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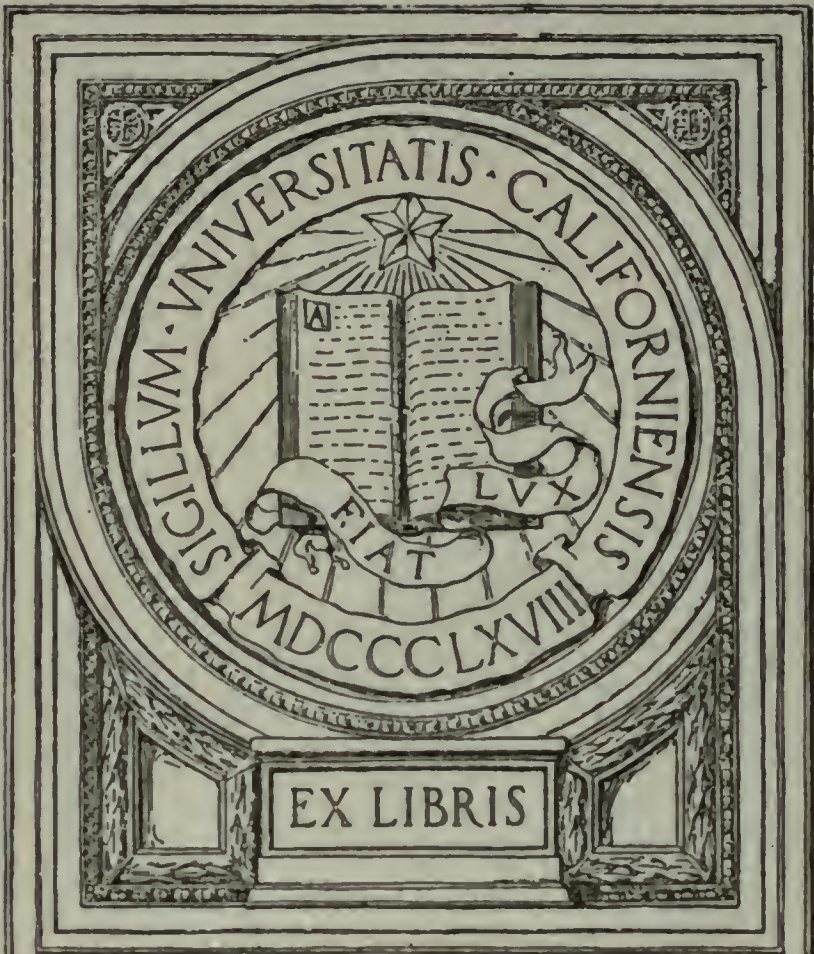
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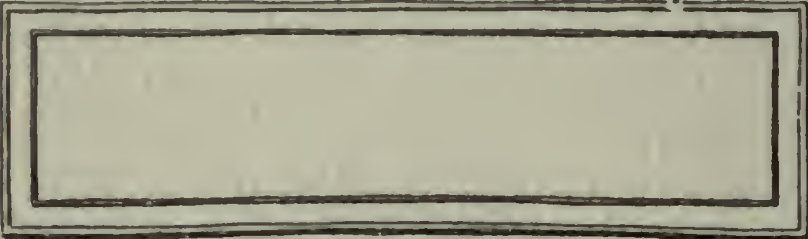


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PHILOSOPHIC SERIES—No. 1.

CRITERIA

OF

DIVERSE KINDS OF TRUTH

AS OPPOSED TO AGNOSTICISM

BEING A TREATISE ON APPLIED LOGIC

BY

JAMES McCOSH, D.D., LL.D., D.L.

AUTHOR OF "INTUITIONS OF THE MIND," "THE EMOTIONS," ETC.

NEW YORK

CHARLES SCRIBNER'S SONS

1882

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TO THE
AUTHOR

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1882

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PREFACE.

THE age may be characterized as one of *unsettled* opinion. Our ambitious youth are not satisfied with the past, its opinions and practices. Authority is not worshipped by them; they have no partiality for creeds and confessions. They do not accept, without first doubting, the truths supposed to be long established. In searching into the foundation of the old temples, they have raised a cloud of dust and left lying a heap of rubbish. It is an age out of which good and evil, either or both, may come according as it is guided. We may entertain fears, for it is dancing on the edge of a precipice down which it may fall. We may cherish hope, for it is an inquiring age.

Every form and phase of opinion seeks to have a philosophy, in which it may embody and express itself and by which it may be defended. Agnostics is the shape or figure which the doubting and hesitating spirit takes. It is not a new heresy. It has been held by a few in every age; it is now espoused by many, provisionally, till something more solid or showy is propounded. It used to be called Nescience, which maintains that nothing can be known, and Nihilism, which holds that there is nothing to be known. It is of little use trying to argue with it, for it

allows us no premises as a ground on which to start, and has no body or substance that we can attack. It is easy to show that it is suicidal. It is an evident contradiction to affirm that we can know nothing. But when we have demonstrated this we have not destroyed it any more than we have killed a spectre by thrusting a spear into it; for its defence is, that all truth is contradictory. The best way of dealing with it is to allow it to dance as it may, like the shadows of the clouds, and, meanwhile, to found and build up truth and set it up before the mind, that it may be seen in its own light. It is well known that when we see a solid object through and beyond a spectre, the spectre melts away and disappears. So it will be with agnosticism—it will vanish when we fix our eyes upon the truth. This is what is attempted in this little treatise.

The work is expository, and, for the reasons just hinted at, is not controversial. It is meant for those who wish, for their own satisfaction, to know the foundations on which the truth which they are required to believe rests. It is also hoped that, it being a treatise on what Kant calls Applied Logic—which may be made quite as useful as Primary or Formal Logic—it may be used as a text-book.

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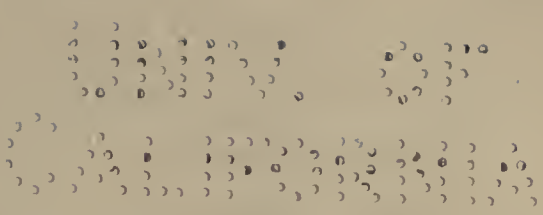
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INTRODUCTION.

WE have truth when our ideas are conformed to things. The aim of this work is to show that there is truth, that truth can be found, and that there are tests by which we may determine when we have found it. We do not propose to guide inquirers in any particular department of investigation; this can best be done in introductions to the books and lectures treating of the several branches of knowledge.

Kant and the German metaphysicians have shown again and again that there is no one absolute criterion to settle all truth for us; that will determine, for example, at one and the same time, whether there is a fourth dimension of space; whether the planet Jupiter is inhabited; where the soul goes at death, and what kind of crops we are to have next year. But it can be shown that there are truths which may be ascertained, and that there are criteria which prove when they are so, and these clear, sure, and capable of being definitely expressed. But the test which settles one truth for us does not necessarily settle all others, or any others. It is necessary to distinguish between different sorts of truth, and we should be satisfied when we find a test of each kind. The aim of the criteria, it should be noticed, is not to help us to discover truth, but to determine when we have found it.

The work is divided into two Parts: one in which we seek to find the Criteria of First Principles, and in the other the Criteria of Individual Facts and their Laws.



PART FIRST.

CRITERIA OF TRUTHS TO BE ASSUMED.

SECTION I.

FIRST AND FUNDAMENTAL TRUTHS.

THE mind must start with something. There are things which it knows at once. I know pleasure and pain. I do more: I know myself as feeling pleasure and pain. I know that I am surrounded with material objects extended and exercising properties. I know by barely contemplating them that these two straight lines cannot contain a space. These are called first truths. There must be first truths before there can be secondary ones; original before there can be derivative ones. Can we discover and enunciate these? I believe we can.

We are not at liberty, indeed, to appeal to a first principle when we please, or because it suits our purpose. When we are left without evidence, we are not therefore allowed to allege that we need no evidence. When we are defeated in argument, we are not to be permitted to escape by falling back on what is unproved and unprovable. It is true that we cannot prove everything, for this would imply an infinite chain of proofs every link of which would hang on another, while the whole would hang on nothing—that is, be incapable of proof. We cannot prove everything by mediate evidence, but we can show that

we are justified in assuming certain things. We cannot prove that two straight lines cannot enclose a space, but we can show that we are justified in saying so. We can do so by the application of certain tests.

SELF-EVIDENCE is the primary test of that kind of truth which we are entitled to assume without mediate proof. We perceive the object to exist by simply looking at it. The truth shines in its own light, and in order to see we do not require light to shine upon it from any other quarter. We are conscious directly of self as understanding, as thinking, or as feeling, and we need no indirect evidence. Thus, too, we perceive by the eye a colored surface, and by the muscular touch a resisting object, and by the moral sense the evil of hypocrisy. The proof is seen by the contemplative mind in the things themselves. We are convinced that we need no other proof. A proffered probation from any other quarter would not add to the strength of our conviction. We do not seek any external proof, and if any were pressed upon us we would feel it to be unnecessary—nay, to be an encumbrance, and almost an insult to our understanding.

But let us properly understand the nature of this self-evidence. It has constantly been misunderstood and misrepresented. It is not a mere feeling or an emotion belonging to the sensitive part of our nature. It is not a blind instinct or a belief in what we cannot see. It is not above reason or below reason; it is an exercise of primary reason prior, in the nature of things, to any derivative exercises. It is not, as Kant represents it, of the nature of a form in the mind imposed on objects contemplated and giving them a shape and color. It is a perception, it is an intuition of the object. We inspect these two straight lines, and perceive them to be such in their nature that they cannot enclose a space. If two straight

lines go on for an inch without coming nearer each other, we are sure they will be no nearer if lengthened millions of miles as straight lines. On contemplating deceit we perceive the act to be wrong in its very nature. It is not a mere sentiment, such as we feel on the contemplation of pleasure and pain; it is a knowledge of an object. It is not the mind imposing or superinducing on the thing what is not in the thing; it is simply the mind perceiving what is in the thing. It is not merely subjective, it is also objective—to use phrases very liable to be misunderstood; or, to speak clearly, the perceiving mind (subject) perceives the thing (object). This is the most satisfactory of all evidence; and this because in it we are immediately cognizant of the thing. There is no evidence so ready to carry conviction. We cannot so much as conceive or imagine any evidence stronger.

NECESSITY is a secondary criterion. It has been represented by Leibnitz and many metaphysicians as the first and the essential test. This I regard as a mistake. Self-evidence comes first, and the other follows and is derived from it. We perceive an object before us and we know so much of its nature; and we cannot be made to believe that there is no such object, or that it is not what we know it to be. I demur to the idea so often pressed upon us that we are to believe a certain proposition because we are necessitated to believe in it. This sounds too much like fatality to be agreeable to the free spirit of man. It is because we are conscious of self that we cannot be made to believe that we do not exist. The account given of the principle by Herbert Spencer is a perverted and a vague one: all propositions are to be accepted as unquestionable whose negative is inconceivable. This does not give us a direct criterion, as self-evidence does, and the word inconceivable is very ambiguous. But necessity, while it is not

the primary, is a potent secondary test. The self-evidence convinces us; the necessity prevents us from holding any different conviction.

