six-day interpretation of the cosmogony of Genesis can no longer be maintained against the

older record of creation which science reveals. The theory which represented the earth as the centre of the universe and all other bodies but satellites has given place to truer cosmic conceptions. The Church has tried in vain to arrest the disintegration of its dogmas, but the process has surely gone on; and now it is gradually compelled to adjust itself to larger conceptions of truth, which, instead of impoverishing, eventually enrich it. Once, the Church was the only oracle: now, Science has also an oracle of its own, at which the Church on many subjects must inquire, if it wishes to test its conclusions by the authority of Truth.

On the subject of immortality, science and religion both claim a voice. In writing the history of humanity, science needs to take into account the religious development of the race, and religion equally needs to seek the truth which comes through science, whenever it sheds light upon the history or destiny of humanity. The question which religion puts to science is, What have you to say on the great theme of immortality? Must the belief in the immortality of the soul share the fate of the belief in the literal resurrection of the body?

In the preceding articles, we cannot claim to have a formal or authoritative decree of Science, any more than we can claim to have an authoritative decree from Religion on the same theme. We have, however, a consensus of scientific opinion presented by twenty-six of the most prominent scientific men of this country and of England. The articles there given present the conditions under which, according to scientific opinion, a belief in immortality may be held, the difficulties which assail it, the indications which support it.

What shall we say of the evidence?

1. It must be noticed that doctors in science, like doctors in theology, do not agree. It is not likely that this jury by any enforced restraint or painful abstinence could be brought to a unanimous verdict. There is, therefore, no decision to be accepted or set aside, but simply a disagreement to be analyzed. If we could multiply these witnesses by a hundred or a thousand, the evidence before us would undoubtedly exhibit the same variety of opinion. The question cannot be settled by a majority vote either of scientists or of churchmen.

2. If unanimity can be found anywhere in

these articles, it is most nearly attained in the general concession that Science cannot show that immortality is impossible. This is, of course, only negative proof; but it shows that science is as helpless to refute the doctrine as religion is to demonstrate it. It has been sometimes assumed in modern discussions that science has facts or tests in its possession which render a belief in immortality rationally impossible. The testimony of this jury of scientists shows that that is not the case.

Mr. John Fiske said, not long ago, that philosophically the relation of science to immortality stands to-day just about where it stood in the time of Descartes; that is, there is no more positive proof against the doctrine now than there was then. Prof. Asaph Hall, in his article, also says, "The metaphysical arguments and analogies of Spinoza, Butler, and Kant may be repeated to-day with as much force as ever; and the answers and discussions must be essentially the same." Prof. Newcomb does not think that "modern investigation has brought to light any new facts which really bear upon the question." Prof. Lesley says, "Science cannot possibly either teach or deny immortality." Dr. Dana says, "I

have the fullest confidence that there is nothing in science or in any possible results from investigations of Nature against immortality." Prof. Huxley, Herbert Spencer, and Prof. Morse are agnostics on the subject.

3. It is to be noted that the evidence *against* immortality presented in these articles is contested by some who take the agnostic position. Thus, Prof. Ward thinks "the conclusion almost a necessary one that brain is the cause of consciousness, and that consciousness depends upon and varies with the nature and condition of the brain," and that "destruction of brain results in destruction of consciousness." Prof. Leidy likewise says, "Personal consciousness is observed as a *condition* of each and every living animal, ranging from microscopic forms to man. The condition is observed to cease with death; and I know of no facts of modern science which make it otherwise than difficult to believe in the persistence of that condition,— that is, 'the immortality of the personal existence.'" "Prof. Huxley, on the other hand, challenges this very assumption: "If [one] says that consciousness cannot exist except in relation of cause and effect with certain organic molecules, I must ask how

he knows that; and, if he says it can, I must put the same question." The difficulty, however, of believing in the persistence of consciousness after death is one which is evidently felt by most of the writers whose opinions we have sought, and, in addition to Profs. Ward and Leidy, Profs. Young, Newcomb, and Morse give expression to it. The phenomena of consciousness secure a fuller discussion in the papers of Profs. Cope and Le Conte.

4. While there are those in this group of scientists who do not find that the discoveries of science have in any way undermined their personal belief in immortality, there are others who find evidence in science which makes their belief even stronger.

It is to be noted here, however, that those who agree in believing in immortality do not wholly agree as to *why* they believe in it. Prof. Asaph Hall is able to say, "I think the discoveries of modern science strengthen the belief in immortality." Prof. Gray thinks that "immortality of the personal consciousness is a probable, but not unavoidable, inference from theism."

Dr. Gould points to "the immanence of Deity in all physical phenomena as well as the permanence of the individual through and beyond all physical changes which may affect him," and adds, "That a profound and unbiassed study of any branch of natural science should lead to disbelief in immortality seems to me preposterous."

