A NEW LOGIC

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BY

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'The present system of Logic rather assists in confirming and rendering inveterate the errors founded on vulgar notions, than in searching after truth; and is therefore more hurtful than useful.'
BACON.

'The Greek mind must have had some vital fault.'
CALVERLY.

'My brethren, I beseech you, in the name of common sense, to believe it possible that you may be mistaken.'
OLIVER CROMWELL.

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To

SIR H. BRYAN DONKIN, M.A., M.D. Oxon.; F.R.C.P., &c.

IN PLEASANT MEMORY OF THIRTY YEARS OF CLOSE FRIENDSHIP,
VARIEGATED BY MANY A STRENUOUS ARGUMENT, BEGUN,
CONTINUED, AND ENDED WITHOUT RECOURSE
TO THE SYLLOGISM

PREFACE

A BOOK on Logic by a practising physician is not calculated to benefit its author, either as a physician or a logician. His professional brethren will look askance upon a physician who wastes, upon such a frivolous subject as Logic, time that might be devoted to increasing his knowledge of disease; and logicians will regard him with the contemptuous abhorrence that is bestowed, all the world over, by the professional upon the amateur.

In foro Medicinæ I have a valid defence, and need not throw myself upon the mercy of the Court. Engaged daily in reasoning on matters of vital, and more than vital importance, I find that valid conclusions can be reached only by strictly departing from the methods of Traditional Logic; and having studied the methods by which I arrive at results that are, upon the whole, successful, I am bound by the salutary rule of my profession, to give to the world the methods by which these results are attained. Candour will not allow me to ascribe the book wholly to compliance with this beneficent rule. Upon reading the works of logicians, and studying what has been said on the subject by them of old time, I am moved by the same spirit that animated long ago that sorry comforter of the man of Uz, when the words of his companions failed them. Great men, I found, are not always wise, nor do men of antiquity always understand judgement. 'Therefore I said hearken to me; I also will show mine opinion; for I am full of matter, and the spirit within me constraineth me. Behold, my belly is as wine that hath no vent: it is ready to burst like new bottles.' An enlarged knowledge of physiology would ascribe the fulness to another anatomical region, but broadly and generally the words express my motive.

But I have, in the Court of Medicine, a better defence than this, even. It is many years since I began to preach the doctrine that, in mental disorder as in bodily disorder, the study of order

is an indispensable preliminary to the study of disorder; the study of the normal should always precede the study of the morbid. In this I have been so far successful that the subject of Psychology is now made a compulsory part of the curriculum for every diploma in Psychiatry. This, however, is only a beginning, and but stimulates me to further effort. Insanity is disorder of conduct, and my next endeavour is to obtain for the study of normal conduct the recognition that is now given to the study of normal mind. And the Psychological aspect of mind is not the only aspect of mind that is susceptible of disorder. The power of reasoning logically is very often impaired in mental disease; and in this respect again, a knowledge of the normal is an indispensable preliminary to a knowledge of the morbid. Until we have an adequate and correct Logic, we cannot duly appreciate or appraise the erroneous reasoning either of the normal or the morbid mind. It was as a prolegomenon to the study of Insanity that I was first moved to examine the Logic of Tradition, and to substitute for it the New Logic that is here propounded.

From the professional logician I can expect no mercy. I have attacked his most cherished opinions, disputed his most sacred dogmas, and have held up to derision his most revered authorities. To him I am that most noxious of all vermin, the irregular practitioner; and I expect him to deal with me faithfully, after the manner of the orthodox to the heterodox. If he would only restrict his choice of weapons to those that are in the arsenal of Traditional Logic, I should rest in the complacent security of a modern battleship attacked by bows and arrows; but no logician reasons syllogistically, except in the formal arguments with which he illustrates the syllogism, and the arrows that pierce me will be winged with feathers plucked from my own logical tail.