UNIVERSALITY is the tertiary test. By this is meant that it is believed by all men. It is the argument from catholicity, or common consent—the *sensus communis*. All men are found to assent to the particular truth when it is fairly laid before them, as, for instance, that the shortest distance between two points is a straight line. It would not be wise nor safe to make this the primary test, as some of the ancients did. For, in the complexity of thought, in the constant actual mixing up of experiential with immediate evidence, it is difficult to determine what all men believe. It is even conceivable that all men might be deceived by reason of the deceitfulness of the faculties and the illusive nature of things. But this tertiary comes in to corroborate the primary test, or rather to show that the proposition can stand the primary test which proceeds on the observation of the very thing, in which it is satisfactory to find that all men are agreed.

Combine these and we have a perfect means of determining what are first truths. The first gives us a personal assurance of which we can never be deprived; the second secures that we cannot conquer it; the third that we can appeal to all men as having the same conviction. The first makes known realities; the second restrains us from breaking off from them; the third shows that we are surrounded with a community of beings to whom we can address ourselves in the assurance of meeting with a response.

But in order to be able to apply these criteria properly we must carry along with us certain explanations and limitations.

1. It should be noticed of intuitive truths that they are,

in the first instance, *individual* or *singular*, and that we need to generalize the single perceptions in order to reach general maxims. In them we begin with contemplating a single object, say an external object, and know it to be extended and solid, or an act of benevolence and know it to be good, or an act of cruelty and proclaim it to be evil. But we can generalize the individual perceptions, and then we have general maxims or axioms, which we can apply to an infinite number of cases. We perceive that these two parallel lines will never meet; and we are sure that we should affirm the same of every other set of parallel lines, and hence we reach the general maxim that parallel lines will never meet. We perceive, on the bare contemplation of this deed of deceit, that it is base, but we would feel the same of every other deed of deceit, and hence the maxim deceit is evil. But it should be observed that in the formation of these general principles there is a discursive act, in the shape of a generalizing process, involved. It is here that there may creep in error, which is not in the intuitive but in the discursive process; for we may form a partial, a one-sided, or exaggerated generalization. Thus, on discovering a particular effect we at once judge or decide that it has a cause. But when we would make the principle universal we may fall into a mistake, and declare that "everything has a cause," which would require an infinite series of causes and make it necessary to hold that God himself has a cause. In such a case our generalization is wrong. But let the maxim take the form that "everything which begins to be has a cause," and we perceive that on a thing presenting itself to us as beginning we should proclaim it to have had a producing power. We thus see that there may be both truth and error in our metaphysical or moral maxims: truth in the primitive perception at the basis of the whole, while there may be hastiness leading to mutilation in the ex-

pression. Hence the wrangling in metaphysics. Thus, everybody acknowledges that two parallel lines can never meet, but there may be disputes as to the fit form in which to put the axiom. So, in regard to the generalized principles that every effect has a cause, that every quality implies a substance, that virtue is commendable, there may be a difficulty in expressing exactly what is meant by cause and effect, what by substance and quality, and what by virtue and moral good; and we may find that when we would make the expressions definite we fall into grievous mistakes, and this while we are certain that there is a self-evident, necessary, and universal truth if only we can seize it.

2. First truths are of various kinds, which we shall endeavor to classify. Some of them are

Primitive Cognitions. In these the object is now before us, and is perceived by us. We perceive that this body has three dimensions in space, and cannot be made to believe otherwise. We decide that this thing, material or mental, cannot be and not be at the same time; that these two things, being each equal to the same thing, are equal to one another. In these cases the object is perceived at once and immediately. But there are others in which the object is not present, and the convictions may be regarded as

Primitive Beliefs. Here there is still an object. It is not present, but still it is contemplated. We have known the object somehow, and on conceiving it beliefs become attached to it. Thus, we know time in the concrete, and in regarding it we believe that time is continuous, that time past has run into time present, and that time present will run into time to come. A number of such faiths gather round our primitive cognitions and widen them indefinitely. We see two points in space; we are sure that there is

space between, and that the shortest line between the two is a straight line. We can rise to still higher faiths. We believe of certain objects, say space and time, and God—when we come to know him—that they are infinite, that is, that they are always beyond our widest image or concept and such that nothing can be added to or taken from them. The senses cannot give us these beliefs, nor can the understanding construct them out of the materials supplied by the senses. Some of them, such as the idea of the infinite, the perfect, lift us above our immediate experience into a higher sphere. We begin in all such cases with realities perceived or apprehended; and we are sure, if we proceed legitimately, that we end with realities. It should be remarked that in order to our having these cognitions and beliefs it is not necessary to express them or even put them in the shape of propositions. It is necessary first to have cognitions or beliefs regarding them before we form comparisons of them or affirm that they exist or possess certain properties. But out of these we can form

Primitive Judgments, in which we predicate—that is, make affirmations or denials—or discover certain properties or relations, as when we say space and time are without bounds and exist independent of the contemplative mind. In order that these judgments may be primitive they must be pronounced as to objects which have been perceived by intuition.

I ought here to add that the mind is capable of perceiving at once certain moral qualities, and we have

Moral Cognitions, Beliefs, and Judgments. On contemplating an act of self-sacrifice done for a friend or a good cause we know it at once to be good, or an act of selfishness we perceive it to be evil. When these acts are done by our neighbors we cannot notice them directly, but we are sure that they are good or evil; and these may be

regarded as beliefs. When we put them in propositions we exercise judgment, as when we declare that sin deserves punishment.

But it will be asked, do we perceive the good and evil to be a reality, to be in the very thing. It might be allowed, it is urged, that intuitively we perceive matter to be extended and that two straight lines cannot enclose a space; for the matter, and the straight lines are before us. But moral excellence and depravity have no such reality, they exist only in our conceptions. To all this I reply that we have the acts before us in the one case as in the other; we have before us every day a deed and an implied affection of benevolence or of cruelty, and in it we perceive the morally good or the morally evil. The benevolence in this act of charity has a reality quite as much as the hand that bestows the alms or the alms bestowed. The malevolence in this calumny is a reality, quite as much as the tongue that uttered it or the newspaper that published it. The reality is of a different kind, no doubt, but it is of a kind which all acknowledge when they approve of the charity and disapprove of the scandal, and perhaps impose a penalty upon the person who has been guilty of it.

It is of vast moment, to ourselves and to the community, that we and all others should acknowledge, theoretically and practically, that there are other realities besides those of sense, and these higher and more enduring. It is the worst influence of the prevailing agnosticism that while it can have little power to keep us from believing in the things that are seen, it may have a mighty influence in keeping us from believing in and realizing the things that are spiritual, and therefore unseen, but eternal. The idealist errs when he denies the reality of a material world which, though temporal, is real. But the sensualist errs far more egregiously when he denies the existence of a spiritual

world, which is real and eternal. It should be the aim of the highest philosophy to carry us up, as Plato endeavored to do, to this high and pure region which has as high an existence as the heavens, which are its special dwelling-place. We should train ourselves, and especially train the young, to retreat from time to time into the higher world, that they may there hold communion with all that is great and good and elevating.

3. The complexity of our mental states places difficulties in the way of our applying the criteria. There are opinions which have been acquired by a lengthened and constant observation, which association has wrought into our very nature, so that we feel as if they are native and necessary; and yet some of them may be mere hereditary or popular prejudices which have no warrant in reason. In particular, experiential truths or even fancies and prejudices may so mingle with our intuitions that it seems impossible to separate them and determine which is the self-evident principle in the complex notion. These circumstances, it should be admitted, do throw difficulties in the way of the application of our criteria. But these are not greater, after all, than the application of tests in any other department of knowledge, as, for example, chemical tests to determine the existence of poisons in very complex mixtures, and generally the verification of scientific discoveries of every description. But, in spite of these difficulties, the tests can be applied if only pains be taken to distinguish the things that differ and to lay aside the things that are irrelevant. It is possible, by a careful discrimination, to separate the associated from the primitive judgment, and thus seize the conviction that is native and necessary and apply the tests to it.

4. In many instances it is essential to apply the tests to alleged intuitive truths before we put trust in them. In

some cases, indeed, the spontaneous belief is so clear and assured that we may follow it without instituting any reflex examination. But in other cases the supposed necessary truth may be mixed with extraneous matter which adulterates it. Every one acknowledges that for the purposes of accurate science it is of importance to have the axioms of mathematics and mechanics so enunciated that no empirical element has entered. In morals and jurisprudence evil consequences might arise from mixing up doubtful principles with true ones, from assuming, for instance, that the promotion of happiness is the sole and essential quality of virtue. Without a sifting we might often be tempted by indolence or prejudice to assume as true what ought to be proven, or what, in fact, cannot be proven. It is of special importance to apply these tests to all those higher faiths which perform so important a part in mystic philosophy and theology. In these there is commonly a real intuition, and this, possibly, of an elevating, inspiring order as a nucleus; but around this there may gather a halo consisting merely of mist irradiated by the light in the centre. All high minds have felt the influence of these faiths, and some have been transported by them. But earthly ingredients are apt to mingle with the ethereal and heavenward aspirations, and claim all the authority which these have. The gilding gold is made to give currency to the coin. Truth and error thus come to be hopelessly intermixed, and visions of fancy come to be regarded as revelations of heaven. The sceptic detects this, and in pulling up the tares he uproots the wheat; to vary our illustration, in tearing down the creepers he pulls asunder the wall on which they grow. These results are to be avoided by a reflex examination of the whole mental exercise. The idea of Plato, the ecstasy of the Alexandrians, the perfect of Descartes,

Malebranche's vision of all things in God, the absolute of Kant, Schelling, and Hegel, the supposed inspirations of poets and the revelations to prophets who utter grand truths—all these point to and imply high realities; but they are liable to run into fancies and extravagances, into follies and deceptions, which mislead and delude those who believe in them, pervert their judgments, and render them ridiculous in the view of the world. There is gold in the mine, and all we have to do is, by crucial tests, to separate it from the dross that we may have the true metal.

SECTION II.

REASONED TRUTHS.

When we have got truth by self-evidence or by observation, we may add indefinitely to it by inference, in which we proceed from something given or allowed to something else derived from it by the mind contemplating it. If we have truth and reality in what we start with, and if we reason properly, we have also truth and reality in what we reach. Of course if what we assume be fictitious, what we arrive at may be the same. These inferences may be of three kinds, each of which has its tests.

IMMEDIATE INFERENCES, or what I am disposed to call *implied judgments*. Here we have a judgment given, and we derive other judgments merely from contemplating the two notions compared. All general concepts, as logicians know, have both extension and comprehension. The extension has reference to the objects in the class; the comprehension to the qualities which combine them. Now, on the bare contemplation of the extension of the concepts we can draw certain inferences, as when it is granted that

“all men have a conscience” we infer that “this man has a conscience,” even though he be a liar. From the same proposition we can draw the inference in comprehension that the possession of a conscience is an attribute of man. The canon is that whatever is involved in the extension and comprehension of a notion may be legitimately inferred.¹

MEDIATE REASONING.—Here we do not discover the relation of two notions, or, as we call them when expressed in language, terms, by directly comparing them, but we can do so by means of a third term which has a connection with both. Reasoning thus consists in comparing two notions by means of a third. The canon of reasoning in its most general form is, “Notions which agree with one and the same notion agree with one another,” with a

¹ From the proposition “men are responsible” the following may be drawn :

In Extension.

Every man is in the Class Responsible ;
 This man is responsible ;
 Some men are responsible ;
 Every tribe of mankind is responsible ;
 It is not true that some men are not responsible, etc., etc.

In Comprehension.