Dr. Hill finds the solution to be that "man is in communication with the Creator of the universe"; that "the progress of modern science is an ever-accumulating demonstration that the source of all being is in a Person"; and that God "would not thus hold converse with beings whom he had doomed to perish."

Prof. Young, of Princeton, leans strongly to the opinion that the question is out of the pale of science altogether. He cannot accept the materialistic hypothesis as scientifically satisfactory, and is forced to consider it as much more probable that a man is more than his body, and likely to survive it. In his judgment, "the knowledge of 'life and immortality' comes only by revelation." This is substantially the position of Prof. Josiah P. Cooke and Sir William Dawson. Prof. T. Sterry Hunt believes "in a conditional immortality in an eternal life begun already in this world, which is not man's birthright, but the gift of God." Prof. Pickering holds that the question is clearly within the pale of the mental sciences, but that the results so far are negative, and "the belief of a scientific man, like that of any one else, must be based entirely on faith."

On the other hand, Prof. A. R. Wallace, the eminent English naturalist, confesses that, "outside of modern Spiritualism," he "knows of nothing in recognized science to support the belief in immortality." He holds that these phenomena may be subjected to scientific tests. In this belief, he is supported by Prof. Crookes, the English chemist. Dr. Elliott Coues holds that "there is much in the discoveries of psychic science not only to support or strengthen the belief in immortality, but to convert that belief into knowledge."

Gen. Greely, who in the terrors of arctic exploration came so near testing personally the question at issue, says, "If scientific truths have weakened in some this hope of personal immortality, yet in others such revelations as the immensity of the universe, the indestructibility of matter, and the conservation of energy have strengthened it."

Prof. Charles S. Peirce does not see "why the dwellers upon earth should not in some future day find out for certain whether there is a future life or not." Gen. Greely also finds ground for the hope "that some day the proving of immortality may be as possible and satisfactory as is now the demonstration of certain physical theories which are generally admitted to be truths."

President Gilman believes that the hope of a life to come, together with man's belief in a Father Almighty and the recognition of a moral law, "will stand firm, whatever discoveries may be made of the evolution of life, the relation of soul and body, the nature of atoms and of force, and the conceptions of space and time."

Prof. Lesley, while admitting, as before said, that "Science cannot possibly either teach or deny immortality," adds, "But every man of science must acquiesce in the fact of the general conviction, and in its probable ground in some persistent part of our nature."

Dr. Ira Remsen writes, "I am convinced that the whole tendency of modern science is to show that immortality — not necessarily of 'personal consciousness,' but immortality in a broad sense — is a necessary consequence of the workings of the laws of nature."

Prof. Joseph Le Conte, in his elaborate study of the history of consciousness, believes that in man "spirit emerges above the surface into a higher world." Before man, he finds spirit incapable of independent life. It is man alone in the whole range of conscious beings that acquires separate life or immortality. "Without immortal spirit," says Prof. Le Conte, "the cosmos has no meaning." This argument is therefore similar to that of Mr. John Fiske, who holds substantially that consciousness may become persistent at a certain period in its development, as in the life of man. Prof. Morse, on the other hand, maintains that immortality of the personal consciousness for man would imply immortality for all life, to the bottom round.

To the mind of Prof. Alexander Graham Bell, the evolutionary hypothesis tends to weaken belief in the immortality of personal consciousness, yet he admits that "if the 'ego' is a distinct existence elemental in character, every analogy would indicate its immortality."

Dr. Cope and Prof. Peirce do not hesitate to grapple athletically with the logical problems involved in the relations of mind to matter. They both take strong and well-fortified ground

against the mechanical and automatic philosophy. "In my opinion," says Prof. Peirce, "the doom of the necessitarian metaphysics is sealed. The world has done with it. It must now give place to more spiritualistic views, and it is very natural now to anticipate that a further study of nature may establish the reality of a future life." Prof. Cope, through an elaborate and thorough study of the problem of creation, finds that "we thus render probable the existence of a supreme mind which is immortal. And from that premise we may infer that under proper conditions our own minds are or may be immortal also."

In the previous quotations, presenting a variety of arguments, opinions, and probabilities, we see on what different rational elements the belief in immortality may be made to rest, while in some cases it is made purely a matter of religious faith. It illustrates the strength of the hold of immortality upon the human mind and heart, that so many holding it justify their belief in it on entirely different grounds. It leads one to think that immortality is one of those faiths of the soul of which it has been said that we believe it, not because we can prove it, but we prove it because we believe it.

