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A table of contents for *Bibliotheca Sacra* can be found here:

https://biblicalstudies.org.uk/articles_bib-sacra_01.php

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ARTICLE I.

THE NEW ANALYTIC OF LOGICAL FORMS.

BY PROFESSOR HENRY N. DAY, CINCINNATI, OHIO.

There is much of truth, if a little of pretension, in the remark of Scotus, quoted by Sir William Hamilton in his second lecture on logic: "Logica est ars artium et scientia scientiarum, qua aperta, omnes aliae aperiuntur; et, qua clausa, omnes aliae clauduntur; cum qua quaelibet, sine qua nulla." If logic be, as the most profound and most learned thinker of the age has pronounced it to be, "the science of the laws of thought," the vitality and importance of its relationship to all science, to all intellectual discipline, can hardly be overrated. Not more indispensable to the physical astronomer or to the civil engineer is the science of mathematics, as a system to be known, as a discipline to be applied in practice, than the science of the laws of thought to the thinker, both as objective science or complement of principles, and also as subjective discipline or instrument of intellectual training. If there be but a grain of truth and justice in these claims of logic, what can interest more the world of thinkers, the world of educators, — a thinking age, an educating age, — than the present condition and probable destiny of logic?

Time was when all thought went out in public habited

throughout in the dress and cut of logic. Now it would be a spectacle that would strike by its rarity, were there to appear in the public courses of thought a gait or a dress that logic had formed or furnished. Time was when logic ruled queen in the courts of science and education. Now she is scarcely allowed to appear as a servitor. If we bow with deferential homage to the maxim, "vox populi, vox Dei," admitting that the sentiment of the world must be in truth and justice, and so acknowledge that there was reason for this remarkable fall of logic in the estimation of philosophers and of educators, it may yet be claimed, in justice, that the rejection of logic is to be attributed to other grounds than a denial of its own intrinsic merits or of its vital relationship to the advance of science and the cultivation of mind. The arrogant pretensions of disciples or the blind devotion of eulogists — *pessimum inimicorum genus* — may repel a sensitive age from real excellence and worth; or an uncouth attire and a barbarous dialect may exclude from a truly refined society. The past literature of logic reveals sufficient grounds in these accidental relations of the science for that general rejection from the halls of education which it has experienced.

Logic claims to be the science of thought. This claim it urges with a strong presumption in its favor. For, that thought has laws, principles governing it, in accordance with which it must proceed, if it proceed at all; laws and principles that are not beyond the range of allowed human research, and which can be ascertained, arranged, and exhibited in an intelligible form and beneficial method; laws and principles which, as acquired and applied, as guiding and controlling, must make all thinking more true and more efficient every way, none will presume, on any *a priori* grounds at least, to question. Let the utmost be conceded to its failure in the past; let it be admitted that the systems of scholastic logic, with their empty pretensions or their narrow exclusiveness and their barbarous terminology, are unworthy of regard but to the philosophical antiquarian, to

whom fossils, as mere fossils, are gems, and who is utterly indifferent whether it be diamond, coal, or granite pebble, so that he finds a product of the ages past, telling its age and history; it still may be that in the recent instauration of the science that chief desideratum to a true thinker and to a true educator, to an age of scientific progress, is actually supplied, which a true system of the laws of all thought must of its own nature promise.

Such an instauration, it is claimed, is in fact realized in "The New Analytic of Logical Forms," by Sir William Hamilton. The nature, extent, and promise of this labor of Hamilton it is now proposed to examine.

The gathered results of Hamilton's labors in this field of science appear in his *Lectures on Logic*,¹ and his *Discussions*.² His earliest contribution to logical science was in an Article published in the *Edinburgh Review*, in April, 1833. This article, which is chiefly a criticism on recent English works on logic, it is interesting to observe, only exposed a fatal defect in the existing doctrine of logic; but did not articulately define its extent or indicate the correction to be made. The article involved the truth of the new doctrine, but only in part, and did not explicitly enounce it. In 1840 he publicly taught the doctrine in full. In his edition of Reid's works, published in 1846, he exposed in form what he calls "a radical defect and vital inconsistency" in the existing logical system. His more matured doctrine of the syllogism is given in a note to Mr. Baynes's "Essay on the New Analytic of Logical Forms," published in 1850.

The improvements introduced into the science by Hamil-

¹ *Lectures on Logic.* By Sir William Hamilton, Bart., Professor of Logic and Metaphysics in the University of Edinburgh. Edited by the Rev. Henry L. Mansel, Waynflete Professor of Moral and Metaphysical Philosophy, Oxford, and John Veitch, M.A., Professor of Logic, Rhetoric, and Metaphysics, St. Andrews. Boston: Gould and Lincoln. 1860.

² *Discussions on Philosophy and Literature, Education and University Reform, chiefly from the Edinburgh Review; corrected, vindicated, enlarged, in Notes and Appendices.* By Sir William Hamilton, Bart. With an Introductory Essay by Robert Turnbull, D.D. New York: Harper and Brothers. 1850.

ton are summarily comprehended by him in the three following particulars :

1. The syllogism proceeds not, as had been previously taught, in one, but in the two correlative and counter wholes of comprehension and of extension ; — the doctrine as it is familiarly but inadequately denominated, of “ the quantification of the predicate.”

2. The enunciation and application of the simple logical postulate, *that what is thought implicitly be stated explicitly* ; — a doctrine wide-sweeping and entirely revolutionary of the whole science as a formal system.

3. A new logical notation.

There is certainly but little show of uncommon power or marvellous achievement here. Yet we shall see that there is here precisely the mark and characteristic of great power, — the comprehension as simple of what weakness can deal with only as the multifarious and chaotic. Not more mighty or far-reaching, nor more revolutionary, was the promulgation by Newton, as ascertained law, of the simple principle of universal gravitation to the science of physical astronomy, than this simple promulgation by Hamilton of the nature of the syllogism to the science of logic. In both cases we have a discovery that is not merely corrective of existing systems, but creative of new sciences. Science makes a new development. The human mind reaches a new stage of growth. Thought, both as system and as discipline, is revolutionized. In the case of logic, the revolution is only more radical, more wide-sweeping, because of the nature of its object, because the laws of thought are more fundamental to man than the laws of motion.

Sir William Hamilton has by no means left us, in any of his literary remains, the new forms of the science as necessarily determined to it by these new promulgations. His Lectures do not contain his latest evolutions of his doctrine ; and in the loose fragments gathered in his Discussions, and the posthumous papers collected by his editors (Professors Mansel and Veitch), we find only vague hints and un-

laborated suggestions. His Lectures, as we shall see, are strangely immature. His new doctrines, here and there, are given in certain forms of application; nowhere thoroughly developed. His Lectures contain divers teachings that are directly contradictory to his fundamental doctrine. We find this imperfection and inconsistency as well in his own original expositions of the science, as in the large draughts he has drawn from German logicians.