Man exists ;
 Responsibility is a real attribute ;
 Responsibility is an attribute of every man ;
 Responsibility is an attribute of this man ;
 Responsibility is an attribute of every tribe of men ;
 Responsibility is an attribute of some men ;
 Irresponsibility may be denied of all men ;
 No man is irresponsible ;
 Irresponsible beings are not men ;
 Men of wealth are responsible with their wealth ;
 To punish men is to punish responsible men.

See “The Laws of Discursive Thought : being a Text-book of Formal Logic,” by James McCosh, LL.D.

corresponding dictum for negative reasoning. But the word “agree” is vague, and it is necessary to state the nature of the agreement. This is done by two formulæ, which act as the criteria of reasoning.

The Dictum of Aristotle.—We have before us a crocodile, and wish to know how it brings forth its young. Our two terms are “crocodiles” and “bringing forth their young.” We find that it has been ascertained by science that the crocodile is a reptile, and that reptiles bring forth their young by eggs. We are now prepared to reason: “The crocodile, being a reptile, must bring forth its young by eggs.” Here we have three terms: two called the extremes, the original ones which we wish to compare, “crocodiles” and “bringing forth their young by eggs,” and a middle “reptile,” by which we compare them. The process when expanded takes the form of two propositions, called the premises, and the conclusion drawn from them.

All reptiles bring forth their young by eggs;
The crocodile is a reptile;
Therefore it brings forth its young by eggs.

The conclusion is reached by the bare contemplation of the premises. The premises being true, the conclusion is true.

But this reasoning proceeds on a principle which it is desirable to have expressed and announced when it becomes the test of this kind of reasoning. It is, “Whatever is true of a class is true of all the members of the class.” What is true of reptiles generally is true of the reptiles called crocodiles, and of every individual crocodile. If we have not something that can be predicated—that is, affirmed or denied—of a class to constitute a premise, no conclusion can be drawn. Thus, if only some reptiles are oviparous, if only the greater number are so, we are not entitled to conclude that the crocodiles must be so. We have thus a very decisive and easily applicable test of reasoning.

In formal logic this governing principle is spread out in various forms, so as to enable us to apply the test to every case of ratiocination. First, the syllogism is found to be the universal form of mediate reasoning. Then logicians divide reasoning according to the position of the middle term, which is the nexus of the argument, and this gives four figures. I do not mean to unfold these; they are to be found in every treatise on elementary logic. All that I have to do is to show that thereby we have a criterion of ratiocination.

All this was established by Aristotle in his "Prior Analytics." A number of attempts have been made since his day to set aside his analysis or to improve upon it. None of these have met with anything more than a temporary success. But I am not convinced that the dictum of Aristotle is the regulating principle of all reasoning; it regulates only that reasoning which involves a general notion—that is, a class notion. It can be shown, I think, that there is a ratiocination which does not proceed on the principle of classes, but of identity or equivalence. Thus, we find that the stick A is equal to the stick B, and the stick B is equal to the stick C, and we conclude that the stick A is equal to the stick C. Here we have no classes or members of a class. The canon is, "Notions which are equivalent to one and the same third notion are equivalent to one another." In ratiocination of this description the subject of the propositions may be made the predicate, and the predicate the subject:

Shakespeare wrote "Hamlet;"

The writer of "Hamlet" is the greatest English poet;

Shakespeare was the greatest English poet.

All reasoning, in order to be valid, must fall under one or other of these rules, which are therefore the criteria of legitimate inference. When a professed argument cannot

be brought under either of them, it is a proof that it is not reasoning. When, on endeavoring to bring it under them, we find that it is not in accordance with them, we may conclude that the inference is not valid.

Reasoning may take several forms, which are legitimate provided they are in conformity with the dictum of Aristotle or the principle of equivalents. The natural form in ordinary circumstances is the categorical, in which we lay down a general principle and bring a particular under it; as when we say, "Consumption is a fatal disease, and as this man has consumption he has a fatal disease;" or, not being sure of the fact, we say, "If this man has consumption he has a fatal disease." This reasoning is hypothetical, and is quite as valid as the categorical. Or the reasoning may take the disjunctive form: "This disease is either a severe cold or consumption. It is not a severe cold; therefore it is consumption."

The greater portion of the reasoning in mathematics is regulated not by the dictum of Aristotle relating to classes, but the dictum of equivalence or equipollence.

SECTION III.

THE JOINT DOGMATIC AND DEDUCTIVE METHOD.

Here we begin with assuming something because it is self-evident, needing no farther proof; and then proceed to infer other truths involved. The best example is found in geometry, where there are laid down at the opening definitions of such things as triangles, circles, squares, and also axioms, or self-evident truths; and from these, and as involved in them, we get farther truths by deductive reasoning. We have also examples in Formal Logic, as

when the dictum of Aristotle is assumed, that whatever is true of a class is true of the members of the class, and from this get the modes and figures of reasoning, and innumerable inferences. The truths thus drawn are called apodictic by Aristotle and demonstrative by the moderns. In all such cases we have the tests of the assumed truths in self-evidence, necessity, and universality, and of the reasoned truth in the syllogism.

This method is powerful when we have the means of using it—that is, self-evident truths. But the field in which we have these is a very contracted one. In all investigations which deal with scattered facts the method is not available. “A clever man,” says Sir John Herschel (“Nat. Phil.,” § 67), “shut up alone and allowed unlimited time, might reason out for himself all the truths of mathematics by proceeding from those simple notions of space and number of which he cannot divest himself without ceasing to think. But he could never tell, by any effort of reasoning, what would become of a lump of sugar if immersed in water, or what impression would be left on his eye by mixing the colors of yellow and blue.”

The method has often been applied illegitimately—that is, to departments which have to deal with scattered facts. In the sixteenth century, when mathematics were making such progress, there were attempts to carry the geometrical method into all branches of science. It was used by Descartes and his extensively ramified school in philosophy and also theology. Assuming the existence of thought, of *cogito*, as a truth which cannot be doubted, he thence proves his own existence, which it would have been wiser in him to assume, and then from the idea of the infinite and the perfect in himself, he argued there must be a perfect being existing whose veracity guarantees our idea of matter. Spinoza, in his Ethics, begins with a formidable

array of definitions, axioms, and postulates, whence he draws out a system in which God is at once extension and thought, and being the All is the morally evil in the world as well as the good. Samuel Clarke, finding that man could not get rid of the idea of space and time, argued that since all things must either be substances or modes, and as space and time are not substances, they must be modes of a substance, which is God, which by other considerations he clothed with benevolence. In these connected systems doubtful definitions were carried out, often by right reasoning, to very doubtful results. In all cases in which we have to use facts, and in which we seek to rise to facts, such as the existence and character of God, there is another method, that of induction, with it, it may be, deduction, which we may and ought to employ.

PART SECOND.

CRITERIA OF INDIVIDUAL FACTS AND THEIR LAWS.

SECTION IV.

INDIVIDUAL FACTS.

AN eminent man is reported as saying that there are more false facts than false theories. There is truth in this. Facts are apt to have adjuncts to them in the reports given by others, and even in our own apprehensions of them, or they are so mutilated that they take an entirely distorted form. We all know how in story-telling additions and subtractions are apt to be made even by honest narrators, so as to make it more attractive and picturesque.

The individual facts are primarily made known by the senses. In these there may be very numerous and complicated details, and any of these if left out may so far distort our apprehensions and the account we give of them. Besides, sensations, feelings, fancies, inferences, attachments, and repugnances may mingle with our pure perception of sense and cast a glow or a gloom around them. In these sections I am showing that we have to guard against these temptations, and that when we do so we can arrive at positive truth.

Observation Proper and Experiment.—These are the two ways in which we obtain facts. In the former we

view objects simply as they present themselves ; in the latter we put them in new positions. The advantage of Experiment over Observation Proper (which may be so designated as Experiment, is, after all, a kind of Observation) is that it enables us to perceive the proper action of the several agencies joined in nature. We wish to know whether bodies, whatever be their weight, fall to the ground in equal times. Common observation seems to show that they do not, as we see the gold nugget and the leaf falling at very different times. But we put the gold and the leaf into the exhausted receiver of an air-pump, and find them fall the same instant. What we should do in all observation is to note precisely what has occurred, and to report it accurately without any additions, subtractions, or coloring ; we must be especially on our guard against torturing the facts in order to make them give a certain kind of testimony.

THE SENSES.—The older Greek philosophers adopted the common opinion that the senses deceive. The sceptics took advantage of the doctrine and argued that if the senses deceive there is nothing we can trust in. The sounder philosophers met them by calling in reason, which corrected the illusions of the senses and conducted to truth. Aristotle corrected both these forms of error, and showed that the supposed deception arises not from the senses themselves, but from the use that is made of their intimations.

To save the senses it is necessary to draw certain distinctions. In particular, we should distinguish between our original and derived perceptions. The former are intuitive, without any process of inference, having the sanction of the author of our constitution, and never deceiving us. The latter imply inferences from the revelations of sense perception, and there may be errors in them.

I believe we can approximately determine what are the

original perceptions of the various senses. By several of the senses we seem to perceive merely the bodily organs as affected. This is the case with taste and with smell, in which we discern simply the palate and the nostrils with a certain sensitive expression of the palate and the nostrils. It is the same also, I believe, with hearing and with touch proper or feeling, in which we know simply an affection of the ear and the periphery of the body. I rather think that by the muscular senses and the eye we discern more; a body resisting our organism and a colored surface affecting us. In all these intuitive perceptions there is no ratiocination, and there are and can be no mistakes. But in all beyond there are inferences, and in these there may be less or more of error. A person tells us that he had mutton to dinner, whereas all he knew was that there was a certain taste in his mouth which he argued was that of mutton. He further lets us know that he felt the smell of roses in a certain garden, where he also heard a flute playing, whereas immediately he felt only an odor in his nostrils and a sound in his ear. He is sure that he was struck in the dark with a man's hand, whereas the blow was from a stick. He depones that he saw a man strike his wife, while all he saw was an action of one figure upon another, and it turns out that the woman was not the man's wife. Hence arise some of the mistakes in witness-bearing; they are not lies of the senses, but errors in the inferences we draw from them.

In all such cases we form a general rule out of certain experiences, and in hasty thinking we illegitimately apply it. We regard sound as coming to our ear in a straight line from the sounding body, but the undulations have been reflected from a wall, and we place the bell from which they have come in that wall, whereas the belfry is actually in a different direction. It is on this principle

that the ventriloquist proceeds when he makes a human voice come from a post or an animal. Having laid down the rule that when there are few observable things between us and an object, it must be near, we look on that island seen across the sea as much closer to us than it is.

Some other distinctions must be attended to. Sensations and feelings, of pleasure and pain, of beauty and ugliness, associate themselves with all our perceptions, and are apt to give a color and even a shape to the actual things. We remember more particulars about the objects that excite us, whether joyously or grievously, than those that are dull and commonplace, and we give these a large, often an undue place in our narrative, and thus distort them and give them a different meaning.

The rapid inferences from the intimations of the senses may at times serve a good purpose. They may prepare us to meet and avoid danger when cool and correct argument would not be quick enough. A fire-bell, the jolt of a carriage in which we are riding, a stumble in walking, the fog-whistle at sea, may at times raise up an unnecessary alarm, but the calm reflection which succeeds will soon dissipate this, and at other times they save us from danger.

We have abundant means of correcting the hasty judgments. We have other senses at hand to correct the apparent deceptions of one sense. We imagine the figures raised optically by magicians to be real, but we can dissipate the illusion by thrusting our hand into the spectre. We may mistake beef for mutton as we eat it, but it is easy to apply to the person who prepared the food to set us right. A diseased eye may present objects double, but the touch will correct the mistake. In all cases we can secure that what is told us by the senses is true by judiciously using the means of correction at our disposal.