In these inquiries, emphasis was laid on the point of personal consciousness, because this has always been an important element in the conception of immortality in the Occidental mind. Undoubtedly, the majority of Christians would think immortality hardly worth considering if personal consciousness did not go with it. The Oriental mind, however, has never laid so much stress upon personal consciousness. The Hindu throws a lump of salt into the river. "It is gone," he says; "but it is all there." The Oriental mind is capable of conceiving without dismay of the absorption of the individual soul into the Eternal Soul of the universe. Such a destiny it regards not as destruction, but as deification. The satisfaction we find in such a view will depend much upon the intensity with which the belief in God is held.

Were the perpetuity of mind the only problem before us, the answers of scientists would be easier and more unanimous. On the physical side, science assures us that not an atom is lost. Matter changes its form, but does not die. If matter is indestructible, is not the soul of matter indestructible? And here Prof. Lester F. Ward assures us that "science postulates the immortal-

ity, not of the human soul alone, but of the soul of the least atom of matter." The loss of personal consciousness does not thus involve the idea of extinction. There is a vast difference between dropping into absolute nonentity and continuing, through whatever changes of personal identity, as a part of the soul-force of the universe. If the individual life is to grow into larger capacity hereafter, perhaps one of the first essentials may be the breaking down of the limits of personality, in order to partake in a larger degree of the forces of an omnipotent Will, an unlimited Intelligence, and an absolute Righteousness. Immortality may be achieved, therefore, not through the insulation of the individual soul, but through its expansion into larger relations of life and mind.

5. There are further indications in some of the papers that such side-light as science throws upon immortality suggests possible change in the form of belief in which that doctrine is held. At least, the effect of questioning science on this theme is to open up another whole series of questions as to the conditions of future existence. This is seen in the conclusion of Prof. Lesley's paper. It is also suggested by Prof. Cope, who

says: "As to the nature of this supposed immortality, science can have little to say. One thing, however, may be asserted. We cannot be sure of retaining our personality intact, although a great change might not be any cause for regret. As we change our personality in the course of time during this life, we cannot be sure of retaining it in another. But we do not always regret the change which time produces here; in fact, we may generally rejoice in it. Then there is a question as to the necessary isolation or distinction of consciousness from each other, all of which may be relegated to the region of speculation."

Humanity has already experienced many changes in its belief in immortality during its passage from a lower zone of life to a higher. But, of the new forms of that belief which still remain to us, science may furnish some of the most grateful. Instead of chilling our convictions, it may eventually give to them a greater glow. We do not believe that the truths of religion are to be verified by what, in the strictest sense, may be called scientific data. But the wholly new conception of the processes and history of the universe and its unity and magnitude,

which science reveals, furnishes grand and inspiring material for the exercise and development of the loftiest piety. This confidence that humanity is growing toward larger ideals and better hopes is well expressed in the reassuring words of Dr. Remsen: "Our views on many subjects are undergoing change,—in most cases, I am convinced, for the better. Should our views regarding the immortality of 'personal consciousness' undergo a radical change, higher views of man's relation to the universe would take their place, and still stronger reasons for living honest, righteous lives would be seen."

The result of our inquiry has thus shown that Science has developed no view of the universe or of the origin and destiny of man which prevents Religion from cherishing its grandest hopes, its most inspiring faiths. The belief in immortality may still be rationally justified by the processes of logic, may still be warmed by the heart, and colored by the imagination. "He must be an unobservant man," says Rev. O. B. Frothingham, "who can persuade himself that the belief in immortality has lost its hold on live minds, and he must be a stubbornly opinionated man

who has persuaded himself that either philosophy or science pronounces finally against it. The thinkers who stand up for it — who maintain it on grounds of pure reason — are as eminent as the thinkers who reject it, and they are far more numerous. The men of science who earnestly defend it are in every respect the peers of its antagonists. At the bar of reason, both sides plead. The case is not closed, nor is it likely to be. Setting aside the evidences presented by 'Spiritualism,' and confessing the insufficiency of the arguments commonly adduced by philosophy and religion, the case is not abandoned by the masters of intellect. The children of the heart give no sign of a disposition to surrender their faith. The conscience still prophesies, the soul still aspires. And so it will be until the ancient petition shall be answered: 'May thy kingdom come. May thy will be done on earth, as it is in heaven.'"

Science itself must be enlarged before it can include in its discussion all the elements which are needed to answer the great question of immortality. Science engages itself mostly with the phenomena of Nature, with the objective world. There is a vast region of mind which it

has not yet included in its tests. Humanity itself is a product of Nature, and cannot be left out in any estimate of Nature's testimony. With humanity, we must take the whole range of emotions and of ethical motives that influence it. The hopes, the affections, the infinite yearnings of the human heart will not be silenced. These are a part of our heritage, and these are prophetic of our destiny. If ethics is something more than a few utilitarian precepts, if it is the manifestation in the life and heart of man of an Eternal Righteousness which throbs in the universe, then science can no more ignore ethics than it can ignore gravitation. It is to ethics and psychology that we must turn when we seek the destiny of mind. From this stand-point there is great significance in the quotation which Dr. James makes from Lotze: "We have no other principle for deciding the question than this general idealistic belief: that every created thing will continue whose continuance belongs to the meaning of the world, and so long as it does so belong; whilst every one will pass away whose reality is justified only in a transitory phase of the world's course."