We may, at once, dismiss from our examination, all the claimed improvement in logical notation. With some modification we may accept Professor Mansel's¹ criticism on attempts at representing logical relations by special forms. "If logic," he says, "is exclusively concerned with thought, and thought is exclusively concerned with concepts, it is impossible to approve of a practice sanctioned by some eminent logicians, of representing the relation of terms in a syllogism by that of figures in a diagram. To illustrate, for example, the position of the terms in Barbara, by a diagram of three circles, one within another, is to lose sight of the distinctive mark of a concept,—that it cannot be presented to the sense, and tends to confuse the mental inclusion of one notion in the sphere of another, with the local inclusion of a smaller portion of space in a larger." This remark is certainly too sweeping; for there is a close analogy between quantities in concepts and quantities in space. That the relations in quantity in the one case may be properly symbolized in the represented relations in quantity in the other case, we cannot question. Special diagrams may be serviceable in helping to a right view of the nature of concepts; but the help so rendered is very limited; and there is danger of the evil intimated by Professor Mansel from an extended use of any such system of notation. It was precisely this kind of subjection to outward form in word and symbol that, as it occasioned the overlooking of the contained thought in the symbolism, smothered the life out of the old logic, and forced the living mind of the last century to de-

¹ Prolegomena Logica, Chap. I.

mand that the dead be buried out of its sight. Herein, indeed, lay the marvellous power of that simple postulate propounded by Hamilton, that it demanded for the admitted principles of the science an embodiment in which they could live and express themselves. The mighty hold which this dead symbolism of logic retained upon the minds of its few remaining cultivators is well exemplified in the case of Hamilton, both elsewhere, in his steadfast adherence to an antiquated nomenclature, but especially here, in his unabated veneration for logical diagrams. His own elaborated scheme of notation is an admirable instance of constructive genius; but it is a scientific toy, not a scientific instrument. That Hamilton should have held it in such estimation is one of many proofs that his genius was not destructive, but conservative; he loved the old, and accepted its teachings even when erroneous, till the truth within forced him to let them go. He was no iconoclast, while a true renovator, — a noble model of a true radical and, at the same time, of a true conservative. The truth of this will appear more signally in a consideration of the second of those improvements which Hamilton claims to have contributed to logical science.

“The self-evident truth, that we can only rationally deal with what we already understand, determines the simple logical postulate: *to state* explicitly what is thought implicitly.” We do not know where to find, in the history of philosophy, an instance to be compared with this of the power of the simplest truth to overthrow the most formidable system of error, provided only that they be brought into actual engagement. The whole stately structure of the scholastic logic was shaken to its foundations at the first shock of the encounter. One is appalled at the long detail of results which, *inter alia*, as Hamilton says, we obtain from a single application of this unquestionable postulate; the application from which “it follows that, logically, we ought to take into account the *quantity*, always understood in thought, but usually, and for manifest reasons, elided in its expression, not only of the *subject*, but also of the *predicate*, of a judg-

ment." We must refer to the Discussions,¹ for the full enumeration. We can only state generally that, in the first place, before the magic touch of this postulate, the whole magnificent system of logical mood and figure vanishes into thin air, leaving scarcely a shred behind. Not only is it shown to be wholly useless as a scientific instrument, — absolutely worthless except as a fossil for antiquarian study, or as a philosophical amusement, — but actually unsound, defective, leading inevitably to error. Mood and figure, in logic, respect only the external, accidental form of a reasoning, and therefore must be held to be of insignificant importance as compared with its essential nature. Further than this, admitting the natural and easy distinction of syllogisms in respect to the order of stating its propositions into analytic and synthetic, we have no irregularity in form to provide for, except "the single case where the conclusion is placed between the premises," and consequently no further use of a doctrine of mood in logic. And as to logical figure, it is demonstrated in an elaboration of proof to which only a Hamilton was competent, that "there is but one figure, or more properly but one process, of categorical reasoning."² The whole doctrine of logical mood and figure being thus eviscerated from the science, as it has been hitherto taught, we have little left. The stateliness, the charm of the scholastic art, disappear, when *Barbara* and all her cabalistic train take their departure. They bear away, however, few regrets from the springing age of thought. Logic lives still; and its true life will develop itself, now that the winter bands of scholastic mood and figure are burst.

Another grand result claimed by Hamilton to be obtained from this application of the newly enounced postulate is, the reduction of all the laws of syllogism to a single canon, and the consequent evolution of all varieties of syllogism from that one canon, and the abrogation of all the special laws of syllogism. It is much to be deplored that Hamilton has

¹ Appendix II. Logical. A. Of Syllogism, etc. (Am. ed.), p. 602.

² Logic, Lect. XXII. (Am. ed.), p. 318.

given us no expanded evolution of the results thus summarily stated; that he has left even the true import of these brief statements to be conjectured or laboriously deduced from the merest germs of doctrinal statement. The single canon of the syllogism is thus enounced: *What worst relation of subject and predicate subsists between either of the two terms and a common third term with which one, at least, is positively related; that relation subsists between the two terms themselves; in other words: In as far as two notions both agree, or, one agreeing, the other disagrees, with a common third notion; in so far those notions agree or disagree with each other.*¹ But we cannot believe this to be the highest canon of syllogism as necessarily resulting from the application of the postulate. If it can be interpreted by any possibility to include all that such a canon, as supreme, should comprehend; still its whole form and shape are ill-suited to express such a fundamental principle. The terms "related," in the first form, and "agreeing," in the second, are altogether too vague, too rhetorical, for such a universal canon. Only as these terms are limited to quantity, is the canon, in either form, tenable. If this be regarded as Hamilton's last exposition of the syllogistic law, and his use of it in his scheme of logical notation seems to favor this supposition, then we must apply to him the language he uses of Aristotle: that "it contains the truth; but the truth partially and in complexity, even in confusion. And why? Because [Hamilton] by an oversight, marvelous certainly in him, was prematurely arrested in his analysis."

If Hamilton could justly claim that this postulate necessarily involves "the reduction of all the general laws of categorical syllogisms to a single canon," he certainly has not left us, in his published works, any actual "evolution from that one canon of the species and varieties of syllogism," or the "abrogation of all the special laws of syllogism."

Indeed, the canon called by Hamilton, in his letter to Mr. De Morgan, his "supreme canon," cannot, by any liberality of

¹ Lectures on Logic, Appendix (Am. ed.) - 507

interpretation, yield the large fruits which his penetrating eye discerned as inwrapped in the true germinant principle of logical science, and certain in its consummated development to be harvested as its legitimate product. It is not the seed-form for such a crop. At all events, so far as we can discover, Hamilton did not live to mature one solitary fruit of this large promise. The scientific world, we may rest assured, as it has shown no disposition as yet to accept this as the fundamental canon of reasoning, so will never thus accept it.

As a third grand result claimed by Hamilton to have been obtained from this application of the postulate, we may instance that which he enumerates as the second in his long schedule of results: "The revocation of the two terms of a proposition to their true relation; a proposition being always an equation of its subject and its predicate." In our attempt to measure the degree of merit in this claim, we labor under the same difficulty as before; we do not know how much or precisely what meaning to put into the language. Everything turns on the import of the term "equation." No logician before Hamilton, probably, would object to the statement that a proposition is "always an equation of its subject and its predicate." All would have unhesitatingly accepted the formula: $A = B$, as expressive of the true nature of a proposition. If all that Hamilton meant was simply this: that there is an analogy between a logical proposition and an algebraic equation, such that logic may, without transgressing the allowed limits in the use of language, represent the relation between the two terms of a judgment as an equation; if this is all, the claim, so far as this particular is concerned, amounts to little or nothing. But if we take the term in its exact literal import, as denoting an identity in quantity between the terms of the proposition, then we have in the claim a principle revealed that is fundamental. If it be allowed, the whole foundation of logic as a system is subverted and displaced; and the science must be built up anew. The old material may be

to a certain extent at least, retained; the old hewn stones, the blocks, the pillars, the carvings, may be used again; but the whole structure must be, in shape and appearance, in use and character, essentially new and different. As before, we have here to say, that if this were the meaning of Hamilton, he has certainly left no formal evidence of any such plan having been conceived by him; we find no draft, no sketch, no hints towards a design of such a new structure. His formal course of instruction in logic — his Lectures — give us no such new system. His editors do not seem to have discovered any hints of any such reconstruction. The most significant utterance we find anywhere on this point is in the item of claimed results, which we have quoted in full.