SELF-CONSCIOUSNESS.—Metaphysicians commonly main-

tain that the revelations of consciousness are always to be trusted ; that they settle everything in the last resort, and are, in fact, ultimate and infallible. But there are physiologists, and of a late date even metaphysicians, who assert that the acts of consciousness are variable and often deceitful. They show us that people often misapprehend what their real feelings are, and give a wrong account of them. It is alleged that there are persons who say that they believe certain tenets while they do not, only imagining that they do. There are cases of persons with a "double consciousness," as it is called, remembering, in the one state, their experience of that state, but without any remembrance of it in the other.

But in all such cases we attribute to consciousness what it is not responsible for. In regard to the inner, as in regard to external sense, we have to draw distinctions if we would determine its precise testimony. It is acknowledged by all psychologists that, properly speaking, we are conscious of self only in its present state. In that state there are various affections : there are sensations and feelings and inferences along with the pure consciousness, and we are apt to mix them up with each other, and thereby breed confusion in our apprehensions and in the account we give of what is in our mind. When we review our consciousness we are dependent on our memory, and we may omit some aspects of our experience and add associated affections. Here, as in regard to the bodily senses, distance is apt to lend enchantment to the view. The hypochondriac magnifies his sorrows, and the gay youth his pleasures in the past. People are apt to think their youth was happier than it really was ; they remember their joys and forget the little disappointments which were then felt to be so great and now appear so little.

What is so called is not really "double consciousness."

It arises from a diseased state of the brain hindering psychical action. The person is unable to recall what has been laid up in the past, and he lives in the present and lays up a new experience, which he uses in his new state, but which he may lose in a later condition of his brain. The man is not under a double consciousness, but in two states, in each of which the consciousness may be correct.

It thus appears that man may trust in what his consciousness really reveals. It makes known to us self in its present state. It should be noticed that it does not know merely a quality of self, such as thinking or feeling; it knows self as thinking or feeling. This is of the nature of a first truth or an intuition; we perceive the very thing. This self constitutes what we call personality—that is, we know ourselves as persons. On comparing the self as presently known with the past self as then known, we declare ourselves to be the same. This is personal identity, which is a self-evident, necessary, and universal truth.

MEMORY.—The vulgar opinion is that the memory may deceive. But it does so only as the senses deceive. The mistakes are not in the memory proper, but in the associated affections and the inferences drawn from them. We ask a man how long it is since he visited us. His recollection is dim, and he makes the time longer than it is, six years instead of five. It is not possible for him to remember his continued existence during these years, any more than it is possible for the eye to see every point in space between us and objects five or six miles off. In both cases he has to avail himself of intervening objects. The event, he remembers, took place after his marriage, seven years ago, for his wife was with him; and before his mother's death, four years ago, for he remembers we made inquiries about her health. But he does not recollect at what precise date between these two occurrences the visit

was paid. The reminiscence is dim and he concludes that the event is more distant than it really is. Our memories in regard to time all need such mile-stones, or rather time-marks, to enable us to measure the distances. Now, in all these processes there may be mistakes. It is much the same with our recollections of the other circumstances connected with events, such as the shape and color of objects, their position in relation to other things, their surroundings, their antecedents and consequents. The vision is obscure and we have to fill it up, and we do so by fancies of our own, which so far modify the scene, perhaps pervert it. We are apt to join causes and consequences with the bare occurrences. This is especially apt to be the case with conversations, with the sentences uttered by ourselves or by others. We recollect how we felt, what we meant to say, what effect was produced on us by what others said, and we confound these with what was actually uttered. Hence the misunderstandings, the perversions which are so apt to appear in the reports of conversations. In the complicated scenes through which we have to pass we remember those parts that have been most vivid—these, I suppose, have impressed themselves most deeply on our organism, and the others are feebler. The consequence is that the record has faded in some places, and we make additions in order to complete it. In this way we clothe our bare memories with dresses, which may make them look sadder or more joyful than the events really were at the time.

But it is always possible to distinguish between our original and proper recollection and our superadded and fictitious ones. Those who are conscientious will be careful not to add out of their own stores to their memories. When the reminiscence is dim they will at once confess it, especially in witness-bearing, and when the character of a fellow-man may be affected. In all scenes which we wish

to remember accurately, we will take pains to note the exact incidents at the time they occurred. There are events of which we may be, and are certain, that they have happened.

TESTIMONY.—It is not necessary to suppose, with some of the Scottish metaphysicians, in their answers to Hume's argument against miracles, that there is an original instinct or principle of common sense leading us to trust in testimony. I believe, indeed, that there is a social affection in all of us inclining us to have an affection for, and trust in, those we meet with, especially in father and mother, brothers and sisters, and leading us to believe in what they say. But the belief in testimony is the result of experience, and is modified by experience; we trust in certain testimonies, but not in others. There is a conscience in every man which disposes him, if he does not resist it, to speak truly; even selfishness prompts him not to lose the confidence of his fellow-men by deceiving them. Hence, the great body of mankind speak the truth when they are not led to act otherwise by a desire to excuse themselves, or by malignity toward their neighbor, or some other like motive. We can reach truth by means of testimony. It was in his haste that David said "All men are liars."

The testimony of one man is often sufficient, because of his character known otherwise; and because he has no motive to deceive. We lay down rules for our guidance in judging of testimony, as that it is a good sign if the statements are direct and unartificial. In most cases we seek to have the testimony of one man confirmed by another, that in the mouth of two or three witnesses every word may be established, it being shown that there has been no collusion or conspiracy. There are commonly circumstances which corroborate or detract from the testi-

mony. Circumstantial evidence is at times sufficient to prove that a prisoner has been guilty, when there is no direct evidence of the act. In witness-bearing, books of law and judges on the bench lay down rules which may guide the jury in the verdict which they bring in.

HISTORY.—Here the evidence is mainly that of written testimony, which, however, may be confirmed by original historical documents, such as monuments, inscriptions, coins, and ancient charters. Laplace, misled by a false analogy derived from the diminution of light when reflected successively from a number of surfaces, declares that the value of testimony may be weakened by transmission, and at length altogether lost (*Essay on Prob.*). This is true of tradition, that is, of oral testimony transmitted from mouth to mouth, or from age to age; but Sir G. C. Lewis (*Meth. Obs. and Reas.*) has shown that, “when the testimony of the original witness has once been obtained and recorded, either by himself or others, in an authentic form, it is perpetuated so long as the written memorial of it is preserved in the original, or in a faithful transcript, and may at any time be used for historical purposes.”

SECTION V.

INDUCTION.

This consists essentially in gathering facts in order to ascertain the order that they follow, which will be found to consist in laws which they obey. It was known to Aristotle that the mind starts with the singular (*τὸ ἐκάστων*) before it rises to the universal (*τὸ καθολον*), which, as he expresses it, may be first in the order of nature, while the singulars are first in the order of time. He practised the method in his natural history, very specially by the collec-

tions which were supplied by his pupil, Alexander the Great. But he cannot be said to have systematically expounded induction as a method of discovering truth. This was reserved for Francis Bacon, who enjoined that in observational science, the mind should begin with particulars, which are to be collected and collated, and then rise to minor, middle, and major axioms, and thence finally to causes and forms. All this was to be done not *per saltum*, but by gradual steps. The method has since been made more definite by Sir John Herschel, in his "Natural Philosophy;" by Dr. Whewell, in his various works on "The Philosophy of the Inductive Sciences;" by John S. Mill, in his "Logic," and by others. The method will become more perfected as science advances with its observations and experiments, with its instruments and its critical examinations. That method has a Means and an End. The Means are observation with analysis. The End is the discovery of laws.

Analysis and Synthesis.—By the former we separate a concrete or complex object into its parts. In chemistry there is an actual separation of one element from another, say the oxygen from the hydrogen with which it is combined in water. But in most investigations, the separation is in thought. Thus in all bodies we find both extension and energy, which cannot be separated in fact. Thus logicians analyze discursive thought into simple apprehension, judgment, and reasoning, or in the expression of these into the term, the proposition and argument. The process is performed by abstraction, in which we contemplate in thought a part of a whole presenting itself, more particularly an attribute of an object, say gravitation. In analysis we separate the whole into its several parts. Abstraction can be performed on every object, as every object has more than one quality, and we can fix on any one of these. Analysis

can be performed only when we have such an acquaintance with an object as to know all its parts.

The exercise of abstraction, and when it is available of analysis, is required in every kind of investigation. Bacon speaks of induction, commencing with "the necessary rejections and exclusions," that is, the separating of the matter to be investigated from the extraneous objects with which it may be associated in nature. Whately says ("Logic") that in teaching a science, the analytical mode is the more interesting, easy, and natural kind of introduction, as being the form in which the first invention or discovery of any kind of system must originally have taken place. Whewell gives an apt name to the procedure, which he recommends as the "Decomposition of Facts." It serves not only to separate objects from others, but to break them down, so that we may obtain a better acquaintance with them, with their internal structure and their several qualities. It is a process to be employed throughout in all investigations of nature, which in every department is full of complexities.

Analysis can scarcely be described as discovering truth. It is rather a means or instrument toward this end. At the same time, it should be noticed that when we abstract a part, say a quality, from an object, the part, the quality, has a reality as well as the whole. If the concrete be real, the abstract is also real. The abstract may not have an independent reality; thus gravitation has no reality except in body, but it has a reality in body. The criterion here is that the part be really a part of the actual whole, that the quality be a real attribute of a real thing.

Analysis is a sharp and may become a dangerous instrument. It may be over subtle and dissect and kill what should be kept alive and entire. It is fulfilling its end only when, to use an illustration of Plato's, it is dividing the

carcass as the butcher does, according to the joints. Among the ancient Greek philosophers the analytic was the method commonly employed. Down to this last age the analytic and the synthetic were represented as methods of discovering truth, and had large fields allotted to them. Kant's great work, the "Critick of Pure Reason," is divided into the analytic and synthetic parts.

In synthesis the parts are put together to show that they make up the whole. Thus Whately decomposes discursive thought into the term proposition and argument, and then shows synthetically that these make up the whole process. Sir John Herschel, in his "Astronomy," begins with taking up the several departments of the heavens, and then expounds the whole science. The two, analysis and synthesis, must continue to be used as instruments, but they now do so in the methods of induction and deduction.

CRITERIA OF LAWS.—Hitherto we have had to do with individual facts, which tell us nothing beyond themselves. We have not as yet any means of anticipating the future from the past, or gathering wisdom from experience. In particular, we have no science, which consists, not of scattered and isolated facts, but of systematized knowledge. In the construction of science we must co-ordinate the facts. In doing so we discover the laws and find that all mundane affairs are regulated by laws.

But the question arises, How do we from individual facts reach a law? Or, more specifically for our present purpose, When are we entitled to conclude and be satisfied that we have found a law which may be regarded as general or universal? The answer of those who have not thought specially on the subject would be, When we have observed all the facts. But a moment's reflection shows that in most cases, I believe in all, we cannot find out all the facts. We assert that crows are black, but we cannot

go the round of the world and ascertain that it is so. We may have examined millions of cases and found all crows black, but how do we know that a traveller may not report that he has found a white crow in some distant island? In science we say that all mammals are warm-blooded, or that all matter attracts other matter inversely according to the square of the distance; but no one has searched the universe and noticed every mammal and every particle of matter so as to be able to say that no mammal is cold-blooded, and no particle of matter without the power of attraction. But from a limited number of observations we can rise to a law which seems to be universal. How is it so? Mr. Mill maintains that he who can answer this question is wiser than the ancients.