Ethics may lead us to the belief that the good

of the individual depends upon the final good of the whole, and psychology may assure us that the mind that wells up in us is a part of the Eternal Consciousness of the universe. When we come, therefore, to believe that the good of the individual is attained through the good of the whole, and are willing to live for such a great end in this life, then we may be willing to live for it in the next. A selfish concern for our own individual salvation may yield to a desire to contribute to the salvation of the universe, to join our little lives with the Eternal Righteousness. And, when we feel that it is the Eternal Consciousness that wells up in us, we may rejoice like the rain-drop to fall in the great ocean from which our life is derived.

In any case, we believe that the hope of immortality is not to be diminished, but to be glorified. If our lives are hid, they are hid in God. It is a faith of the soul that we cannot go where the Eternal Love will not hold us in its protection and the Eternal Mind illumine us. Our immortality is the immortality of God, whose children we are and from whose endless life we are born. If we lose our lives, it is only that we may find them again in God.

BIOGRAPHICAL NOTES.

FREDERICK AUGUSTUS PORTER BARNARD, S.T.D., LL.D., L.H.D., was born in Sheffield, Mass., in 1809, graduated at Yale College in 1828, was tutor in the same college in 1830, Professor of Mathematics and Natural Philosophy in the University of Alabama 1837–48, Professor of Chemistry and Natural History in the same institution 1848–54, President of the University of Mississippi 1856–58, Chancellor of the same 1858–61. He took orders in the Protestant Episcopal Church in 1854, was connected with the United States Coast Survey in 1863–64, was elected President of Columbia College, New York, in 1864, and still holds the position. He has published a large number of works on scientific and educational subjects. He was one of the original incorporators of the National Academy of Science, and one of the United States Commissioners to the Paris Exposition.

ALEXANDER GRAHAM BELL, was born in Edinburgh, Scotland, March 3, 1847. He is a son of Alexander Melville Bell, the eminent elocutionist, and author of the *System of Visible Speech*. He

was graduated at the Edinburgh High School and Edinburgh University. He came to Canada in 1870, and to the United States in 1872. He introduced in this country the system of deaf-mute instruction, which his father did so much to develop. He was Professor of Vocal Physiology in Boston University. He is most widely known as the inventor of the telephone. On May 10, 1876, he gave an exhibition in Boston, in the rooms of the American Academy, on telegraphing musical sounds. This was the prelude to the speaking telephone, which was exhibited at Philadelphia in the same year. He is also the inventor of the photophone. He has been much interested in the education of the deaf and dumb, and has written an important paper on this infirmity as viewed in its relation to heredity.

JOSIAH PARSONS COOKE, LL.D., was born at Boston, 1827, graduated at Harvard in 1848, became Erving Professor of Chemistry and Mineralogy of Harvard University in 1851. He has published *Chemical Physics*, *Religion and Chemistry*, *Principles of Chemical Philosophy*, *The New Chemistry*, *Scientific Culture and Other Essays*, and made numerous contributions to scientific journals.

EDWARD DRINKER COPE, A.M., Ph.D., was born in Philadelphia in 1840. He was Professor of Natural Science in Haverford College from 1864 to 1867.

He has been a voluminous contributor to scientific literature. A catalogue of his papers would fill several pages of this book, and its readers might find many of the titles almost unpronounceable. His studies have ranged through zoölogy and paleontology, and he was paleontologist of the United States Geological Survey of the Territories. He has done much in the interest of accurate scientific classification. He has treated the hypothesis of evolution in various aspects, and has published a collection of essays on the subject in a work entitled *The Origin of the Fittest*. His last book, issued within a few weeks, considers the "Theology of Evolution." Professor Cope, as will be seen from his paper, is not only strong in scientific knowledge, but in his philosophical power of grappling with scientific generalization.