We have stated what may be regarded as the more important of the results claimed by Hamilton as obtained from the application of his new postulate in one direction. He enumerates eighteen in all. Most of these are embraced in the general statements which we have made. The others are of only subordinate importance.

There remains of the three improvements which Hamilton states he has introduced into the science of logic, the first one mentioned, viz. the doctrine of the two correlative and counter quantities in the syllogism. In this doctrine we recognize the vital principle of the New Analytic. As must have been seen, it is by virtue of this principle that the new postulate worked its destructive work on the old logical system. The elaboration of this principle, the demonstration of its truth, and the triumphant vindication of it against its assailants, win for Hamilton the just title of Founder of a new Analytic, worthy to rank with Aristotle as an original expounder of the laws of logic.

He did not originate this distinction in quantity. The quantities of extension and comprehension were familiar terms in logic. He only demanded that in the proposition the subject and the predicate should be regarded as standing in inverse reciprocal relations of containing whole and con-

tained part. Before, the predicate was regarded the one exclusive, containing whole; the subject was held to be a part of the class denoted by the predicate; the only quantity recognized was, of course, the quantity of extension. The syllogism: "Man is mortal; Socrates was a man; therefore Socrates was mortal;" was explicated as if it were expressed thus: "Man is contained under the class mortal; Socrates is contained under the class man; therefore Socrates is contained under the class mortal." But, as Hamilton taught, it is equally legitimate and proper to explicate in comprehensive quantity, and to say, "the notion 'man' contains in it the notion 'mortal'; the notion 'Socrates' contains in it the notion 'mortal.'"

The application of this new view of the relationship between the terms of the proposition, — simple, unquestionable, almost obvious as the doctrine is, — gives a new form to the whole development of the science. Happily Hamilton has himself in his Lectures applied the theory most ably and most beneficially. His system of logic, by reason of this one improvement alone, utterly eclipses all other systems, — all at least which have appeared in the English tongue. They were all constructed in error, in serious error; and the error lay in the very principles of the system. If, as Galen says, "a trivial slip in the elementary precepts of a logical theory becomes the cause of mightiest errors in that theory itself,"¹ the fatal results in the ultimate evolution of the science from such an error in the very fundamental conception of it, can hardly be over estimated. It is true that in the terminology, in the divisions, in the special handling of the several parts of the science, there is little change to be made in order to a full correction of the error. But the entire conception of the science is changed; a new import is put into all the definitions and laws; the applications are multiplied and enlarged; a new world of thought is opened to the view. And in exact correspondence with this, the science as a discipline becomes a new thing; thinking expands into a new

¹ Quoted by Hamilton, *Logic*, Appendix (Am. ed.), - 500

atmosphere; it is freer, larger, more just and natural altogether. A paralysis that had bound one entire half of the intellect is removed; and the mind puts forth its energies with more than a redoubled vigor under the discipline, and makes more than a double growth.

From this summary view of the logical labors of Sir William Hamilton, it will appear that they are to be characterized rather as suggestive and germinant than as exhaustive and complete. His Lectures are incomparably the best complement of logical doctrine in our literature. They bear the marks of his profound learning, his thorough method, his clear and accurate enunciation, his correct taste. No conceivable instrument of intellectual culture for minds sufficiently developed to apprehend it, can compare with it. The system as here presented is not however, in all its details, a perfected one. The Lectures were written before he had fully established in his own mind the new doctrines of logic. Traces of these maturer views appear here and there; but the system was first developed from other principles. The introduction of the new gives somewhat of a patchwork character to the Lectures. The special laws are not always reshaped to the new principle. There are instances of irreconcilable contradiction, which are to be accounted for in the light of this fact. In his large draughts from German logicians he has occasionally introduced presentations of doctrine entirely alien from his own established views. In short, his own matured conception of the principles of logic has not given shape and character to the development of the science in his Lectures. We will, in the sequel, endeavor to enunciate what we conceive to be the full, final form which, from the results of Hamilton's labors in this field of science, logic as a system must assume; into which these results must, by logical necessity, sooner or later emerge.

In the first place, in regard to the proper sphere of logic, its legitimate field and boundaries, the scientific world will hardly be able to resist the demand of Hamilton that logic

shall be limited to the formal laws of thought, — of thought in the narrow import of that term, as the mere product of the discursive faculty. There will doubtless be some hesitancy in yielding to this demand. It will be urged that there should be one comprehensive science, that shall comprehend the laws of the intelligence generally, at least of its original and properly acquisitive faculty, and that that science should be called logic. There is reason in this claim. Why should there not be a science of the laws of the immediate, of the perceptual, and the intuitional, as well as of the mediate—the discursive—intelligence? Good use has warranted this wider import. To all this it may be replied, in the first place, that the progress of science necessarily carries along with it nicer, narrower distinctions, and involves the necessity of narrowing the use of terms to mark and preserve these distinctions. The term “logic” has embraced, in its use by some philosophers, as by Descartes, all mental phenomena, feelings and volitions, as well as intellectual states. If we limit its application to cognitive acts of the mind, we shall need to distinguish two very widely separated departments—the science of immediate and that of mediate cognition, each having laws and modes of development altogether peculiar. More than this, the science of mediate cognition has received a development altogether disproportionate and in advance of that of the laws of simple apprehension; it has now assumed almost the completeness in form which characterizes the science of geometry. And what is, perhaps, still more decisive, the science of mediate cognition can now be regarded and trusted as properly a pure science—having necessary truth as its matter, and admitting demonstrative evidence in all the successive stages of its development. With such a determination of the field of logic to the sphere of the discursive faculty, we have clearly-defined boundaries for the science, as well as a peculiar matter and a peculiar method, so that obscurity and liability to confusion and consequent error are well nigh removed. We thus attain a science possessing all the

eminent beneficial uses of proper mathematical science in intellectual training and discipline, besides giving the promise of all those incomparably higher and richer benefits which a science of thought itself should yield as compared with a science of mere special forms.

Philosophy owes Hamilton a debt of lasting gratitude for having aided so effectually in establishing the proper limits of logic. The contracted views of its sphere presented by the leading British logicians, as by Dr. Whately, limiting it essentially to a fractional part of but one, and that one by far the least important, of the three grand departments of the science, — to the deductive forms of the syllogism, — Hamilton utterly discards. The doctrine of concepts and that of judgments are departments of altogether higher importance and rank than that of syllogisms, in every view that can be taken of the matter. The doctrine of syllogisms concerns altogether a less important part of our thinking than that of judgments or that of concepts, and is founded on those doctrines, and without them must be baseless and futile; and deductive reasoning is by far the least important, in every view, whether of intrinsic rank or of beneficial promise as a study and discipline, of the various modes of reasoning. Hamilton has greatly enlarged the domain of logical science, as marked out by such logicians as Dr. Whately; he has greatly circumscribed its boundaries as defined by such logicians as Watts, Kirwan, *et id omne genus*. He has drawn its circumference in a clear, well-defined line, and marked out thus a science second to none in the entire circle of sciences, both in intrinsic worth and in utility as a study; a science outranking all others as lying at the foundation of all, and determining the validity and the methods of all, strictly and literally *ars artium et scientia scientiarum*. If any still think that logic should embrace in its sphere the laws of intelligence generally, or of the cognitive intelligence, all that they need do, will be to limit the term to its recognized sphere, and denominate what Hamilton would call logic without limitation, discursive logic, or the logic of mediate cognition.