Bacon describes the method of observation by "perfect innumeration" of cases as puerile and incapable of yielding any fruitful results. In induction we have to rise from the unknown to the known. We argue from a limited number of cases in the past to a universal law which we hold to be true in the future, not only so, but in all unknown cases, past and present. The father of inductive philosophy was aware of the difficulty of the problem, and he sought to solve it by bringing in Prerogative Instances (*Prerogativæ Instantiarum*) which could determine what is true of all instances. To give only one example, that of *Instantia Crucis*, the metaphor being taken from the notice put up where two roads meet to tell which to take. It was disputed whether light consists of material particles or of vibrations in an ether. To settle this it was maintained by Fresnel that instances can be artificially produced which are inconsistent with the material, but not with the undulatory theory. But we have now better tests in the Canons of Induction.

In all such investigations we must take along with us

two grand principles. One of these is the principle of Cause and Effect. I believe this to be an intuitive principle, standing the tests above enunciated. I believe that when we discover anything beginning to be, we look for an antecedent producing it—a substance with power. But without entering at this place on this disputed metaphysical subject, I may take it for granted that the principle of causation is sanctioned by a universal experience, and will not be denied by any one. Many, indeed, feel that the principle may require to be enunciated anew and put in a better form since the discovery of the law of the Conservation of Energy, or the Persistence of Force, as Herbert Spencer calls it. But whatever be the best shape in which to put it, we assume in all induction that causes produce their proper effect, and that every new product or change in an old thing has a cause. One of the aims of inductive science is to discover what has caused a given phenomenon, what has produced it in the past and will produce it again. But we have need to assume more than this.

The second is the principle of the Uniformity of Nature, as it is loosely called. The principle of causation might have reigned in all nature and yet there have been no uniformity. All action in nature might have as its sole cause the fiat of God. The connection of all things would, in this case, be with God, but not with one another. The spring, with its buds and blossoms, would be produced by God, but this would give no security that the fruits of autumn were to follow. Or, again, there might be constant interferences by God with the operation of natural agents; or causal agents might work, and yet there be no such thing as the general laws, such as the seasons, which we observe and trust in. We find, instead, that the agents of nature are so disposed or arranged that they produce uniformities, not the result of any one cause, but of a com-

bination and harmony of causes, such as the periodicity of the heavenly bodies, the flow of the tides, the regular return of the seasons, the plant rising from a seed and producing a seed, the descent of the animal from a parent, its growth and its death. All these imply causation, but they require more—an adjusted causation.

But it is necessary to settle more definitely what is implied in the uniformity of nature which lies at the basis of all induction. It implies first that there is a certain number of agents acting in nature—it is not necessary for us to settle how many. Secondly, that these are so collocated or arranged—I believe, adjusted—as to produce general results called laws, which we observe and act upon and can scientifically express. Thirdly, these agents constitute nature, and there is no introduction of new agents and no interference with them in ordinary circumstances. This statement does not preclude miracles on rare occasions, these miracles not being contrary to the law of causation, for they have the power of God as a cause, but they are simply an exception to the uniformities of nature.

We thus see that there are two kinds of laws sought after in induction. The one, the primary and the fundamental, are the laws of causation. In the inquiry into these, we seek to settle the precise nature of the causes acting—what is the precise nature of the power which keeps the moon in her sphere and makes the apple fall to the ground. Or, having discovered the cause and its nature, we try to find what will be its influence and effect in certain circumstances—how, for instance, gravity will produce tides in the ocean.

CANONS OF INDUCTION.—There seem to be three grand ends which men of science have in view in their investigations. One is to discover the composition of the objects around us; the second is to discover natural classes; the

third is to discover causes. There are canons which guide and guard us in each of these investigations.

I. *Canons of Decomposition.*—Almost all the objects we meet with in the world, whether material or mental, are composite. It is the aim of many departments of science, in particular of chemistry and psychology, to analyze them. This can, so far, be effectively done. There are certain rules to guide us, and these may be made more and more specific as the analytic sciences advance.

A. We must separate the object we wish to decompose from all other objects. If we wish to analyze water, we must have pure water separate from all other ingredients. If we wish to analyze intuition or reasoning, we must separate it from all associated observations and fancies.

B. When we have found the composition of any piece or portion of a substance, we have determined the composition of every other part, and, indeed, of the whole. When we have ascertained that a pint of water is formed of hydrogen and oxygen, we have settled that water everywhere is composed of the same elements. This arises from the circumstance that every substance in nature has its properties which it retains. Having detected these properties in one case, we have found what they are in all.

C. The elements reached are to be regarded as being so only provisionally. We are not sure that in any cases we have found the ultimate elements of bodies. At present it is supposed that there are sixty-four elements, but we are not sure of any one of these that it will never be resolved into simpler substances. Meanwhile the chemical analysis is correct so far as it goes. It will always hold true that water is composed of oxygen and hydrogen, though it is possible that oxygen or hydrogen, one or both, may be resolved into something simpler.

Canons of Natural Classes.—There are certain sciences

which are called by Whewell classificatory. They are such as botany, zoology, and mineralogy. We may have two ends in view in classifying; one may be simply to aid the memory by having the innumerable objects of nature put into a convenient number of groups. For this purpose we fix on certain obvious and convenient characteristics and put all the objects possessing them into one class. It was thus that Linnæus put under one head all plants possessing the same number of stamens and pistils. This arrangement, though it does not come up to the requisitions of a perfect classification, is found to be very convenient. Second, our object may be to increase our knowledge by so arranging objects that one characteristic may be a sign of others. In natural classification we should always aim at securing both these ends. There are canons which may assist us in determining when we have reached natural classes.

A. We must have observed the resemblance in many and varied cases, say in different countries and at different times.

B. We must be in a position to say that if there had been exceptions, we must have met them. These two rules guard against forming a law from a limited class of facts.

C. There are classes in nature called Kinds, in which the possession of one quality is a mark of a number of others. All classes entitled to be called natural are more or less of this description. Thus, mammals are so designated because they suckle their young; but this characteristic is a mark of a number of others—that the animals are warm-blooded, and have four compartments in their hearts. Reptiles are recognized as producing their young by eggs, but they are also marked as having three compartments in the heart, and being cold-blooded.

These canons guarantee truth. When we are able to place objects in a class, we know that they possess the properties of the class.

Canons of Causes.—The most lucid and, upon the whole, the clearest and most satisfactory exposition of these methods is by Mr. John S. Mill in his “Logic.” It should be noticed that his methods relate to causes, and we have not had from him an exposition of the canons of decomposition and classes as given above. He mentions four or five methods.

A. The Method of Agreement.—In the spring season we see innumerable buds, leaves, and blossoms appearing upon the plants, and we find the common cause to be the heat of the sun shining more directly upon the earth. The canon is, “If two or more effects have only one antecedent in common, that antecedent is the cause, or, at least, part of the cause.” That canon is too loose to admit of a universal application, as we may not be sure that the point of agreement we have fixed on is the only one.

B. The Method of Difference.—In the very middle of the day I find the scene around me on the earth suddenly darkened. There must be a cause. I find that the moon has come between us and the sun, and this seems the only difference between the two states—the one in which everything was bright, and the other in which it is in gloom. The canon is, “If in comparing one case in which the effect takes place and another in which it does not take place, we find the latter to have every antecedent in common with the former except one, that one circumstance is the cause of the former, or, at least, part of the cause.” This method is the one employed in cases in which experiment, with its separating power, is available. It is the most decisive of all tests when the circumstances admit of its application. There are cases in which this

method is not applicable, when a sort of intermediate one may come to our aid.

C. The Indirect Method of Difference, or the Joint Method of Agreement and Difference.—The canon is, “If two or more cases in which the phenomenon occurs have only one antecedent in common, while two or more instances in which it does not occur have nothing in common but the absence of that antecedent, the circumstance in which alone the two sets of cases differ is the cause, or part of the cause, of the phenomenon.” The illustration given by Mr. Mill is: “All animals which have a well-developed respiratory system, and therefore aërate the blood, perfectly agree in being warm-blooded, while those whose respiratory system is imperfect do not maintain a temperature much exceeding that of the surrounding medium; we may argue from the two-fold experience that the change which takes place in the blood by respiration is the cause of animal heat.”

D. The Method of Concomitant Variations.—We want to know the cause of the rise of water in a pump or of mercury in a barometer. The ancients accounted for this by nature’s horror of a vacuum, which is inconsistent with the fact that water will not rise above a certain number of feet in the pump. Torricelli and Pascal gave a better explanation when they referred the rising of the water or mercury to the weight of the incumbent atmosphere, which Pascal proved by ascending a mountain with a barometer, and finding that, as he rose higher and higher, the mercury fell lower and lower in the tube. Here we have the effect varying with its alleged cause, which is an evidence that the alleged cause is the true one. The canon is, “Whenever an effect varies according as its alleged cause varies, that alleged cause may be regarded as the true cause, or, at least, as proceeding from the true cause.”

E. The Method of Residues.—A farmer knows how much grain a particular field has yielded in the past. He mixes manure with the earth on the field, and finds he has a larger crop, and he ascribes the increase to the manure. He knows what the previously existing antecedents will produce, and after subtracting this, he ascribes the residue to the new antecedent. The canon is, “Subtract from an effect whatever is known to proceed from certain antecedents, and the residue must be the effect of the remaining antecedents.”

I do not need here to give anything more than the above general account of these canons, which are fully unfolded by Mr. Mill. I mention them simply to show that when they are applied they settle for us what is truth.

REASONING IN INDUCTION.—The question is started, Is there reasoning in induction? I am sure that there is. From what has been ascertained by observation taken in a wide sense we infer something else—that there is a law which enables us to predict results.

How is it that the countryman is enabled to predict a coming storm? His father has told him, or he himself has observed that when the wind is in the East, and the clouds are thick and black, there will probably be rain or wind. Here there is evidently inference which can be stated syllogistically by the logician, the general observation being the major premise, the particular state of the wind and sky the minor, and the conclusion that there will be a storm. Every class of men, in fact all men, do thus reason on premises implied, though possibly not expressed. The laborer argues, in his own way, that there should be a rise of wages; the merchant purchases because he concludes there will be a demand for his goods. Before there were any precise rules laid down on the subject, scientific men drew true and important conclusions from common-sense principles in their own mind. The canons of in-

duction now expressed definitely enable us to put the reasoning in a more systematic form, which is a great advantage. We can now use the canons of induction (which, I believe, will become more definite and better expressed) as our majors in the syllogism of induction.

Major. When two or more effects have only one antecedent in common, that antecedent is the cause.

Minor. But the budding of innumerable plants in spring has only one common antecedent—the return of the sun to a higher altitude.

Conclusion, this one antecedent *is* the cause.

This is the method of agreement. Let us take a case from method of concomitant variations.

Major. Where an effect varies with its supposed cause, this is the true cause.

Minor. But the rising and falling of the mercury in the barometer varies with the less or greater weight of the superincumbent atmosphere.

Conclusion, the weight of the atmosphere is therefore the cause of the rise or fall of the barometer.