ELLIOTT COUES, M.D., Ph.D., was born at Portsmouth, Sept. 9, 1842. Dr. Coues is chiefly known through his numerous works on ornithology, mammalogy, herpetology, bibliography, comparative anatomy, and natural philosophy. Dr. Coues has held the following official positions: Medical Cadet, U.S. Army, 1862–63; Acting Assistant Surgeon, U.S. Army, 1863–64; Assistant Surgeon, U.S. Army, 1864–81, resigned November 17; Professor of Zoölogy and Comparative Anatomy, Norwich University, Vt., 1869; Surgeon and Naturalist, U.S. Northern Boun-

dary Commission, 1873–76; Collaborator, Smithsonian Institution, 1875; Secretary and Naturalist, U.S. Geological and Geographical Survey of the Territories, 1876–80; Professor of Anatomy, National Medical College (Medical Department of Columbian University), Washington, 1877; Professor of Biology, Virginia Agricultural and Medical College, 1883; Member of the General Council, and of the American Board of Control, Theosophical Society of India, 1884.

Dr. Coues is a member of the National Academy of Sciences, of the American Philosophical Society, Corresponding Member of the Zoölogical Society of London, and is a member of many other societies. He is the founder of the Gnostic Theosophical Society of Washington, and a Fellow of the Theosophical Society of India. He is the author of several hundred monographs and papers in scientific periodicals, besides many separate works.

JAMES DWIGHT DANA, LL.D., was born 1813, and is a graduate of Yale. His *System of Mineralogy* was first published in 1837. He accompanied the Government Exploring Expedition of 1838, under command of Capt. Wilkes. He has been for years one of the editors of the *American Journal of Science*. In 1850, he was elected Professor of Natural History and Geology in Yale College, and entered on

duty in 1855. He is one of the three American Fellows of the Royal Society.

SIR J. WILLIAM DAWSON, C. M. G., LL.D., F.R.S., F.G.S., was born in Pictou, N.S., in 1820. He was educated at the University of Edinburgh. He was appointed Superintendent of Education in Nova Scotia 1850, and Principal of McGill College, Montreal, in 1855, a position which he still holds. He is the author of *Acadian Geology*, *The Story of the Earth and Man*, *The Origin of the World*, *Life's Dawn on Earth*, *Fossil Men and their Modern Representatives*, and many memoirs, reports, and papers on geological subjects. He is a past President of the American Association for the Advancement of Science, and presided at the meeting of the British Association for the Advancement of Science in Birmingham in 1886.

DANIEL COIT GILMAN, LL.D., was born at Norwich, Conn., in 1831, and graduated at Yale in 1852, was Professor of Physical and Political Geography at Yale College in 1856–72, Superintendent of Schools in Connecticut 1863–65, President of the University of California 1872–75, became President of Johns Hopkins University, Baltimore, 1875. He has written numerous scientific, historical, and educational papers.

BENJAMIN APTHORP GOULD, LL.D., was born in Boston, 1824, graduated at Harvard College in 1844,

studied astronomy abroad for four years. Dr. Gould established at Cambridge, in 1849, the *Astronomical Journal*. His contributions to astronomical science have been numerous and valuable. In 1855, he became Director of the Dudley Observatory at Albany. In 1870, he went to South America, where he established a national observatory at Cordova for the Argentine Republic. He published several volumes of observations. He is a member of the National Academy of Science, of the Royal Astronomical Society of London, the Academies of Paris, Berlin, St. Petersburg, Vienna, Göttingen, etc., the American Philosophical Society, and the American Academy.

ASA GRAY, M.D., LL.D., was born in Paris, Oneida County, New York, 1810. He received his medical degree in 1831, made a specialty of botany, and became Professor of Natural History in Harvard University in 1842. He resigned from this position 1873. Dr. Gray was President of the American Academy, is a member of the National Academy of the Linnæan Society of London, and the Imperial Academy of Science of St. Petersburg. He is one of the three American Fellows of the Royal Society. His popular books on botany, *How Plants Grow* and *Lessons in Botany*, are widely known; and his *Manual of Botany* is as familiar as a dictionary to all students of that science.

BRIG.-GEN. ADOLPHUS W. GREELY was born in Newburyport, Mass., March 27, 1844, and was fitted for college in its public schools. On July 3, 1861, he was enrolled as a private in Company B of Major Ben: Perley Poore's Rifle Battalion, which formed part of the Nineteenth Regiment Massachusetts Volunteer Infantry. July 26, 1861, he was mustered into the United States service. In September, 1861, he was appointed Corporal. He served in the engagements of Ball's Bluff, reconnoissance at Lee's Mills, siege of Yorktown, West Point, Fair Oaks, Heintzelman's skirmish, June 25, 1862, Peach Orchard, Savage Station, White Oak Swamp or Glen Dale (wounded), Malvern Hill, Chantilly, Antietam (twice wounded and in hospital therefrom two months), and was one of the "forlorn hope" at the crossing of the Rappahannock, Dec. 11, 1862, and at Fredericksburg. For good behavior at Fredericksburg, he was appointed First Sergeant. He rose to be a Captain, and was brevetted Major United States Volunteers, March 13, 1865, "for faithful and meritorious services during the war."