Two subjects of academic study have been pursued continuously, as far as academic study has been continuous, from the time of the great Greek philosophers of more than two thousand years ago down to the time of the present generation. One of these—Geometry—was taught, until yesterday, upon the lines and in the words of Euclid. The other—Logic—is taught to-day on the lines, and to a great extent in the words, of

Aristotle. A few years ago, Euclid was formally superseded as the authorised exponent of Geometry. His system was openly attacked, was defended, was attacked again; until it was formally abandoned, and it is taught no more. The fate of Logic has been different. Aristotle's system of Logic has never, I believe, been openly attacked all along the line. It is true that, in the thirteenth century, his works were proscribed and burnt by the synod of Paris; but this was owing to no destructive criticism which found them fallacious. It was rather because their tendency was heretical, and because they fostered the use of reason, and so were subversive of authority. With this brief exception, there has been no whole-hearted condemnation of Aristotelian Logic; and Aristotle is still regarded with a reverence that almost savours of superstition. Aristotelian Logic is still the subject of formal teaching and examination in every University in the world. It still engages the learning of scholars and the subtlety of dialecticians in every Western nation. It is expounded in innumerable text books, that still continue to issue from the press, and run into edition after edition. But in spite of its immense prestige; in spite of the professed allegiance of innumerable eminent men; in spite of its prominence in every University; its position is undermined. Under the surface there exists a profound dissatisfaction and distrust. Its very exponents, in commending it to their readers, adopt an apologetic tone. Those who have been through the mill, and have taken their degrees in Arts, of which Logic is, in some Universities, an important constituent, privately deride and contemn it. Its very professors, though they cherish the Organon of Aristotle as a sacred text, and contend that the errors and imperfections of Traditional Logic, as taught in the text books, are due to their departure from the pure teaching of Aristotle, yet, in so doing, admit the errors and imperfections. In short, Traditional Logic is now much in the position that was occupied, two hundred and fifty years ago, by witchcraft. Without being formally attacked, it is crumbling into ruin, and losing its hold upon the minds of men. Modern Logicians, indeed, profess that they disregard the old formulæ, and give us a Logic that purports to be new; but it is new more by reason of lacking the clearness and intelligibility of the old Logic than by any novelty of doctrine. It still clings to the syllogism, and tries to put the new

wine of scientific discovery into the old syllogistic bottle. The exponents of Modern Logic represent, not so much the foundation of a new school of Logic, as the despairing effort of the old to defend the last ditch.

In these circumstances, it seems that if left alone, Aristotelian Logic, and the whole fabric of Traditional Logic that is founded upon it, will speedily perish; and that it is scarcely worth while to stuff a pillow into its mouth, and suffocate the dying creature; or to deliver a *coup de grâce* to one that is already moribund. It seems, however, expedient to deliver a formal attack, and for these reasons:—

In the first place, however few defenders Traditional Logic may have in private, it yet occupies a very conspicuous and important public position, to which it is, in my opinion, not entitled. It is all very well to say that an attack on Traditional Logic is slaying the slain, or, as one distinguished adviser put it, that it is digging up a dead horse in order to flog it; but there stares us in the face the plain, indisputable fact, that Traditional Logic is still a compulsory subject of study and examination for many important and honourable degrees and distinctions; and that many innocent students, who have passed or failed in these examinations, still believe, with pathetic confidingness, that the syllogism is, as Whately called it, the Universal Principle of reasoning.

In the second place, it is impossible to tell, as matters stand, what the true position of Traditional Logic is, or how far those who profess and call themselves logicians, are, in fact, followers of Aristotle; who is for him, and who indifferent to him; how far his hold is slipping away, and how far he still retains his grip; whether the worship of Aristotle is already extinct, or whether there is still a remnant of true believers.

Lastly, my object is not solely, nor mainly, iconoclastic. I propose, not merely to demolish the system of Traditional Logic, but to substitute for it a new Logic, that shall supply the defects and correct the errors of the old; and it is not practicable to build upon a site, until the ramshackle structure that already cumbers the ground is cleared away.

For these reasons, I accompany my exposition of what I pretend are the true principles of reasoning, by a running commentary of criticism applied to Traditional Logic. I can scarcely suppose

that anyone who is sufficiently interested in the subject to read this book, will not already be acquainted with the system now in vogue; and it would not be practicable to establish my claim to have formulated a new Logic, unless I compared it point by point with the old.