It should be observed that the canons, with their implied reasoning, do not guarantee to us absolute certainty, what is called apodictive truth or demonstration. None of these are certified, as first truths are, by the law of necessity; we can easily conceive any one of the ordinary physical laws not to be true universally, and we might believe so provided we have evidence. The evidence, after all, is merely a probability of a lower or higher degree, but may rise to a certainty only a little short of being absolute, and quite sufficient to justify us to put trust in it and act upon it in ordinary, indeed in all, circumstances. Such, for instance, is the proof which we have in favor of the law of gravitation. It is not demonstrative like a mathematical truth, but it satisfies the mind and is verified by constant observation.

SECTION VI.

THE JOINT INDUCTIVE AND DEDUCTIVE METHOD.

J. S. Mill argues that more progress will now be made even in observational sciences by deduction than by induction. This may be doubted. It seems to me that observation and experiment must always be the surest way of advancing research. But deduction may be joined to induction. When this is done the method may be called the Joint Inductive and Deductive. This is, in fact, the method represented by Mr. Mill as conducting to such fruitful results.

In this method the inquirer begins in the inductive method, that is, he observes facts with care and with the view of discovering a law. As he proceeds he will ever be asking whether the law is so and so, that is, devising an hypothesis. In order to determine whether this is a true law of nature, he has to examine further facts, it may be, facts of a different kind. As he acts thus, he may find he can apply deduction. He inquires what effects follow from the law in his mind, and he then compares these with the facts. If he finds these to correspond, he has a Verification of his Hypothesis. It is by combining the two in this way that the greater number of the established laws of nature have been discovered. In some cases there have been long processes, both of induction and deduction, before the law has been ascertained and adjusted. When the laws of nature are quantitative, as they commonly are, mathematics may be applied to them, and it becomes the instrument of the deduction, and often a far-reaching one, showing very distant consequences which can be compared with facts.

In the sciences of observation sometimes the inductive

element and sometimes the deductive method is the more prominent; in all cases the inductive, as I reckon, is the essential. In Galileo's researches experiment was the main instrument, but he also used mathematics. Kepler's fertile mind was always devising hypotheses, but he accepted them only as they were confirmed by observations. It would be wrong to say that Newton's method was mere induction. He had before him the observations of Galileo and Kepler, and also a measurement of the distance of the earth's surface from the centre, and he applied a powerful mathematics, created by himself, to these facts. It is a circumstance greatly to his credit that when, on having a wrong measurement of the distance of the earth's circumference from its centre, he found his theory that the moon was held in her sphere by the same power as draws an apple to the ground not in accordance with facts, he gave it up for a time, and only resumed it when it was found, on the proper distance of the earth's distance being ascertained, that the facts corresponded. In all departments of physics or natural philosophy the deductive mingles with the inductive. In optics, in thermotics, in theoretical astronomy, in mechanics, the deductive or mathematical element has a conspicuous place; but in all these sciences we have always to start with observed facts. In ethics we carry out indefinitely the laws of our moral nature; but these have been ascertained by a previous observation of that nature. In like manner, in logic we deduce consequences from the laws of discursive thought, which we have found by observing how they act in the mind. In all the social sciences there is a mixture of the two elements, sometimes the one and sometimes the other being the more predominant. Jurisprudence is forever appealing to fundamental principles, and inquiring how they apply to a given case. The science of national wealth must be

constructed mainly by the observation and collection of facts, in statistical and other forms; but there are universally operating principles ever called in. Thus it is supposed that men are usually swayed by a desire to promote their interest so far as they know it. This is certainly a powerful motive. But there are others, such as the desire for fame, for power, for society, for the beautiful, for the promoting education and religion, all actuating individuals, and the influence may be traced in the progress of nations. In chemistry the laws have to be ascertained by observation, particularly by experiment; but when principles have been discovered, such as that of affinity, they may be carried out indefinitely. Psychology, as a science, is constructed mainly by the observations of consciousness; but having ascertained certain laws, such as those of the association of ideas, we can explain how they affect our beliefs and feelings. In pedagogics, or the science of teaching, we must carefully observe the ways of children; but, in doing so, we discover their actuating motives, such as the love of knowledge, the love of play, the love of approbation, which have to be taken into account in constructing our methods of instruction and discipline. In æsthetics there are ascertained laws of taste which must be taken along with us in the construction of the science. In all departments of natural history, observation must play the most important part; but there are laws of life and of form to guide biologists in all their investigations.

The principles from which we deduce conclusions are of two kinds. Some are self-evident or demonstrative. Such are moral laws and maxims. These are assumed, and are applied extensively and constantly in history and in all the social sciences, in all sciences which deal with motives and character. Of this description is the maxim that men are likely to be happy and comfortable when

they are moral. To this same class belong all mathematical propositions founded on axioms. These self-evident truths are seldom formally enunciated, they are simply assumed and applied. So far as science uses them, it is very much employing the joint Dogmatic and Deductive method. But there is a second kind of principles used in deduction even more extensively; these are acknowledged truths and wise saws established by a large induction. For example, any one may now assume the law of gravitation. In optics it is allowed that the angle of reflection is equal to the angle of incidents, and from this a great many particular truths may be drawn. In chemistry it is taken for granted that the elements combine in certain proportions, and from this a multitude of consequences follow.

In this joint method the induction is tested by the canons of induction and the deduction by the rules of reasoning.

HYPOTHESES AND VERIFICATION. CONSILIENCE OF INDUCTIONS.—“Hypotheses non fingo,” said Newton, meaning, perhaps, that he introduced no fictitious agency, but merely *veræ causæ*, such as existed in nature; or, more probably, that he accepted no truth till it was established. Since Newton’s time, especially within the last age, hypotheses have played a very important part in all departments in which the laws have not been settled, as, for example, in electricity and biology. The investigator is bent on knowing what laws certain phenomena follow. But in nature divers agents are mixed up with one another, and we cannot determine what they are by a loose inspection. As he observes tentatively, he makes a supposition suggested by the facts as to what the law should be. When he notices the descent of plants and animals, he says to himself, Let us suppose the law to be that of development or heredity. He has now a specific end to work for, and he observes

and collects facts, and inquires whether they agree with the hypothesis he has formed. If he finds that many of them do so, he has a probability, and is encouraged to proceed; and if the hypothesis explains a large body of events it rises to the rank of a theory. When it takes in all the facts bearing on the particular case, and no exceptions can be discovered, it is regarded as a law of nature, which, however, may require to be modified and adjusted before it suits all the facts, and so becomes the true law. This process is called

The Verification of Hypotheses.—When first suggested the supposition may have little to support it, and there may seem to be facts opposed to it. But if it is the correct one, there will come confirmations from a variety of quarters, difficulties will disappear, and the seeming exceptions may corroborate it. The hypothesis started is that light consists in vibrations, not a very probable supposition beforehand, but then it is found to explain one set of phenomena after another, till at last it seems to account for everything, and is counted as an established law. Or the hypothesis is that of the conservation of energy, or that the amount of energy in the world, real and potential, cannot be increased or diminished. On the first consideration of this view, obvious objections will present themselves. We strike with a hammer upon a piece of iron till our strength is exhausted, and it looks as if force had been expended and lost. But, on further inquiry, we detect the energy that had gone out of the body to be conserved in the molecular motion or heat of the metal.

Hypotheses, I rather think, must be resorted to in the early stages of the investigation of every sort of phenomena. They are simply tentatives, and most of them may have to be abandoned. They may or they may not be announced: they may, in the first instance, be simply

guesses, and only a few or one of them prosecuted to any great extent. The law of gravitation was for a time only an hypothesis, taking the erroneous form that matter attracts other matter, not according to the square of the distance, which is the true law, but according to the distance. Hypotheses are necessary, but are to be carefully watched and limited.

First.—The hypothesis must be suggested by the facts and not be feigned by the mind; this may be the meaning of Newton.

Second.—It must be regarded as a mere hypothesis till it is established by the criteria applicable to the department. We are much troubled in the present day by hypotheses being represented as established laws.

Third.—The hypothesis is to be abandoned when it is found that there are facts inconsistent with it. It requires much courage to abandon an hypothesis which has long been cherished and perhaps published to the world.

Fourth.—It is established as a law when it explains all the phenomena bearing on the subject and is not contradicted by any known fact.

It is a powerful confirmation of an hypothesis when it enables us to predict occurrences. If the alleged law be the true one, the facts will correspond to it in the future as in the past, and as they fall out will tend to prove that the hypothesis is a sound one. Dr. Whewell has shown that the evidence in favor of our induction is of a much higher and more forcible character when it enables us to explain and determine cases of a kind different from those which were contemplated in the formation of our hypothesis. "Thus it was found by Newton that the doctrine of the attraction of the sun, varying according to the inverse square of the distance, which explained Kepler's third law of the proportionality of the cubes of the distances to the

squares of the periodic times of the planets, explained, also, his first and second laws of the elliptical motion of each planet, although no connection of these laws had been visible before. Again, it appeared that the force of universal gravitation, which had been inferred from the perturbations of the moon and planets, by the sun, and by each other, also accounted for the fact, apparently altogether dissimilar and remote, of the precession of the equinoxes." He designates this process as the Consilience of Inductions. He declares: "No example can be pointed out in the whole history of science, so far as I am aware, in which this consilience of inductions has given testimony in favor of an hypothesis afterward discovered to be false."

SECTION VII.

CHANCE.

In one sense there is and can be no such thing as chance, that is, an event without a cause or without a purpose. Every occurrence has a cause in God. Not only so, but in the ordinary affairs of this world it has a mundane cause. Further, it falls out according to the uniformity of nature.

But there are senses in which there is a chance in our world. The oldest definition of chance (*τύχη*) was by Anaxagoras, who makes it an event whose cause cannot be discerned by human reason (*λογισμῶ*). This account needs only to be a little expanded and made more definite. There are occurrences of which the cause or the law is unknown, and, in consequence, we cannot anticipate their occurrence. This may arise from the cause being utterly unknown to us. More frequently it arises from the com-

plexity of nature, from there being a number of agents working, or from the nature of their operation. We may know all the agencies at work, but we cannot tell how they are working. In all cases the events do not recur with such regularity as to constitute a law. There was a time when eclipses were regarded as coming according to no law, and men, following the law of causality, referred them to a deity. When these causes were discovered they were found to have periods, and astronomers could predict their recurrence, and they were viewed in a different light. Till lately meteors were supposed to appear capriciously, but now showers of them are expected at certain seasons of the year, and nobody ascribes them to chance. When we shake a die in a dice-box, we are acquainted with the mechanical law which it obeys in its movements, but we cannot say which side will cast up. We know, in a general way, what physiological agencies produce death, but we cannot predict at what precise time any man will die.

Still, even in such cases a certain kind and amount of truth may be had, and this from the circumstance that the event proceeds, after all, from causes which operate regularly and from there being a limited number of causes. We find that, given a sufficient number of trials, each side of the die will come up the same number of times; if any side comes up more frequently than another, we argue that the dice have been loaded. We do not know when any one man will die, but we can ascertain what number of people will die in a given time in a community.

In such cases we can strike an average, and we can foretell average results and estimate the probability of a given event. When we speak of the probability of an occurrence, we are not to understand this as implying the uncertainty of the occurrence considered in itself. The event, say the death of a person on a certain day, may be abso-

lutely sure, owing to causes operating. We can conceive that there are higher intelligences to whom it would not be uncertain. We are sure that it would not be so to the view of the Omniscient. It is so to us because of the limited nature of our faculties and of our knowledge of the causes operating. Were we cognizant of all the antecedent circumstances we might in many cases be able to predict the result. It is because of our ignorance that the event is uncertain to us. The probability or improbability is not in the event which we have for expecting it; it is subjective and not objective.