He was appointed a Second Lieutenant Thirty-sixth Regular Infantry, March 7, 1867, from the State of Louisiana, and served with his regiment at Fort Sanders, Fort Bridger, and at Salt Lake City, until August, 1868, when he was ordered to duty with the chief signal officer of the army.

His work in the Signal Service Bureau has been of

great value. He was complimented by the chief signal officer for the great energy and despatch shown in the construction of military telegraph lines. He has made important contributions to meteorological charts.

In March, 1881, he was assigned by direction of the President to the command of the International Polar Expedition to Lady Franklin Bay, and sailed July 7, 1881. The remarkable history of this expedition, its valuable scientific observations, and the wonderful escape of Gen. Greely and a few of his comrades aroused the attention of the civilized world.

Since his return, Gen. Greely has received many attentions from learned societies at home and abroad. The Royal Swedish and Scottish Geographical Societies and the British Science Association have elected him to honorary membership, the American Geographical Society gave him an enthusiastic reception, while the Paris and the Pacific Geographical Societies adopted complimentary resolutions on his services. The Royal Geographical Society unanimously awarded him the highest honor, the founder's gold medal, in 1876. He received the thanks of the Commonwealth of Massachusetts through the General Court.

Gen. Greely was promoted to Captain of the Fifth Cavalry June 11, 1886, and Chief Signal Officer, with the rank of Brigadier-General, Feb. 6, 1887. He received, April 15, 1887, the Roquette gold medal, the

highest honor conferred by the French Geographical Society. Gen. Greely has left a lasting memorial of his expedition in the scientific account which he has prepared of it.

ASAPH HALL, LL.D., was born in Goshen, Conn., in 1829. He is Professor of Mathematics, U.S.N., and is connected with the National Observatory at Washington. He received the degree of LL.D. from Yale in 1879, and from Harvard in 1886. He won a world-wide reputation as discoverer of the moons of Mars, and received a gold medal from the Royal Astronomical Society. He has made important contributions to the annual *Washington Observations*.

THOMAS HILL, D.D., LL.D., was born in New Brunswick, N.J., 1818, graduated at Harvard College, studied theology two years, was made President of Antioch College in 1859 and of Harvard College in 1862, resigned in 1868. Dr. Hill is a man of wide knowledge and remarkable versatility. He is most highly distinguished as a mathematician; but, in addition to being a good classical scholar, he has made a special study of the philosophy of education and of natural theology. He has published a number of poems, is a great lover of music, has tried his hand at landscape painting, and not long ago painted his own portrait for a friend. Think of it,—preacher, teacher, poet, mathematician, botanist, artist, philos-

opher, author! He is a member of the American Academy and of the American Philosophical Society.

THOMAS STERRY HUNT, LL.D., was born at Norwich, Conn., 1826; studied medicine and chemistry, and in 1845 became assistant in chemistry to Prof. Silliman; served for twenty-five years as chemist and mineralogist to the geological survey of Canada; was Professor of Chemistry in the Laval University, Quebec, and in McGill College, Montreal, and later, until his resignation in 1879, of Geology in the Massachusetts Institute of Technology. He is a member of the National Academy of Sciences of the United States, of the Royal Society of London, of the Leopoldo-Carolinean Academy of Germany, and of a great number of other learned societies in America and Europe, besides being an officer of the Legion of Honor of France, and of the order of Sts. Mauritius and Lazarus of Italy. He is M.A. of Harvard, and LL.D. of Cambridge, England. In his two recently published volumes, entitled *Mineral Physiology and Physiography* and *A New Basis for Chemistry*, but especially in the first two chapters of the former, will be found embodied his views on the philosophy of matter and of life.

WILLIAM JAMES, M.D.—Dr. James is the son of the late Henry James, of Cambridge, and a brother of the well-known novelist. He graduated from Har-

vard in 1869, studied abroad, was Assistant Professor of Physiology in Harvard College, and is now Professor of Philosophy in the same institution. He has made many contributions to scientific and philosophical journals, and is a philosophical writer of rare depth and acumen.

JOSEPH LE CONTE, M.D., LL.D., was born of Huguenot parentage, Feb. 26, 1823, in Liberty County, Georgia. Graduated A.B. at Franklin College, University of Georgia, in 1841, and A.M. in 1845, and LL.D. in 1879. Graduated M.D. in New York College of Physicians and Surgeons in 1845, B.S. in Lawrence Scientific School, 1851, specialty being Geology and Natural History. Elected Professor of Natural Sciences in Oglethorpe University, Georgia, in 1852; same in Franklin College, University of Georgia, in 1853; of Chemistry and Geology in South Carolina College, in 1857; of Geology and Natural History in University of California, in 1869, where he still remains.