The central doctrine of Traditional Logic is that all reasoning is the bringing of particular cases under general rules: its insoluble difficulty was to determine the way in which general rules are discovered. The debates of the Schools raged for centuries about this subject. Three doctrines were held, and were discussed with acrimony and obstinacy that sometimes terminated in bloodshed. Are general rules, principles, or Universals, *Universalia ante rem*, *Universalia in re*, or *Universalia post rem?* In other words, is the Universal a noumenal Idea, having an hypostatised existence, not only apart from the mind that conceives it, but antecedent to the things in which it is manifested; or is it resident alone in the things that manifest it; or is it in the mind alone that conceives it? For generations these themes were debated, and on the view taken of the nature of the Universal depended doctrines of the most sacred and esoteric mysteries of the Church. At long length, the utter barrenness of these discussions, and the proved impossibility of arriving at any consensus by dialectic alone, led to the Baconian reaction, which repudiated altogether the *à priori* Universal, and so abhorred the very suggestion of such a thing, that it refused to allow the legitimacy of an hypothesis even; for in hypothesis it smelt a savour of the *à priori* Universal. The long severance of Logic from experience led to a reaction, in which experience was to supersede Logic. Facts were to be collected—this was the Baconian doctrine—and whatever agreements were observed among facts, were to be taken for the true Universals. The Baconian reaction was, in a sense, the triumph of the *Universalis in re*. Not until more generations had passed, was it discovered that agreement among facts will not be found, unless expectation of agreement is taken to the facts—that the Universal must first exist in the mind, before it can be found in experience.

This was the discovery of the Inductive School, whose apostles were Herschell, Whewell, and J. S. Mill. Of course, the practice, as distinct from the teaching, existed as far back as the dawn of intelligence; and was no more discovered by the prophets of Induction, than grammatical speech was invented by the first

grammarians; but the Inductive School first taught the use and value of hypothesis, and the function it performs in reasoning. The dominance of this school was the triumph of the *Universalis post rem.*

Of late years, a suspicion has arisen that the doctrines of the Inductive School, true though they may be, do not cover the whole ground. It is discerned, dimly, as I think, that there are other ways, or there is another way, of arriving at general rules, besides that direct appeal to experience by the erection and testing of hypotheses, which is the cardinal feature in the teaching of the Inductive School; moreover, there is an uneasy feeling abroad that the Aristotelian scheme of Deduction does not say the last word in its own department; and this has led to the formation of a fourth body of doctrine. Foreshadowed by Kant, founded by Hegel, and developed by Sigwart, Lotze, Green, Bradley, Hodgson, Bosanquet, and others, Modern Logic seeks to supersede both Traditional and Inductive Logic. Its teachings, however, like all the writings of its founder, are vague and nebulous. It expresses dissatisfaction with what is, rather than a statement of what should be. It is unable to emancipate itself from the tyranny of the syllogism, and it fails to make itself generally intelligible. When we find one of its exponents declaring that 'as the fundamental form of knowledge the judgement tends to overcome change and to view phenomena *sub specie æternitatis*, and is in this respect at one with Platonic "forms,"' it is evident that we are here in the presence of an attempt to rehabilitate the *Universalis ante rem;* so strangely does the whirligig of time bring in its revenges.

My own position may be thus explained:—From Traditional Logic I differ in every principle and in every detail. Its cardinal doctrine, that all reasoning is the subsumption of the particular under the Universal, was contested by Mill, who held that reasoning is from particular to particular, and I am not singular, therefore, in disputing that; but my quarrel with Traditional Logic is far wider and deeper than Mill's. In my opinion, its concepts of the composition of the proposition, and of the constituent parts of the proposition, are erroneous; its doctrines of Quantity and Quality are wrong; its Immediate Inferences are but a poor few out of multitudes that may be obtained by an adequate Logic; the few Immediate Inferences it does obtain are faulty; its doctrine of the

syllogism is artificial and mistaken; the rules of the syllogism are all wrong; there are multitudes of Mediate Inferences that cannot be reached by the syllogism; Traditional Logic fails to distinguish the *argumentum in materiâ* from the *argumentum ex postulato*, and so involves itself in endless confusion; in short, its whole system is insufficient, defective, and erroneous, from beginning to end.