Logic, then, or, if any so prefer, discursive logic,—the science of mediate cognition,—is exclusively conversant with the acts of the discursive faculty, and its acts all come within its domain. Their spheres are commensurate. It will be serviceable to indicate more exactly, and from other points of view, the field of mental activity thus denominated.

The discursive faculty has otherwise been known as the understanding properly so called (German, *verstand*), as the comparative faculty, or the faculty of comparison, the faculty of relations, the faculty of thought in its narrower import. It is denominated by Hamilton the elaborative faculty.

Of the nature of the operations of this faculty, the profound and accurate discrimination of Hamilton has given us the most true and exact notions. It is a faculty of cognition, not of retention, not of reproduction, or as Hamilton (as we think) unhappily denominates it, of imagination, but of acquisitive cognition. But of acquisitive cognition there are two easily distinguishable species. There is the immediate, the direct, as in perception and intuition,—recognized on the European continent as the intuitional, and, with some indefiniteness, in English science as that of simple apprehension; and there is the mediate, the indirect. In the one case, the object is given; in the other, it is thought. In the one, we know the object immediately and irrespectively as an individual,—“as a complement of certain qualities or characters considered simply as belonging to itself”; in the other, we know the object mediately and relatively, “as comprising qualities or characters common to it with other objects.” The distinction is clear and unquestionable. It is, we will add, radical, and of as vital importance in the representation in discourse of an object of thought as in the apprehension of it in the mind itself. A “ship,” as an object of immediate cognition, is known as an individual ship—the Pacific—with a certain size, color, rigging, etc. It is known mediately only as having

characters in common with all ships, and is of course never realized in objective reality, either as having those characters only, or as wanting any one of them. "Fortitude," known immediately, is known as an individual action characterized by its relations to space, time, person, etc.; known mediately, is known as one of a class of virtues, with specific characteristics distinguishing it from other virtues, never realized just with these characters alone, and never realized without them all. Mediate cognition thus fastens only on what is common, what belongs to a plurality of objects. In other words, in mediate cognition, we know a character or complement of characters that a plurality of objects possess in common. A mediate cognition of "ship" knows it as an instrument of transportation by water, as the complement of these characters. But these several characters are common to many individuals. That is, many individual objects possess *the same* characters. The discursive faculty as the faculty of mediate cognition, applied to several objects, apprehends such a common character — *the same* character — as belonging to the several objects. This character, as the same, identical in the many individuals, is the object with which it has to do. It is, in fact, in its essential nature an identifying faculty, apprehending the same in the many; and with all deference, we think that this name better indicates its proper character than the other denominations, — discursive, comparative, elaborative, or the faculty of relations. The proper, the peculiar, the individual, it has nothing to do with, as such; it is the common, — what is the same, identical, — in the plurality of individuals alone that it apprehends. All the modifications of its action, in comparison, in analysis and synthesis, in abstraction and generalization, are modifications of this one essential activity of identifying, — of seizing the identical in the many. We compare, thus, by identifying the common character in the objects compared. We analyze and synthesize only that we may separate in a complement of characters some one character common to some other notion, or that is identical with

some one character in another notion, or that we may gather about a single character that is identical in a plurality of objects those objects that possess it in common. We generalize by identifying a property or character in all the individuals of the class. Identifying is the essential, characteristic operation of this so-called discursive faculty. Everything else that is ever associated with it is accidental, — constitutes no essential property.

It would be easy to substantiate this view of the essential nature of this mental activity from the expositions of psychologists. If we find it nowhere formally enunciated, it is necessarily involved in their best teachings. No satisfactory explication, for instance, of the process of generalization has ever been given which did not involve this as the essential element in the process. A single quotation from Hamilton's *Metaphysics*¹ must answer our purpose. "A general notion is nothing but the abstract notion of a circumstance in which a number of individual objects are found to agree, that is, to resemble each other. In so far as two objects resemble each other, the notion we have of them is identical, and therefore, to us, the objects may be considered as the same. Accordingly, having discovered the circumstance in which objects agree, we arrange them by this common circumstance into classes, to which is also usually given a common name." Generalization is thus but that modification of the identifying process in which we view the plurality of objects possessing the same character as one. And what is to be particularly remarked is the convertible use of the terms "resemblance" and "identity." "Similarity," "resemblance," is in fact but partial identity. Two objects are similar, resemble each other, when they are recognized as having any one property the same; and we say that in respect to that property they are the same. All individuals of a given class are the same in respect to that property which constitutes the principle of classification. James and John, and all individual men, are the same in respect of their

¹ Lecture XXXV. (Am. ed.), p. 475.

rationality and immortality. If any two of our notions embrace similar properties and relations in all respects, we of necessity think they alike respect the same object. Now, while it is a contradiction in terms to say that any two real objects are absolutely identical, and we say only that they are the same in respect to one or more properties, that they are partially identical, similar, we may in thought separate one or more properties and think them as the same, although pertaining to different real objects. We say "snow and paper are the same in whiteness"; "the white in the snow and the white in the paper are the same"; "snow and paper are white." In thus thinking, the discursive faculty has identified the common property "white," in the two objects; and by virtue of that identification thinks the objects as so far the same. All generalization is thus but an identifying process.

But we may go further than this. In truth, all judgment is but an identifying act. When it is judged "snow is white," the judgment is true and actual only as the subject "snow" is, in a part of its meaning, identified with the quality "white"; and the real, necessary import of the proposition is that one of those characters that make up our notion of "snow" is the character "white." To predicate a quality of an object is nothing more or less than to judge that quality to be one of the qualities that together make up our notion of the object. We are thus prepared to accept the oracular enunciation of Hamilton, that "a proposition is always an *equation* of its subject and its predicate," in the exact, literal meaning of its terms, regretting ever that he has not carried out his principle in the development of his logical system, and has nowhere indicated whether he designed the language to be taken as rhetorical or strictly scientific. In the exactest mathematical import of the language, we maintain that every proposition, so far as true, is an identification, an equation, of the subject and the predicate. This is the foundation principle of all logic, of all discourse.

This identification of the subject with the predicate which constitutes a proposition, as such, it will of course be remarked, may be total or partial. When the identity affirmed is total, we have the so-called identical proposition. It is absolutely total when notion and word are both identical, as "snow is snow." It is total in thought, when only the outward expression differs, as "snow is crystallized vapor." It is partial in thought when only a part of our notion of the subject is identified with the whole or a part of the predicate, or a part of the predicate with the whole or but a part of the subject; as when we say "snow is white," we mean that one of the qualities that make up our notion of "snow" is "white"; or that "snow" is one of the things that make up the class of objects called "white"; and when we say "snow glistens," we mean that a part of our notion of snow, conceived of as active force, is "glistening force." As would be supposed from the purposes of discourse, language consists chiefly of partially identical propositions. With this distinction of total and partial identity, and confining the statement to affirmative judgments, we are prepared to enounce as the single germinant principle of all logical science, the truth that *every judgment is the identification of one notion with another, partial or total; every proposition is the declared identity, partial or total, of subject and predicate.* From this principle logical science can develop itself in strictest philosophical method into a pure science with mathematical exactitude and certainty. And we venture to add that it is the indispensable condition of any true science of logic.