In all cases we must have certain data gained by observation and yielding a general average. In some departments we can express numerically the probability or improbability of the particular occurrence. An event reckoned impossible may be represented by 0, an event certain to happen by 1. All degrees of probability may be denoted by the fractions representing value from zero to unity. The probability of an uncertain event is represented by the number of chances favorable and unfavorable. Thus the casting up of a head or a tail being 1, and the chances against it being 2, the proper chance is one-half. The tables that have been prepared for life insurance companies have been very elaborate, but need not here be given.

There is another sense in which it may be said that there is such a thing as chance. There cannot be an occurrence without a purpose on the part of God, who has ordered the causes producing it. But there may be a concurrence without a design. It is by chance that certain rocks take the form of the face of Napoleon or Wellington. I do not know that there was any purpose designed or effected by so many men of genius being born in the year 1759, or by Cervantes dying on the same day as Shakespeare

died. There are certain minds that take the keenest interest in observing such coincidences and discover a deep meaning in what is in itself meaningless ; for example, connecting a calamity with the spilling of salt at a table, or from thirteen persons meeting at that table. On the other hand, when there is an immense congregation of agents that are independent, to produce an evident benevolent end, for instance, of vibrations of light of coats, and humors, of rods and cones, to enable us to see through the eye, there is evidence of design, the chances being all against such a concurrence.

SECTION VIII.

PSYCHOLOGY.

Here, as well as in all the physical sciences, we have to begin with the observation of facts. There is, however, an important difference between the two departments. The facts in physical science are obtained by the senses ; whereas, in mental science, the observing agent is self-consciousness. It is only thus we can find out what any psychological act is. An examination of the nerves and brain may show how a mental state arises, but can give no idea of the mental act itself, say of a sensation, a recollection, an imagination, of moral approbation, of emotion or wish. But in making consciousness our witness we have to allot to it a large province. We must include in it not only immediate introspection, but also the observation of the mental acts of others, as disclosed in their words, their writings, and their deeds. We cannot, indeed, look directly into the bosoms of our fellow-men so as to ascertain what is passing within, but we can gather what this is by the

expression of it, which, be it observed, we can understand because we are conscious of our own acts. History, biography, travels, plays, novels, newspapers, and especially conversation and familiar letters, may all show us human nature quite as much as they do external incidents. Without these supplements we should have a very contracted view of the mind by inspection of our own souls.

The individual facts are made known in this way. The criterion of consciousness is in itself, it is self-evidencing. As we observe the facts we distinguish between those that differ and co-ordinate them into laws. The criteria of the laws are much the same as those of physical science.

Psychology proceeds on the same two fundamental principles as physics. It is seeking for causes. Without determining the question of the freedom of the will, we may confidently affirm that causation, that the persistence of force, rules in the mind as it does in the body. Certain antecedents are sure to be followed by certain consequences. The orator urges the considerations which may persuade those whom he is addressing and lead them to action. The poet raises up images that please and elevate the mind. The father and the teacher inculcate principles which may guide the young in all their future lives. Investigators in this department have been seeking to discover faculties and the rule and mode of their operation. The early Greeks found sensation, the discursive power, and reason. Aristotle had in the soul the nutritive power sensation, memory, phantasy, and above these, the reason, active and passive. In all ages there has been a grand distinction drawn, in a loose form, between the intellect and the will, the cognitive and the motive powers. Everybody talks of the memory, the judgment, of reasoning, and of sentiment and feeling, of the power of abstracting, generalizing, distinguishing, of loving and of hating.

There seem, also, to be laws of uniformity in nature. It does not appear that in the association of ideas one idea is the cause of that which succeeds; that when height suggests hollow, and the dwarf suggests the giant, and prosperity, adversity, and a portrait the original; that when we count up from one to one hundred, there is a causal connection between the ideas—they are the joint effect of a number of causes. In the science of psychology we seek to discover these laws, such as the law of habit, the connection between the idea and the feeling raised by it, the kind of acts which conscience approves of.

Now, there may be criteria of these laws, both of causation and uniformity. These have not been so carefully enunciated as those of physical science. I believe that, *mutatis mutandis*, they may be considered as very much the same.

The Method of Agreement.—Washington is named, and we find the mind following a certain train. We think of his education, his training, the revolution, his battles, his character, all of which have been previously in the mind together, and we reach the law of contiguity, that when ideas have been in the mind at the same time, when one comes up the others are apt to follow.

The Method of Difference.—We see a portrait of Washington for the first time. The two, the portrait and Washington, were never before in the mind together, yet the portrait calls up Washington, and the law is, things that are related, especially things that are like, recall each other.

The Joint Method of Agreement and Difference.—There are days in which we find that we can easily recall the things we would remember, other days in which they will not come up. The difference is in the time: that in the first few days our brain was in perfect health; in the

other we had a headache, and we discover that the state of the brain affects our associations.

Method of Concomitant Variations.—When we are interested in an event known to us, we are apt to think of it more frequently, and we conclude that feeling, as a secondary law, influences our associations, and according to the feeling with which it is accompanied, so do ideas come up.

Method of Residues.—On contemplating kind actions, we feel a pleasure which can be explained by our social feelings; but we find that on contemplating some of these we have a feeling of moral approbation. This cannot be explained by the mere social feeling, and we have to call in a moral principle.

SECTION IX.

NATURAL THEOLOGY.

Attempts have been made to conduct this science on the joint dogmatic and deductive method, but, in my opinion, without much success. It has to deal with facts, the existence of God and the immortality of the individual soul, and therefore must have an inductive or observational element. I have my doubts whether, from a mere idea or principle in the mind, we can argue the existence of the living God. It should proceed, I reckon, mainly in the joint inductive and deductive method. It looks at God's works within and without us, and, discovering wonderful mutual fittings, means and end, traces of love and just government, it rises to the belief in a being of power, wisdom, benevolence, and justice. The inductions are collected in such works as Ray's "Wisdom of God," in Paley's

“Natural Theology,” in the Bridgewater treatises, and the ordinary works of natural religion.

But there are deductive processes involved. The premises here are supplied mainly by *à priori* principles or by intuition, all to be justified by the criteria of First Truths. In the mind of man there are high and deep truths in the germ, all capable of being developed and actually working in the mature man, being called forth by the circumstances in which he is placed. There is the principle of causation, requiring us, on a new thing or a change appearing, to seek for a cause. This can stand the tests of intuition, being self-evident, necessary, universal, in our very nature and constitution, and it leads us to believe that where there are traces of design there must be a designer. There is a moral power within us, with its law and its obligations, implying a law-giver. We have not an adequate idea of infinity, but we believe that there is something beyond our widest idea or concept, something to which nothing can be added, and we are led to apply it to the powerful, the good and holy One.

We are entitled, we are required, to trust and follow these principles. They are elements and the highest elements of the reason with which we are endowed. We begin with trusting the senses, and find, as we do so, constant confirmations in our daily experience; what appeared at first to be realities we discover to be more real as we bring one sense after another to bear upon them, and find that meat nourishes us and pure air refreshes us, and the due use of the good things of this world prolongs life. We should confide in the same way in our higher ideas and beliefs, and as we do so we find them expanding and elevating the mind, opening grand vistas which look beyond the seen and temporal into the unseen and eternal. If we do not follow our lower instincts, if

we do not eat and drink, our bodies will become feeble and die; and if we deny our higher reason, our souls will lose their freshness, vigor, and aspirations.

But when we would construct the argument, indeed, in all scientific investigations and in all true philosophy we must be careful to ascertain the exact nature of the intuitions or intuitive reason we call in, and only use them accordingly. Those who neglect this are sure to present them in an extravagant form or make a perverted use of them. This has been done by the mystics of the East and of mediæval times, indeed, of all ages. Almost always they have got a glimpse of a reality, but they have seen it only under partial aspects, and they have shown it to us through a cloud, or irradiated it with reflected light, and have represented it to us as vision, inspiration, and ecstasy, whereas it is only one of the higher elevations of our nature.

All our profound thinkers have seen these truths, but have not always properly represented them. We may hold with Plato that there is a grand, indeed, a Divine idea; but I wish that idea, as in the mind, carefully examined, and its forms or law exactly determined, and it is for inductive science, and not speculation, to tell us what are the types which represent it in nature. I hold with Aristotle that there are formal and final as well as material and efficient causes in nature; but it is for a careful induction to determine the nature of these and to show how matter and force are made to work for order and for ends. I am as sure as Descartes, and as Augustine and Anselm were before him, that there is in the mind a germ of the idea of the infinite and perfect; but we must show what is the precise nature of the idea, so as to secure that we draw only legitimate inferences from it. I discover, as Leibnitz did, a pre-established harmony in nature, but it

consists mainly, not in things acting independently of each other, but in the harmony produced by things acting on each other. I attach as much importance to experience as Locke did, but I maintain that observation discovers that the intuition (which he acknowledged) looks at principles in the mind prior to all experience. I allow to Kant his forms, his categories, and his ideas, but their nature is to be discovered, not by criticism, but by induction, when they will be found not to superinduce qualities on things, but simply to enable us to perceive what is in things. I believe with Schelling in intuition (*Anschauung*), but it is an intuition viewing realities. I hold with Hegel that there is an Absolute, but I believe that our knowledge, after all, is finite, implying an infinite, and that the doctrine can be enunciated so as not to issue in pantheism. I turn away with scornful aversion from the pessimism of Schopenhauer and Von Hartmann, but I believe they have done good by calling attention to the existence of evil, to remove which is an end worthy of the labors and sufferings of the Son of God. I believe with Herbert Spencer in a vast unknown above, beneath, and around us, but I rejoice in a light shining in the darkness and revealing the known. I believe in the gems so rich and varied which the higher poets have left us as a rich inheritance; but before they can enter into philosophy they must be cut and set, and it will require a skilful hand to adjust them, and when they are cut it must be as skilfully as diamonds are, and this only to show more fully their form and beauty.

SECTION X.

THE SUPERNATURAL.

We have to posit the Supernatural as the origin of the natural. This we do on the principle of cause and effect. We discover in nature evidences of its being an effect. It has, as Sir John Herschel says, the appearance of "a manufactured article." This is seen particularly in the adaptation of one thing to another all throughout nature. We argue a cause above and beyond nature, and this is Supernatural.

Miracles.—It is asserted that in the very midst of the natural occurrences there are events which cannot be accounted for by natural agents. These are called miracles. Of most of these, when we examine them, we find that they cannot stand our criteria; they are the products of superstitious fears and of credulity. But there are events recorded in the Old and New Testaments which are worthy of having the tests of truth applied to them. These are not to be regarded as occurring without a cause. They are not inconsistent with the intuitive conviction of causation. They have a sufficient cause in that power in which nature originated. We are only following out the principle of causation in arguing thus. We rise to a supernatural cause because there is no agent in nature adequate to produce such occurrences as the resurrection of Lazarus or Jesus.

I would not describe miracles with Hume, as "violations of the laws of nature;" but they cannot be accounted for by these laws. They do not fall in with that general fact that every event has not only a cause in God but a cause in a physical agent. As physical agents cannot produce them, we argue that they are effected by the immediate power of God. Further, they are

not in accordance with the uniformity of nature. It is not in conformity with this that fishermen and mechanics of Galilee should produce our Lord's discourses. They accomplish their ends, in guaranteeing revealed truth, because they are above the causes and laws of nature.