From the Inductive School—no one is now a pure Baconian*—I differ no less profoundly. This school accepts the Deductive scheme of Traditional Logic; and in this I cannot follow it. It supplements Deduction with Induction; but its scheme of Induction is, in my opinion, faulty. The Inductive logician recognises but one mode of appeal to experience—the direct appeal. The indirect appeal, by which most of our arguments *in materiâ* are conducted, he confuses with syllogistic reasoning, and in this I hold that he is wrong.

Modern Logic I confess I do not understand. It is, by some of its votaries, couched in a language beyond my comprehension. They may emulate their master, Hegel, in the profundity of their speculations: they certainly follow him in the obscurity of their diction. When I am told that 'the fundamental activity of thought' is to be regarded 'as the same throughout and as always consisting in the reproduction by a universal of a real identity, presented in a content, of contents distinguishable from the presented content, which also are differences of the same universal,' the words convey no distinct notion to my mind, and I am unable even to discuss them. As far as I can understand it, Modern Logic seems to me to range far beyond the realm of Logic. In examining the nature of Judgement, Conception, and Perception, it invades the domain of Psychology. In discussing the Infinite, the Absolute, Abstract Quantity, and Necessity, it trenches on Metaphysics. In treating of the nature of Law, of Causation, and of *à priori* Truth, it encroaches on Philosophy. In investigating the nature of Truth, of Knowledge, and the relation of Knowledge to its postulates, it is in the realm of Epistemology. No doubt, Logic touches at various points on all these subjects, as every science touches on neighbouring sciences at various points; but

* True at the time it was written, this is now not true. At the meeting of the British Association that is being held, as these proofs are being corrected, the President of the Mathematical Section advocated a return to the pure system of Bacon, though whether he mentioned Bacon by name, I don't remember.

Logic has its proper boundaries; and to obliterate the distinctions between it and its neighbours, incurs the objurgations justly applied to those who remove their neighbours' landmarks.

Nothing is said in this book of the Symbolic Logic of Boole, Jevons, Venn and others. This is a kind of calculus. It rests upon a confusion between the province of Logic and the province of Mathematics. It is based upon the postulate, which seems to me completely erroneous, and far remote from fact, that every proposition can be expressed as an equation. It is mathematics gone mad. The utter illogicality of the whole scheme is put out of doubt by the fact that the operations of symbolic Logic can be conducted by machinery. This is materialism with a vengeance. In fact, of course, all the thinking is done before the data are put into the machine; and all the machine does, and all Symbolic Logic can do, is to add and subtract. Traditional Logic pretends that all reasoning is inclusion in classes and exclusion from classes. This is narrow enough, and shallow enough, goodness knows; but what is to be said of a Logic that reduces all reasoning to addition and subtraction? Poor as is my opinion of Traditional Logic, yet if I had to choose between it and Symbolic Logic, I should plump for the Logic of Tradition, which at any rate does not pretend that cogwheels can reason.

In calling the system of Logic here propounded a New Logic, I do not pretend that it is in every part wholly novel. Parts of it have been anticipated, and parts have been adumbrated, by previous writers. Mill, for instance, made the distinction between the Logic of Consistency and the Logic of Truth; Spencer adumbrated the indirect appeal to experience that I call Mediate Induction; and perceived that the Aristotelian and Euclidean Analogy is a reasoning process; Hamilton adumbrated the doctrine that Deduction is but the explication of what is implicit in the premisses, and laid down, as others had done before him, the rule that nothing may be concluded that is not in the premisses; Jevons, in his doctrine of Substitution of Similars, anticipated one of the Minor Canons of Explication; and no doubt other instances of forestallment could be found. These, however, are but fragments. They are details scattered here and there. As an organised and coherent body of doctrine, covering the whole field of reasoning, growing naturally from a single root, and forming an harmonious and interdependent whole, the system

here propounded is so different from all previous expositions as to warrant the title I give to it, of A NEW LOGIC.