The judgment is the essential element of logical science. It is the simplest, purest act of thought. The other elements of logical science—the other products of thought, concepts, and reasonings—are derivatives from the judgment. They possess the one essential characteristic of a judgment, that of identity between different notions. A concept is the signalized complement of characters which in several judgments are identified with a notion. The

concept "snow" is the signalized aggregate of the characters which in separate judgments, as "snow is crystallized," "snow is vapor," have been identified as making up a certain object. Thus, as Hamilton teaches, "every concept is, in fact, a judgment or fasciculus of judgments."

A reasoning is but a derived judgment. As a concept is an *aggregation* of the several characters identified as the constituents of an object, a reasoning is the *separation* of one of such identified characters into its constituent characters, and an identification of one or more of these lesser characters with the object. "Snow is vapor," "snow is crystallized," are the first elements of thought. The characters identified in the two judgments aggregated form the concept "crystallized vapor" = "snow." The character "vapor," by another judgment, is identified, in respect of one of its constituents, as "water," of another as "aeriform." So in a reasoning we identify "water" or "aeriform" as one of the characters of snow in so far as we conceive of it as "crystallized vapor"; as "snow is crystallized vapor; crystallized vapor is water; therefore snow is water."

The entire science of logic, accordingly, — inasmuch as it is the science of mere thought, and of thought in the narrower sense as product of the discursive, or more properly the identifying, faculty, the three products of which are concepts, judgments, and reasonings, — is founded on the one principle of identity. It can maintain a scientific character only as this one principle is made to determine all its developments and appear in them all. And when thus developed, we may in the fullest, exactest meaning of the language, use the words of Hamilton, although employed by him in reference only to a part of the science, and, we conceive, in a somewhat rhetorical sense: "Its laws, erewhile many, are now few, we might say one alone, but thoroughgoing. The exceptions, formerly so perplexing, have fallen away; and the once formidable array of limitary rules has vanished. The science now shines out in the true character of beauty, — as at once one and various. Logic thus

accomplishes its final destination; for as 'thrice-greatest Hermes,' speaking in the mind of Plato has expressed, 'The end of philosophy is the intuition of unity.'"

Accepting this principle of identity as the one principle of logical science, a system of logic should determine at the outset the exact compass and control of this principle. Now absolutely simple as this principle is, it yet, in its applications, presents a threefold aspect; and from these three phases of the one simple principle we derive at once the three comprehensive laws of thought. When, for illustration, we affirm the identity of A with B, we may construe the application explicitly and positively as meaning that A is B; or we may, in the second place, construe it as implicitly meaning that A is not something different from B, or A is not non-B; or, in the third place, we may construe it as implicitly meaning that A is not anything other than B. In other words, the explicit identification of A with B implies necessarily that A is not different from B, and further that A is not something else than B. We may take the principle of identity thus: 1. in its simple positive form; or, 2. in its simple negative form; or, 3. in its exclusive form. We have thus the three general laws of thought: the law of identity proper; the law of contradiction; and the law of excluded middle. The law of reason and consequent, enumerated as the fourth in the text of Hamilton's Lectures on Logic, is in his Discussions rejected from the science, as in truth it should be.

The operation of these fundamental and universal laws of thought is, as would be supposed, most vital and most significant as applied to the primitive product of thought—the judgment. They originate, at once, the three forms of the judgment—the categorical affirmative, the categorical negative, and the disjunctive judgment; inasmuch as in affirming the identity of A and B, we may affirm in either of the three ways: 1. A is B; 2. A is not non-B; 3. A is either B or non-B.

As applied to concepts, their operation determines the

whole process of the resolution or analysis of concepts, and gives us the governing special laws of logical division and definition.

As applied to reasonings, their significance is equally obvious, validating in mediate reasonings every conclusion in the categorical affirmative syllogism on the simple principle of the identity between some part of A and a part of B, if B be a part of A; and in the categorical negative, on the corresponding principle that, if no part of A be identical with any of B, then no specified part of A is identical with any specified part of B. In immediate reasonings these laws validate in like manner all legitimate forms of logical conversion; all proper explications, as when we conclude from the proposition, "man is rational animal," that "man is rational" or "man is animal"; and all conclusions in what have been blindly termed the disjunctive and the hypothetical syllogisms. We say "blindly termed," for if syllogism be a mediate reasoning, these reasonings are not syllogistic; and logicians have mistaken a mere accidental form of statement for essential substance. Further, there is nothing of a hypothetical nature in a hypothetical reasoning more than in all syllogisms; and logicians have in this nomenclature also mistaken form for substance.

We may be allowed, in noting this instance of that common vice of logicians, which has so nearly proved the death of the science for all practical use in mental discipline and training, and occasioned its general neglect or rejection, — the substitution of form for substance, and of a dead symbolism for the living spirit of the science, — to turn aside for a moment to indicate another strange oversight of logicians, which has so confused their teachings in regard to the form of reasoning now alluded to — the hypothetical syllogism. It is the oversight of the clear distinction between the verbal statement of a subject when it is a mere object, and the statement of a subject when it is a truth, — the form of stating an original concept, and that of stating a judgment when viewed as a concept. In the first case we use a normal

noun, as it is called in grammar, as "*grass is green*"; in the other case we are obliged to use a grammatical conjunctive, as *if, that, who, why*, etc.; thus, "*that grass is green is true,*" "*if it be green may not be questioned,*" "*why grass is green is not known.*" Now it is of the essence of a hypothetical judgment that the subject be a truth, not a simple object; that it be a judgment viewed as a concept. It was necessary, therefore, in stating it to use a conjunctive. The judgment, "*If A is B, C is D,*" means nothing more nor less than this, that "*the truth that A is B involves, that is contains as a part of it, the truth that C is D; or, "a part of the truth that A is B is identical with the truth that C is D.*" Logicians have stumbled over this distinction, and have in consequence involved the whole doctrine of hypotheticals, so beautifully simple and so congruous with the other doctrines of a true logic, in obscurity and perplexity. Hypothetical reasonings, thus, in the light of this simple distinction, fall at once into the class of immediate reasonings, and come easily under all the laws of logic applicable to this class of reasonings, as distinguished from mediate or proper syllogisms.

This division of reasonings into mediate and immediate is a most important one, and yet has generally been overlooked by logicians. Hamilton, in some fragmentary notes posthumously published by his editors in the Appendix to the Lectures on Logic, recognizes it; but his Lectures ignore it. The distinction is obvious: in a mediate reasoning the partial identity of two notions is recognized through the partial identity of each with a third; in an immediate reasoning this partial identity is recognized from the immediate relation between the two notions, without any intervention of a third notion. The appearance of similarity in the formal statement of the reasoning is entirely illusive. In the categorical syllogism, the judgment which forms one of the three in a hypothetical or a disjunctive reasoning, is not expressed, but is as necessary as in the other forms. Thus in the hypothetical: "*If A is B, C is D; but A is B, there-*

fore C is D"; the second judgment, A is B, only removes the hypothesis which logic ever attaches to the premises of a syllogism. But this removal is not expressed, and only implied in the usual categorical form. Thus the syllogism, "A is B, C is A, therefore C is B," if as fully expressed as it is in the hypothetical, so-called, would read: "If A is B, and if C is A, C is B; but A is B, therefore C is B." The famous postulate of Hamilton, *that what is implicitly thought be explicitly stated*, would do as fatal execution to the common logical doctrine of the hypothetical as it did in his hands when applied to the old doctrine of mood and figure. In truth, the hypothetical is essentially a categorical judgment, and differs from the other co-ordinate species only in the character of its subject, which here is a truth, while elsewhere it is an object simply; and the general laws of categorical judgments apply naturally and readily here as elsewhere. The hypothetical reasoning is, however, as more commonly employed, an immediate reasoning, involving no comparison beyond that of the subject and predicate. Its formula is: "The truth A involves the truth B; therefore as A is, B is." But nothing forbids the use of this kind of judgment, in which one truth is affirmed to be contained in another, in mediate reasonings; thus: "The truth A involves the truth B; but the truth B involves the truth C; therefore the truth A involves the truth C." This form runs exactly parallel with the comprehensive categorical: "Caius is a man," i. e. the notion "Caius" contains the notion "man"; "man is mortal," i. e. the notion "man" contains the notion "mortal"; therefore "Caius is mortal," i. e. the notion "Caius" contains the notion "mortal."