His principal works are: "Agency of Gulf Stream in Formation of Peninsula and Keys of Florida," in 1856, *American Journal of Science*. "Correlation of Vital with Physical and Chemical Forces," 1859, *American Journal of Science*. A series of articles in *Southern Presbyterian Review*, on Education, on Philosophy of Art, on Relation of Sociology to Biology, etc., 1858–63. A series of twelve

articles on "Phenomena of Binocular Vision," in *American Journal of Science* and elsewhere, 1868–87. A series of articles, "Structure and Origin of Mountain Ranges," *American Journal of Science*, 1872–78. A series of articles on "Ancient Glaciers of Sierra," *American Journal*, 1873–75. Three articles on "Genesis of Metalliferous Veins," *American Journal*, 1882 and 1883. Two on "Glycogenic Functions of the Liver," *American Journal*, 1878 and 1880. Two on the "Old River-beds of California as showing Post-tertiary Elevation of the Sierra," 1874–86. Four articles in *Popular Science Monthly*: (*a*) "Correlation of Vital with Physical and Chemical Forces"; (*b*) "Relation of Instinct and Intelligence"; (*c*) "Genesis of Sex"; (*d*) "Relation of Biology to Sociology," 1873–80. Five articles in *Princeton Review*, 1878–84: (*a*) "Man's Place in Nature"; (*b*) "School, College, and the University"; (*c*) "Relation of Evolution and Materialism"; (*d*) "Illustrations of a Law of Evolution of Thought"; (*e*) "Psychical Relation of Man to Animals." Two articles in *Berkeley Quarterly*, "Effect of Mixture of Races on Human Progress," "Comte's Classification of the Sciences," many others of less note.

He is the author of the following books:—

1. A volume of Sunday lectures entitled *Religious Science.*
2. *Elements of Geology*, for colleges.
3. *Compend of Geology*, for high schools.

4. *Sight*, an exposition of principles of monocular and binocular vision. International Scientific Series.
5. He is about to publish a work on *Evolution and its Relation to Religious Thought.*

He is a member of all the principal scientific societies of this country, member National Academy, Fellow American Academy of Arts and Sciences, Boston, American Philosophical Society, Philadelphia, New York Academy of Sciences, Fellow of American Association for Advancement of Science, etc.

JOSEPH LEIDY, M.D., LL.D., was born at Philadelphia 1823, graduated at the University of Pennsylvania in 1844, devoted himself to biology, comparative anatomy, and vertebrate paleontology, was chosen Professor of Anatomy in the Medical Department of the University of Pennsylvania in 1853, and in 1871 Professor of Natural History of Swarthmore College. He received the degree of LL.D. from Harvard College on its two hundred and fiftieth anniversary. He has been a frequent contributor to the Smithsonian *Contributions* and the *Journal of the Academy of Natural Sciences* and *Transactions of the American Philosophical Society*, Philadelphia.

J. PETER LESLEY was born in Philadelphia in 1819, graduated at the University of Pennsylvania in 1838, and at Princeton Theological Seminary in 1844, was assistant geologist in the first survey of Pennsylvania in 1839–41. He travelled on foot through France, and studied in the University of Halle in 1844. In 1845, he established the colportage system of the American Tract Society in the northern and middle counties of Pennsylvania. He was pastor of the Orthodox church in Milton, Mass., in 1847, and retired from the ministry in 1850. He has held various other official positions of a scientific character,—has been Secretary and Librarian of the American Philosophical Society, Professor of Geology and Mining Engineering in the University of Pennsylvania, was one of the corporate members of the National Academy, has published a variety of scientific monographs, and is now State Geologist of Pennsylvania. Like Dr. Hill, he is a man of great versatility; and we have before us a paper read by him before the American Philosophical Society on "The Hebrew Word 'Shaddai,'" showing a great deal of independent research in the Old Testament. Prof. Lesley is a man of wide knowledge in many departments.

EDWARD S. MORSE, Ph.D., was born at Portland, Me., in 1838. He manifested at an early age a profound love of natural history, preferring the woods and streams to the academy desk, and finding special delight in the study of shells, both land and marine. He also prepared himself for close observation and careful record by prolonged studies in drawing, spending several years in this pursuit and in practice as a professional draughtsman. From 1859 to 1862, Prof. Morse was an assistant of Agassiz at Cambridge, attending also the lectures of Wyman, Cooke, and Lowell. He was Professor of Comparative Anatomy and Zoölogy in Bowdoin College, Maine, for several years. In 1866, he settled at Salem, Mass., where he still resides, as Director of the Peabody Academy of Science. The chief scientific societies have chosen him to their memberships and to conspicuous offices in their organizations, and he was elected President of the American Association for the Advancement of Science. In the year 1877, Prof. Morse decided to visit Japan, in order to dredge along the coast for specimens in his favorite lines of research, especially for *brachiopods*,—an ancient, interesting, and wide-spread variety of deep-water creatures. The Japanese authorities secured his promise to return and accept the Chair of Zoölogy at the Imperial University at Tokio. Accordingly, in 1878, he removed with his family to Japan, where he dwelt for nearly two years, actively engaged at the University teaching, establishing a zoölogical station on the Bay of Yeddo, studying the traces of primitive man on the Japanese islands, and making voluminous notes and sketches of ethnological and general interest. He subsequently made a third visit to Japan, for the sole purpose of collecting and completing his illustrations. Prof. Morse has written a fascinating