Though it is in principle new, I have of course incorporated such parts of the old Logic as seemed sound; and though my system is new, I do not pretend that it is complete. Completeness is not to be expected in a first essay, and I may adapt to it an apposite exhortation of the Father of Logic with respect to his first essay on another subject. 'Let this then be taken for a rough sketch . . . since it is probably the right way to give first the outline, and fill it in afterwards. And it would seem that any man may improve and complete what is good in the sketch, and that time is a good discoverer and co-operator in such matters. It is thus in fact that all improvements in the various arts have been brought about, for any man may fill up a deficiency' (*Ethics:* Book I., Chapter V.). By the time the New Logic has stood two thousand years of commentary, its details may have been filled in; and then, no doubt, like its predecessor, it will have had all the guts taken out of it, and will be ripe for supersession by a better.

Here I must express the deep obligations under which I lie to three friends who have assisted me with their criticisms. Mr. Cannan, who read the first two drafts of the book, condemned it unsparingly, and to his trenchant criticisms the book owes the elimination of many crudities. Sir Bryan Donkin, to whom the book is dedicated, suggested a re-arrangement of the matter and an important improvement in nomenclature, both of which I have adopted; and Professor Carveth Read has not only applied his profound learning to the correction of sundry errors that my more superficial acquaintance with the lore of Logic had allowed me to fall into, but when I was taken ill suddenly, on the very day on which the proofs began to issue from the press, he had the great kindness, and the equally great courage, to undertake their correction for me. It is difficult to express adequately a sense of obligation so deep, but here I express, as well as I can, my gratitude, heaped up, pressed down, and running over, for services so great and so timely.

CHAS. MERCIER.

LONDON, W.

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INTRODUCTION

THE PROVINCE OF LOGIC

It is scarcely too much to say that, of the innumerable writers on Logic, no two are agreed on what its subject-matter is, what its limits are, or even whether it is a Science or an Art. Aldrich regards it as the Art of Reasoning; Mansel, as the Science of Formal Reasoning; Whately, as the Art and Science of Reasoning; the Port Royal logicians, as the Science of the operations of the understanding in the pursuit of Truth; Hamilton, as the Science of the Necessary Laws of Thought; Mill, as the Art of Correct Thinking, and the Science of the conditions of Correct Thinking; Bain, as a Theoretical or abstract Science, the Practical Science of Proof, and a body of Method auxiliary to the search for Truth. Of recent writers on Deductive Logic, Prof. Carveth Read calls it the Science of Proof; Mr. Welton, the Science of the Principles that regulate valid thought; and Dr. Mellone says that it deals with the principles that regulate valid thought, and on which the validity of thought depends. Logicians of the Modern School do not formally define the scope or province of Logic. Mr. Bosanquet does say incidentally, in his second volume, that 'Logic is little more than an account of the forms and modes in which a universal does or does not affect the differences through which it persists,' but I find no other indication of the province of Logic. Logicians are not agreed even about the subject-matter of Logic. Some say it is concerned with Propositions; others that it treats of Concepts; yet others that its subject is Real Existence. Some say that Logic is concerned with the process only of thought, and is regardless of results; others that it looks to results only, and is regardless of processes.

In spite of this immense diversity of opinion as to what Logic is, and what it treats of, all writers on Logic include much the same subjects, and all writers on Traditional Logic treat them in much the same way. The latter begin with a discussion on Names

or Terms; consider the Proposition as the unit of Logical doctrine; pass on, after discussing the various forms of propositions, to their combination in the syllogism; deal exhaustively with the modes and figures of that venerable institution; and treat, as incidental or subsidiary subjects, of Classification, Definition, and Fallacies. Some logicians treat of Probability and Analogy also; others do not. Modern text books add, under the name of Induction, a consideration of the means of ascertaining Causation, which I regard as somewhat of an intruder into the domain of Logic. Writers on what is called Modern Logic do not exclude these topics, but they treat them as mere incidents in an examination of the fundamental nature of Judgement, Conception, Inference, and so forth, and pay but little attention to the Methodology of reasoning.