While the three phases of the general principle of identity thus furnish so many of the special laws that preside over the products of thought, there is another distinction to be made in reference to this principle, which will originate at once other laws equally important. It is that determined by the particular object to which the principle in these several phases is to be applied. The principle accordingly

assumes a more specific form in reference to the nature of thought ; in other words, in reference to the several products of thought — concepts, judgments, and reasonings. From the very nature of the faculty of thought, or the identifying faculty, its objects are necessarily composite. Only where there is a plurality in a unity can it operate ; as its one function is to apprehend the one, the same in the manifold. It cannot act but by analysis and synthesis. Now the relation of plurality to unity is the relation of quantity ; and we see thus that all the processes of thought, all logical processes, are limited to this one relation. They all proceed in quantity, and have no significance or value except as quantitative in their nature and import. In addition to the principles of identity, the more determined relations of quantity, therefore, have sway in logic, and test all its procedures. Only so far as quantitative can an object come into thought, in its stricter import ; or, in other words, come into logical consideration. And on the other hand, so far as quantitative it may be brought under logical laws, — it may be thought. It devolves upon logic, as a science for man's benefit, that it exhibit its applications to all the general forms of quantitative relation within the limits of the universal and necessary, which, of course, as a pure science it cannot transcend. It should indicate the general kinds of quantity ; and from this enumeration, which must, to be exhaustive, be commensurate with human thought, evolve its doctrines, as specially modified in application to them. There will, we conceive, be no hesitancy in accepting the following enumeration of the forms of universal quantity, or of wholes.

First and most fundamental is the whole of thought itself — *the Noetic whole*. Its parts are the positive and the negative. It gives the formula : " A is B or not-B." It is the whole in which the identifying process, the working of the principle of quantity, first realizes itself. The parts are complementary, they make up the whole, and necessarily infer each the other.

Second is the whole of the necessary forms in which being enters thought, — *the mathematical whole*, with its two species, numerical or that of time, and geometrical or spacial. Under the denominations of extension and comprehension, the two species of this kind of whole have become familiar in logical expositions. The full evolution of these, and particularly the elevation of that of comprehension to a co-ordinate rank and place with that of extension in all logical products, constitute, as we have seen, the main contribution to the science by Hamilton. This is the soul of the “new analytic.” They are applied, however, in logical systems, chiefly to substances.

Third is the whole of substance and attribute, — *the substantial whole*. We cannot think substance but as we think attribute, nor think attribute but as we think substance. Substance and attribute make up a whole to our thought. As such, logic can apply to them the principles of identity. But they necessarily become greatly modified in this application. These modifications it is incumbent on logic, as a useful science, to indicate fully, distinctly, and in form. The necessity of this must be conceded at once, if it be granted that logic should deal at all with objective being; for only till it treats of substantial wholes does it get beyond the mere formal conditions on which being can come into thought. In fact, logical science has ever dealt freely with this kind of whole; but, strange to say, has never consciously recognized its peculiarity. It has blindly endeavored to think substance as mere form — as merely spacial — not as space-filling; just as it has endeavored to think the whole of thought itself as fully mathematical whole; and hence misconceived and utterly misrepresented the nature of disjunctive judgments and reasonings and ignored all immediate reasonings.

Fourth is the whole of cause and effect, — *the causal whole*. We conceive of all objective being as a cause, a force, a power, as time-filling, as necessarily as we conceive of it as substance, and space-filling. A causal whole, the comple-

mentary parts of which are cause and effect, each necessarily implying the other, requires peculiar modifications of the general principles of identity, and such as are most vital to intelligently right thinking.

These are the four quantities or wholes which it is incumbent upon logic, as a science for use and application, to recognize in form, and in reference to them separately and distinctly to develop its principles. They are undeniably distinguishable kinds of quantity or wholes. They are implicitly involved in all logical expositions. They furnish grounds of distinction which are of vital importance; without the clear recognition of which there must be obscurity, confusion, error. They are none of them extra-logical distinctions. The two first will not be questioned as lying within the jurisdiction of logic as a purely formal science. As little can the two last. Whether there be substance, whether there be cause, logic does not inquire, no more than it inquires whether there be thought, or whether there be magnitude or number. It only teaches that if there be thought, if there be space and time, if there be substance and cause, and they can be conceived of as wholes, as quantities, so far logic as the science of the discursive faculty can deal with them; determine what must necessarily be true of them. "Philosophical logic," says Ritter,¹ "is not only science of the forms of thought, but also science of the forms of being." If we can think being, bring being into our thought, we must be able to determine, *a priori*, to a most important extent, from the mere principles of identity, what must be thought of it. So much of the science of being may rightfully come into logic. And if logic be the science of all our knowing—*scientia scientiarum*,—then certainly it is an imperative need that it push its applications further than the mere forms through which we recognize being at all, and which are *a priori* conditional to all knowledge, further

¹ Abriss der Philosophischen Logik. "Die philosophische Logik wird also nicht nur Wissenschaft von den Formen des Denkens sondern auch Wissenschaft von den Formens des Seins," Einl. 8.

than mere mathematical forms, to the forms of being itself, and in its two necessary forms of substance and of cause.

The necessity to a perfect logical science of a distinct formal recognition and treatment of this last kind of whole — the causal whole, as a determining element in the development of the science, will appear from a view of a fatal defect still inhering in the science. The defect appears in the treatment of inductive reasoning. That inductive reasoning comes within the domain of logic, it were needless now to call in question. Logic, then, should expound its true nature and laws. It has not done this. Sir William Hamilton says emphatically: "All you will find in logical works of the character of logical induction is utterly erroneous." This judgment is sweeping, but well-considered, and we must accept it as decisive. But does the learned logician, who so entirely rejects all the teachings of logicians as "utterly erroneous," give us the true theory and the valid laws? He promises this more than once; we fail to find the fulfilment. He leaves the whole matter in as profound darkness as before. He essays a formal exposition of the nature of induction. He defines it, ¶ LXII. of his *Logic*, as "a reasoning in which we argue from the notion of all the constituent parts discursively to the notion of all the constituted whole collectively." But this is no induction. We do not reason from *all* the parts to the whole. We reason in induction from one part, from some of the parts, to other parts, to the whole. There is no reasoning in such a process as that indicated in Hamilton's definition. If we have found, in any legitimate mode of investigation, if we have found, for instance, that A, B, C, D, composing a class, have alike the character *y*, it is by no inductive process, certainly, that we conclude that, as all the members of a class have the character, the class as a whole has it. We induce from the fact in supposition that A has *y*, the fact that B has *y*, that C has *y*, — that all the parts have *y*. The essential nature of induction, everywhere recognized, is this, that we proceed from part as part; hence from a single part, if truly a part,