The evidences of Christianity are of two kinds: one internal and the other external. The external are facts attested by witnesses, whose depositions are to be tested by the criteria of testimony. The others are those derived from the suitability of the truth revealed to our nature, moral and spiritual, to our sinful state and our wants. Take the Sermon on the Mount as so conformable to our moral nature. Take the life and character of Jesus, so perfect, so full of love in a world of sin and selfishness. Take his sufferings and his death, so fitted to accomplish their avowed end, that is, make atonement for sin.

There is proof of a uniformity of laws in nature, not from intuition, but the combined result of the experience of all times and countries. But it can be shown that there is a like uniformity in revelation, in its types, its prophecies, its doctrines. Its miracles are of a certain kind. Those of our Lord were mostly the healing of diseases, the cure of evils. Each one is part of a system; each part bearing up the others and the whole. By the one uniformity we are sure that every event is according to law. By the other we find a conformity in a whole supernatural system.

SECTION XI.

CONCLUSION—LIMITS TO HUMAN KNOWLEDGE.

The aim of this treatise has been to show that the human mind is capable of reaching knowledge, and that it has tests to determine when it has done so. I have faced the agnostic, but have not entered into a wrestling with him, which would be endless, because he refuses to take a form by which I may lay hold of him. I have pursued a more effectual method. I have shown objects where he assures us that there is nothing. It is in this way we can command assent and gain assurance.

I have proceeded on the idea that there is a difference in the certitude of truths. Some I have shown are self-evident, necessary, and universally held, and therefore certain beyond doubt or dispute; others are only probable, some with only a slight balance in their favor, others rising to certainty. This is not so much a difference in the truths as a difference in the evidence to us. To God and to higher beings, the one kind may be as certain as the other. We cannot tell whether there will or will not be a good harvest next year. But to Omniscience it may be as certain that there is to be a good harvest as that all the angles of a triangle are equal to two right angles. It is of vast moment that we should know what kind of evidence we have, and what the validity of the evidence which we have in favor of any proposition we are required to believe, whether it is demonstrative or merely probable, and if only probable, what the degree of probability. It is also of moment that we should note what kind of truth admits of apodictic and what of only probable proof. It is vain to seek for demonstration in every kind of investigation. We can have such, as I reckon, only when we have

self-evident truth. But, then, it can be shown that inductive truth can rise to certainty. I doubt much whether we have immediate evidence of the existence of God as we have of the existence of ourselves. But we have quite as valid proof of the existence of God as we have of the existence of our fellow-men; in both we have a fact, the acts done, and we rise up by the principle of causation to a cause. The criteria of truth which I have been furnishing should assist us in all such investigations.

Man's knowledge is increasing and must continue to increase. His generalizations widen as his knowledge increases and take in more and more objects. He is constantly gaining more premises which lead to farther conclusions. One discovery leads on to another; one chamber opened shows us the door which opens into a second. Davy proved the correlation of electric and magnetic forces, Oersted of electric and magnetic, and at last the grand doctrine disclosed itself to a number of investigators, particularly to Mayer, that all the physical forces are correlated.

But man's power of discovering truth is and ever must be limited. First, there are limits to his mental powers. He has only five original inlets of knowledge into the material world. Had he fifty senses instead of five he might know vastly more. Then, his power of working on the materials required by sense and consciousness, his memory and his understanding, are also limited. Some men can discover more truth than others, and it is conceivable that there may be higher intelligences who see farther into the nature of things than the most far-sighted of men. Secondly, every man's individual experience is limited, and the same may be said of the experience of the race—it is confined within very stringent bounds.

Man can discover a vast amount of truth, speculative

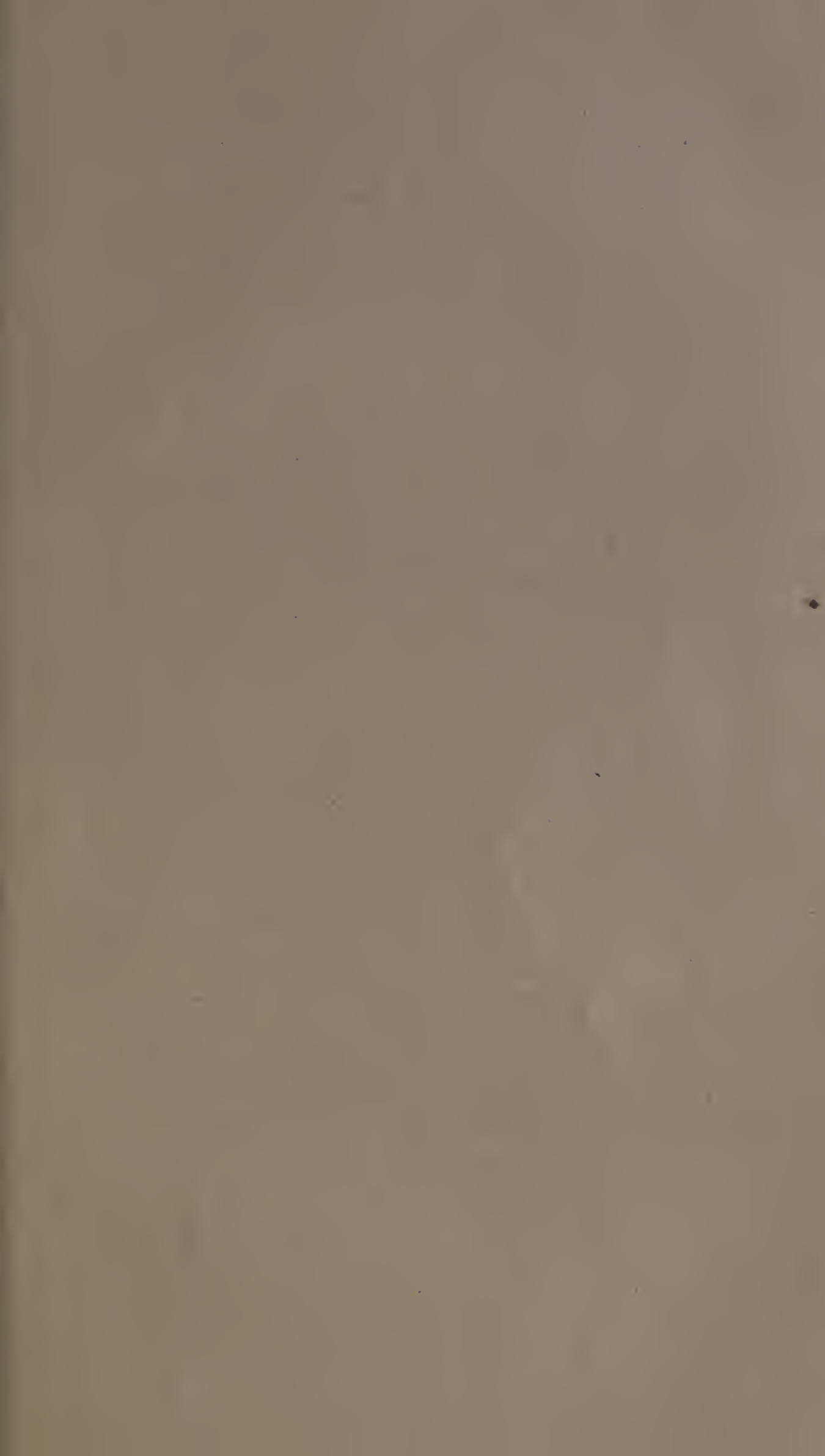
and practical. We have enough revealed to exercise our faculties, to expand and elevate the mind, and to serve for all the purposes of the duty we owe to God, to ourselves, and our fellow-men. Every truth known leads, however, into the unknown. But this is to tempt us to penetrate into the unknown region that we may know it.

As we do so we shall find that there are things beyond our ken in a region beyond, above, or beneath us, and we must be content to allow them to lie there. We know as much as to know that there are truths which we cannot know. We see the objects within our proper range of vision, but we also see the darkness that encompasses them. "We know in part." Yes, we know, but we know only in part.

We who dwell in a world "where day and night alternate;" we who go everywhere accompanied by our own shadow—a shadow produced by our dark body, but produced because there is light—cannot expect to be absolutely delivered from the darkness. Man's faculties, exquisitely adapted to the sphere in which he moves, were never intended to enable him to comprehend all truth. The mind is in this respect like the eye. The eye is so constituted as to perceive things within a certain range, but as objects are removed farther and farther from us they become more indistinct, and at length are lost sight of altogether. It is the same with the intellect of man. It can penetrate a certain distance and understand certain subjects, but as they stretch away farther they look more and more confused, and at length they disappear from the view. And if the human spirit attempts to mount higher than its limited range, it will find all its flights fruitless. The dove, to use a well-known illustration of Kant's, may mount to a certain height in the heavens; but as she rises the air becomes lighter, and at length she finds that she

can no longer float upon its bosom, and should she attempt to soar higher her pinions flutter in emptiness, and she falters and falls. So it is with the spirit of man: it can wing its way a very considerable distance into the expanse above it, but there is a boundary which if it attempts to pass, it will find all its conceptions void and its ratiocinations unconnected.

Placed as we are in the centre of boundless space and in the middle of eternal ages, we can see only a few objects immediately around us, and all others fade in outline as they are removed from us by distance, till at length they lie altogether beyond our vision. And this remark holds true not only of the more ignorant, of those whose eye can penetrate the least distance; it is true also of the learned; it is perhaps true of all created beings that there is a bounding sphere of darkness surrounding the space rendered clear by the torch of science. Nay, it almost looks as if the wider the boundaries of science are pushed, and the greater the space illuminated by it, the greater in proportion the bounding sphere of darkness into which no rays penetrate, just as (to use a very old comparison) when we strike up a light in the midst of darkness, in very proportion as the light becomes stronger so does also that surface dark and black which is rendered visible.



PROGRAMME OF A PHILOSOPHIC SERIES.

For the last thirty years I have been taking my part in the philosophic discussions of the age. I have a few things yet to say before I willingly leave the arena. These have long occupied my thoughts, and they relate to thrilling topics of the day on which many are anxious to have light thrown. In order to bring my views before the thinking public, I start A PHILOSOPHIC SERIES to consist of small volumes, of about sixty pages each, in stout paper, at Fifty Cents per volume, and issued quarterly, and each embracing an exposition complete in itself of one theme. I begin with

I. THE CRITERIA OF DIVERSE KINDS OF TRUTH AS OPPOSED TO AGNOSTICISM BEING A TREATISE ON APPLIED LOGIC. — This will confront me with the leading philosophic heresy of the day, which is working secretly where it does not appear above ground and undermining some of our most precious faiths. It has been shown again and again that Agnosticism is suicidal. It is an evident contradiction to affirm that we know that we can know nothing. But when we have done all this we have only strengthened the position of Agnosticism which holds that all truth is contradictory. Without entering into a wrestling match with a spectre I have set before the mind the truth which is seen in its own light. It has again and again been shown that we have no one absolute criterion of all truth. I have allowed this and approached the subject in a different way, and I show that we have now satisfactory criteria of the diverse kinds of truth which we are required to believe. The little treatise which can be read in a few hours is intended to give assurance to thinking minds, especially young men, in this age of unsettled opinion. It may also be used as a text-book in our upper schools. It may be followed by

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But I have proposed enough till such time as I find that my project is to be countenanced by the friends of a sober philosophy.

JAMES McCOSH.

* * * NOTICE.—Orders for THE CRITERIA OF DIVERSE KINDS OF TRUTH (*Realty Oct. 12th, 1882*), and subscriptions for the entire series, will be received by

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