book on *Japanese Homes*, and an important ethnological monograph on "Methods of Arrow Release," in addition to various scientific monographs. He is a member of the National Academy of Science and Fellow of the American Academy of Arts and Sciences.

SIMON NEWCOMB, LL.D., was born at Wallace, N.S., in 1835; came to the United States in childhood. A remarkable talent for mathematics was early exhibited. He was employed when twenty-two years of age as computer on the National Almanac. In 1861, he was appointed Professor of Mathematics in the United States Navy, and stationed at the Naval Observatory. In 1877, he was detached from the observatory and made Superintendent of the Nautical Almanac, the office of which is in the Navy Department. He was chosen in 1872 a Foreign Associate of the Royal Astronomical Society of England, which in 1874 awarded to him a gold medal for his table of Uranus and Neptune. He has published a book on Popular Astronomy, and is also the author of a work on Political Economy, and has been a frequent contributor to the magazines in this department. He is a member of the National Academy of Sciences.

EDWARD CHARLES PICKERING, S.B., is a descendant of one of the oldest families in Boston, and was graduated at the Lawrence Scientific School in

1865. Was Thayer Professor of Physics at the Massachusetts Institute of Technology from 1867–77, when he was appointed Phillips Professor of Astronomy, Professor of Geodesy, and Director of the Observatory of Harvard College. He has written two volumes on *Elements of Physical Manipulation*, and has contributed a large number of papers on astronomical and mathematical subjects to the *Journal of the Franklin Institute*, the *Proceedings of the American Academy*, and the *American Journal of Science*. He has edited several volumes of the *Annals* of the Harvard Observatory, containing photometric observations. He has received the gold medal from the Royal Astrononical Society of London for valuable researches.

CHARLES S. PEIRCE, S.B., is a son of the late Prof. Peirce of Harvard College. He was graduated at Harvard, was connected with the United States Coast and Geodetic Survey, and was a Lecturer on Logic in Harvard and the Johns Hopkins Universities. He is a member of the United States National Academy of Sciences, and has devoted himself to scientific logic. He has made some physical determinations, and has published a number of memoirs on the application of mathematics to physical problems.

IRA REMSEN, M.D., Ph.D., is a graduate of the College of the City of New York, and received his M.D. from the College of Physicians and Surgeons in New

York in 1867. He obtained a Ph.D. from the University of Göttingen in 1870, was Professor of Chemistry in Williams College from 1872–76, and previously assistant in chemistry in the University of Tübingen. He is the editor of the *American Chemical Journal*, and Professor of Chemistry in Johns Hopkins University. He is a member of the American Academy of Arts and Sciences and of the National Academy of Sciences. He is the author of four well-known text-books of chemistry, and is a constant contributor to the principal journals of chemistry.

LESTER F. WARD, A.M., of Washington, is one of the geologists of the United States Geological Survey, having vegetable paleontology for his branch of the service. He is also connected with the National Museum as Honorary Curator of Botany and Fossil Plants. He has published as a bulletin of the National Museum a *Guide to the Flora of Washington*, and in the Annual Reports of the Geological Survey a "Sketch of Paleobotany" and "Synopsis of the Flora of the Laramie Group," which are forerunners of larger works in preparation. His best known work is his *Dynamic Sociology*, in two volumes, which embodies a complete system of philosophy from an American stand-point. The scientific journal *Science* pronounced this work "America's greatest contribution to scientific philosophy." Mr.

Ward has been a constant contributor for the last twelve years to the leading scientific periodicals and magazines.

CHARLES A. YOUNG, Ph.D., LL.D., born at Hanover, N.H., 1834, graduated at Dartmouth College 1853, studied theology in Andover Seminary 1855–56, was Professor of Natural Philosophy and Astronomy at Dartmouth, is at present Professor of Astronomy in Princeton College. Is a member of the American Academy of Arts and Sciences, a member of the National Academy, and a Foreign Associate of the Royal Astronomical Society of Great Britain. He was President of the American Association for the Advancement of Science in 1883. He has written some popular works on Astronomy, and as an original investigator has made important discoveries. He has contributed to various scientific journals.