to other parts, to all the parts. The necessity of a number of observations in order to a certain induction, is of extra-logical consideration. Logic requires but one. In fact, we are often satisfied with one. We are as much convinced from a single observation of the combination of oxygen and hydrogen to form water, that this combination will in the same circumstances always in like manner form water, as from any number of observations. We multiply, in material, physical induction, our observations only for the purpose of determining that we really have a part of a causal whole. But this is all extra-logical. Logic proceeds on what is given or assumed only; and its principle is: "given one part of a causal whole, and the whole is necessarily inferred;" for, by the necessary laws of thought, the part cannot be without the complementary part, and so cannot be without the whole of which it is a part. The part brings in the whole as truly as the whole the part. This is the necessary, the unquestionable principle of logic. Let the case be brought to which it applies, and its influence holds necessarily. We have precisely the same difficulty in the case of a substantial whole, which is the kind of whole that logicians have almost exclusively regarded, that we have in the case of a causal whole — no more, no less. All their examples, all their specific statements of principles, suppose a substantial whole. Even when treating of induction itself, they have seemed able to represent it to themselves only in the forms of a proper substantial whole. It is hence that Hamilton is justified in declaring their teachings to be utterly erroneous. We may, in few words, indicate the precise relationship of this logical consideration of cause to that of substance, as well as to the science generally.

Logic is of no utility except as applicable to objective being. It must of necessity, therefore, develop itself throughout in reference to this applicability. Being we necessarily conceive as substance and also as cause. The latter conception is as important to us as the other; and logic should as much regard it as the other. It assumes; does not prove.

— does not give us the reality of substance. It deals with notions, thoughts only. But its notion of substance is as a whole containing parts, called attributes or characters. As such, and in this relation only, can it deal with them. Now, all real substance is given us in simple apprehension, — in perception or intuition, — in the gross, as a whole. From the whole, as thus given, we proceed, by an act of proper thought, to the parts. Logic, as applied to substance, as realized in it, therefore, more naturally, as more in correspondence with the direction of our ordinary mental activity, proceeds analytically, deductively, from whole to parts. We infer, when dealing with objective being as substance, from the whole to the parts. Cause, as real, on the other hand, is given us by the parts, for its necessary form is succession. The logical consideration of cause, therefore, should more naturally proceed genetically, synthetically, inductively, from the part to the whole. The nature of cause prescribes, *a priori*, this mode of procedure, which is exactly counter to that in the case of substance. The principle of identity works either way just as naturally. The part implies the whole as truly as the whole contains the part; and we need but one part from which necessarily to induce the whole. In substance and in cause we have the same necessity imposed on us of determining the whole, and the part as pertaining to that whole. If we use the premise in a substantial whole, “man is mortal,” we need to assume that the whole of characters denoted by the term “man” contains the character “mortal” as one of them, or that the extensive whole, the class-whole, “mortal” contains under it, as one species, “man”; in other words, man as substance contains the attribute “mortal,” or the class of substances “mortal” contains the substance “man.” Then we have a valid judgment, from which a second, affirming that “Caius,” as a whole of characters, contains among them that of “man,” will enable us, on the deductive application of the principle of identity, to derive our conclusion that “Caius is mortal.” So, precisely, in a causal whole and in induction: “Caius is mortal; Caius is

a man; therefore man is mortal"; the reasoning, as explicated, runs thus: "Caius," as effect, is part of the causal whole "mortal"; Caius, so far as such effect in this causal whole, is man; therefore, the effect "man" is part of the causal whole "mortal." If the reasoning proceed in extensive quantity, then we should explicate thus: "Caius, as effect, is part of the class of effects in the causal sphere 'mortal'; Caius is one part of a class, of which other men are the complementary parts; therefore other men with Caius, that is all men, belong to the class in the sphere 'mortal.'" This is the significance of the principle universally recognized as the one governing and validating principle of induction; that nature is uniform; or that the same cause works, in the same circumstances, ever the same effect. If we verify the existence of the cause thus, as we do when we verify a part of its effect, and if we also determine the sphere within which the cause operates, our conclusion is valid, is necessary for every effect of such cause in that sphere. The causal whole is the cause with its entire effect; a part of that causal whole, on the principle of identity, as applied to the relation of parts to whole, involves the other parts as complementary of that causal whole.

In the application of the logical principle to actual induction in matters of experience, we have difficulties precisely analogous to those which we encounter in deduction or in substances. We must apprehend the effect as the product of a cause, just as in the deductive process we must apprehend the attribute; we must also apprehend the causal whole or sphere, and the effect as belonging to it, just as in the other case we must apprehend the substance and the attribute as pertaining to it. Whether one or more facts are necessary to assure us of the cause, and of its embracing the class of effects in question, is to be determined on the same grounds on which we determine whether one or more observations are necessary to assure us of the substance, and of its attributes. But all this is extra-logical. Dealing only with the process of thought, and confining

itself to the exposition of its nature and laws, logic only assumes the facts to which its processes are to be applied; and this as well in inductive as in deductive reasoning. In the one case its one principle is: "Given a whole, a part of that whole, and a part of that part; and the conclusion follows necessarily, that the part of the part is a part of the whole." In the other case, its principle is: "Given a part; a whole of that part; and a whole of which this whole is a part; and the conclusion follows necessarily, that the whole of which the lesser whole is a part is a whole also of the part of this lesser whole." For example, in the first case: given, "mortal," "man" as part of "mortal," and "Caius" as part of "man"; and deduction gives the necessary conclusion, "Caius is part of mortal." In the other case: given, "Caius," "man" as whole of which "Caius" is part, and "mortal" as whole of which "man" is part; and induction gives the necessary conclusion, "man is part of mortal." The one form is that which our necessary mode of conceiving substance compels us to adopt; the other is that which our necessary mode of conceiving cause prescribes to us. The one form of application involves the other. Logic, as a complete science, should treat of the one as well as the other. In neither does it transcend its bounds as pure, necessary science. Of the two applications, if there be a preference, that to cause in induction is of superior practical importance. At all events, logic has been one-sided in its development, in so far as it has been exclusively in the direction of substantial wholes, and has so far failed in its command of respect and cultivation; just as in giving exclusive consideration to reasonings, to the neglect of concepts and judgments, which are of incomparably greater importance, scientifically and practically, it has become, as a structure, top-heavy, and fallen into ruin.

We are now prepared to enunciate in brief, formal statements, what we conceive to be the form of development which logic as a science should assume; indicating, as we

proceed, what remains to be done even now, after the Herculean achievements of Hamilton, in expurgating the systems as received before his time.

I. Logic must be, throughout, treated as a pure science, developed from necessary principles by necessary methods of thought. Hamilton has done an eminent service in exposing the defects of the logical systems in this respect.