To write upon a subject without ascertaining the nature or extent of the subject-matter, does not appear to me a very reasonable or useful course; and before discussing logical doctrines, it seems best to settle what is meant by Logic, or, at any rate, what meaning is attached to it in this book.

As has been shown above, writers on Logic are not agreed on whether it is a Science or an Art, or both; and although some are of one opinion, and others of another, these opinions are not usually fortified by reasons; and Mill is, I think, the only writer who discusses the nature and limits of Science and Art, or the differences or relations between them. My own opinion on the matter is as follows.

At the root, and as the motive, of all human endeavour, are two fundamental, original, and consuming desires,—the desire to know, and the desire to do. Curiosity is the foundation of all Science; the desire to exercise Capacity is the origin of all the Arts. As soon as Curiosity and Capacity begin to be exerted, a further desire comes into play. We desire to find out, and to achieve other ends; but we desire also, to find out, and to achieve these other ends, with the least expenditure of exertion; and we soon find that, by acting, we assist Curiosity to attain knowledge; and by knowing, we assist Action to do things easily and well. As soon as anything attracts attention, we act in order to know it better. We look at it, we move towards it, we touch it, handle it, perhaps listen to it, smell it, and taste it. Thus, by the Art of Investigation, we assist Curiosity to attain Knowledge, and the

knowledge thus gained enables us the better to utilise for our purposes the thing thus better known. So that knowledge depends much on action; and action depends much on knowledge. In practice, the two are inseparable; it is only by analysis that we are able to separate them.

Knowledge, however, is not Science until it is organised; and action is not Art until it is methodised. Organising is a mode, not of knowing, but of doing; and hence Science cannot come into existence without the practice of Art. Correspondingly, in order to do an act at all, we must know how to do it; and to do an elaborate act we must be assisted by that organised knowledge of the way to do it, that constitutes the methodology of the Art in question. Thus knowledge and action depend on each other, and grow up together into Sciences and Arts. Science cannot come into existence without the aid of the Arts of Investigation and Organisation; nor can Science become elaborate or extended without the aid of other Arts, such as Nomenclature, Description, analysis, and so forth; all of which may be called the Arts of Science.

Arts express purposes, and strive after results. To achieve these purposes and attain these results, the action, of which the Art consists, must be adapted to the circumstances in which it takes place, and which it modifies; and first among these circumstances is the subject-matter of the Art, or the material on which the Art is exercised. For action to be successful, the circumstances in which it takes place must be known; especially must the properties of the subject-matter be known; and when the Art is elaborate, it cannot treat its subject-matter to the best advantage unless the knowledge of this subject-matter is organised into Science. The art, for instance, of making objects of steel requires an organised knowledge of the properties of steel. Thus, Science becomes the more necessary to Arts, as Arts become more intricate.

But Science aids Arts in other ways than by furnishing an organised knowledge of their common subject-matter. Modes of action are themselves subjects of investigation; and the knowledge of them thus attained may be organised into a Science, which then raises the Technique of an Art into its Methodology; and without such an organised knowledge of technique, the more elaborate arts, such as that of working in steel, cannot be profitably pursued.

Lastly, the products of Art, no less than the subject-matter and the methods, may be investigated, and may form the subject-matter of a science; and in this way arise the sciences of Archæology, of Architecture, of flint implements, of Philology, of Numismatics, and so forth.

In several ways, therefore, Science is dependent on Art; in several ways Art is served by Science. Art and Science are distinct, but inseparable. They are a happily married pair; and their numerous and vigorous offspring are of both sexes—the products of arts, and extensions of knowledge. If Science is organised knowledge, Art is systematic action; and neither can be attained without the other.

Science and Art differ, moreover, in this:—that to science, a subject-matter is necessary; but an art can proceed without a subject-matter. There can be no knowledge without something known, as distinguished from the knower; but there may be doing without a product, as distinguished from the doer.