II. Logic, or at least discursive logic, is the science of thought, in the stricter sense, as the product of the discursive faculty. It embraces the whole sphere occupied by this faculty; all its products — concepts, judgments, reasonings. Here Hamilton has achieved a most vital success for the science. He has clearly identified these three products of thought in their derivative affinity and consequent equality of claim to co-ordinate consideration in the science. His exposition of concepts is new to English literature, and has made his system of logic an indispensable necessity in all intellectual training. It will force the study of logic into every reputable institution of learning, as a study without which all training must be regarded as fatally onesided and defective, and thus regain for the science its former distinction, now worthily attained. We go further than Hamilton, who, while he thus identified the three elements — concepts, judgments, and reasonings, — as alike products of thought, yet went little further in unfolding their distinctive natures, as we proceed to indicate the more precise distinction, that in a judgment thought identifies the single character; in a concept, it aggregates single characters, thus separately attained, into one; in a reasoning, it separates this single character into separate constituent characters. The judgment is the original product; the concept arises from the synthesis of thought; the reasoning, from the analysis of thought. Logic, in its fuller developments, we claim therefore, should recognize these specific differences in the elements of thought.

III. The faculty of thought is essentially an identifying faculty. Its one principle, therefore, is that of identity. Hamilton has, in scattered posthumous fragments, pointed

in the direction of this singleness of logical principle. He has not indicated its ground as given by the very nature of the faculty of thought, nor anywhere gathered into one the several principles of the science. This, logic should now do; and in its thorough development carry out its single principle into all the parts of the science.

IV. The faculty of thought, as identifying faculty, deals only with quantities — with wholes. Its systematic development should be throughout in this relationship of quantity — of wholes and parts. Hamilton has in this field of logic signalized his meritorious achievements for the science. But here, as elsewhere, his labors are to be characterized as initiative, germinant, suggestive only. His *Lectures* bear proofs of this crudity and immaturity. His *Discussions* and posthumous papers still indicate that the development had not ripened into perfect fruit in his own mind. We find thus in his latest writings,¹ the strange doctrine that “a proposition is simply an equation, an identification, a bringing into-congruence of two notions in respect to their extension. I say, in respect to their extension; for it is this quantity alone which admits of amplification or restriction, the comprehension of a notion remaining always the same, being always taken at its full amount.” That this is wrong, and that there is no such difference in the two quantities, is clear at a glance. The proposition, “man is mortal,” taken in extensive quantity, is explicated thus, on the principle that the proposition is an equation, an identification of subject and predicate: “man is identical with one of the species contained under the class mortal,” — the predicate being necessarily restricted to a part of its extension — to one included species. Explicated in comprehensive quantity, the proposition, as identifying subject and predicate, must read thus: “the notion ‘man’ in respect to one of the characters which constitute it, is identical with the notion ‘mortal.’” But here “man,” although taken in its comprehensive quantity, is restricted as truly as it is in the other case, when taken in its

¹ *Lectures on Logic* (Am. ed.), Appendix V. (iii.), p. 525.

extensive quantity. The principle, indeed, that "every proposition is an equation of subject and predicate," will not hold in comprehensive judgments, if this strange assertion of Hamilton be accepted. We deem it an inconsiderate remark, thrown out in his eagerness to carry a special point in a discussion.

V. Logic, as mainly designed to help us to right, methodical knowledge of objective being, should develop itself co-ordinately in the two directions of the twofold phase of being — substance and cause. If our exposition of the true nature of inductive reasoning be accepted as correct, then not only must we, with Hamilton, reject the teachings of logicians concerning the nature of induction as erroneous, but positively derive it from the necessary forms of the identifying activity which moves in the twofold direction, from whole to part and from part to whole, with equal validity and significance. It should therefore recognize causal wholes equally with substantial wholes, as means of illustrating the nature and application of its principles, assuming, of course, both alike.

VI. Logic should recognize and distinctly expound the two kinds of reasoning — mediate and immediate; and in this reduce hypothetical and disjunctive reasonings to the immediate class.

VII. In order to this, and also to perfect its own development, it needs to establish the distinction between subjects of propositions which are originally concepts — mere objects, and subjects which are judgments — mere truths. Hamilton, in his posthumous papers, has drawn nice distinctions between mediate and immediate reasonings; but the development of the doctrine is imperfect; and the distinction in the nature of the subjects of propositions just indicated seems utterly to have escaped his notice.

VIII. Logic needs to settle the doctrine of modality on its true basis. By earlier logicians it is expounded extra-logically. It is utterly discarded from the science by Hamilton, as thus extra-logical. But modality lies within the

sphere of logic as a pure science. Hamilton's arguments are both of them singular instances of fallacious reasoning. His first argument is that of an example. He adduces the proposition, "Alexander conquered Darius honorably"; and proceeds to show its equivalence to the proposition, "Alexander was the honorable conqueror of Darius." Unfortunately for his success, his proposition is not a *modal* at all, since modality is a property of the copula, not of the predicate. His second argument is, that modality is without the domain of logic as a formal science, inasmuch as to determine the modality of a proposition we must go out of the field of form into a consideration of the matter. But this is all a mistake, although Hamilton may have been correct in his representation of the doctrine of Whately and other logicians, and his reasoning valid against them. But modality, belonging to the copula exclusively, attaches to the form, not to the matter, of the judgment; and the reasoning of Hamilton, therefore, is entirely fallacious. Nor, in our opinion, does Dr. Mansel's distinction between the *logical* and the *psychological* copula¹ help the matter. If logic be, as we have claimed, the science of the products of the discursive faculty, then certainly the necessary general forms of the judgment should come into view in the expositions of the science. Logic loses nothing of its character as pure science by the recognition of these forms of the judgment. It accepts them as psychological facts; its laws apply as well to them as to any of its assumptions, and with all their purely scientific stringency. With much more plausibility, indeed, might the consideration of disjunctive judgments with more than two disjunct members be discarded from logic as pure science. But there is no occasion for rejecting either on any scientific ground.

IX. Logic should perfect its doctrine of methodology. We recognize the hand of a master in the work of Hamilton in this department of the science, as elsewhere. Even if his views were mainly derived from German sources, the Eng-

¹ *Prolegomena Logica*, Nota H.

lish mind owes him a debt of gratitude for the introduction of this division of logic in a truly scientific way and form. We have to regret here, also, the immaturity of his views as presented in his Lectures. He has transferred the errors and superficialities of the German logicians, from whom he cites so largely, to an extent that seriously mars the presentation. The attempt to found the three virtues in the formal perfection of thought on the three grounds respectively of, "1, the comprehension; 2, the extension; and 3, the concatenation of notions," is most unscientific. Even the introduction by Hamilton of the very unscientific qualification "principally founded" does not save it from this criticism. The exposition of the doctrine of method is, of course, in serious error and, indeed, often in direct contradiction to the principles of the New Analytic. The presentation of "division," thus, in the methodology, is entirely irreconcilable with the teachings given in the doctrine of concepts. The three virtues of perfect thought have no such peculiar relationship respectively to the several principles of method. "Clearness" belongs as much to "extensive quantity" as to "comprehension"; and "distinctness" as much to "comprehension" as to "extension;" as in fact Hamilton expressly teaches in his "doctrine of elements." And "harmony," the third virtue named, does not exclusively pertain to mediate reasonings. The author from whom Hamilton derives his teachings had clearly never recognized the true relation of concepts, judgments, and reasonings; never understood their true nature.

The whole matter of methodology, practically the most important department of the science, calls for an entirely new development on the strictest scientific principles. It may be a question whether the treatment of it should not be wholly relegated to rhetoric. There would seem to be here, in fact, common territory. But if logic undertakes to expound the principles of method, she may justly be required to expound them in exact method. If she show inability to apply her own principles, she discredits herself, and justifies rejection and contempt.