The art of dancing, for instance, is not exercised upon any material; produces no change in anything but the dancer; leaves no result, except in him. Most arts, however, have their subject-matter, on which the skill of the doer is exercised; which is changed by his exertions; and whose changed form remains as a permanent result of the exercise of the art.

Science regards its subject matter in two aspects. It considers the nature of the subject-matter, its relations and its kinds; and analyses it into its constituent parts. This may be called the statical aspect. Further, Science regards its subject-matter in its time-relations. It investigates the ways and stages by which the subject-matter became what it is, and forecasts, if possible, what it will become. It treats of the history and future of its subject-matter, and thus regards it in its temporal aspect.

Those arts that have a subject-matter, alter this subject-matter for the purpose of attaining results, and the methodology of the art shows what alterations are best for the purpose, and how they can best be achieved. Methodology, therefore, treats its subject-matter in its dynamical aspect.

Applying these considerations to Logic, we are now in a position to decide how it stands. Is it a science or an art? If it is a science, what is its subject-matter? If it is an art, what does it do? What

purpose does it serve, what results does it achieve, and how does it attain them ?

In all modern text books, logic is divided into two separate parts—Deduction and Induction. Deductive Logic has for its subject-matter the proposition. It considers the nature of propositions and their kinds; it analyses propositions into their constituent parts, and describes them. Deductive Logic, as commonly understood, is the science of propositions.

But Deductive Logic is an art also. All the examination, description, and analysis of propositions is undertaken with a view to showing how syllogisms may be constructed and inferences deduced. The investigation of the structure and kinds of propositions is merely a preliminary to the Methodology of Deduction. Deductive Logic, besides being the pure science of the proposition, is the methodology of Deduction, and the art of drawing inferences, immediate and mediate. We have seen how close are the interconnections of Art and Science, and there is nothing improper or confusing, therefore, in treating of both Art and Science in the same book.

Inductive Logic, as expounded in the text books, treats of the methods by which causation may be ascertained ; and of little or nothing else. Mill's 'Canons of Induction,' which are the foundation on which all subsequent writers have built their treatment of Induction, are canons for the discovery of causation. Inductive Logic does not treat specifically of propositions, any more than Deductive Logic treats of causation. The two departments are entirely distinct ; and are different in subject-matter, in purpose, and in treatment. The only connection between them is that Induction seeks to show how those universals are found, that are necessary to the process of Deduction. Inductive Logic is the art of discovering causation.

Interspersed among these topics, we find, in text books of Logic, chapters on Probability, on Classification, on Definition, on Nomenclature, on the Laws of Thought, on Hypothesis, and other matters. For the most part, the connection of these topics with the science of the proposition and the art of propositionising on the one hand, and with the discovery of causation on the other, is not made clear. Probability would seem to belong to Epistemology, and the Laws of Thought to Psychology. The want of a definite understanding of the nature and limits of Logic, has led, so it seems, to

the inclusion in it of topics foreign to the subject; and the fact that no two books take the topics in the same order, indicates that they are rather gathered together by somewhat haphazard aggregation than the result of organic growth from a single root.

Modern Logic discusses much the same topics, but discusses them from a different point of view, and rather psychologically than logically. The aim of Modern Logic seems to be to dive into the deepest recesses of the mind, to search out the ultimate nature of the processes concerned in judgement, and to do no more. It does not, as Traditional Logic does, expound a Methodology of the subject, or attempt to furnish rules by which reasoning may be conducted.

In common use, 'logical' means 'consistent with reason'; and, in the practice of logicians, both Traditional and Modern, the main aim of the Art of Logic is undoubtedly to show how reasoning is, and should be, conducted. Whatever attention is given to other topics, such as Nomenclature, Probability, Classification, and so forth, is given to them because they are contributory or ancillary to the art of reasoning. For the purpose of this book, I divide Logic into two primary departments, both of which have the proposition for their subject-matter. The first department of Logic is the Science and Art of the proposition; it is an investigation of the nature, the kinds and the components of propositions, and it is the Art of propositionising, or of expressing in verbal propositions the thoughts we have in our minds. The second department of Logic is the Science and Art of reasoning; it is an investigation of the ways in which new propositions can be constructed out of old propositions already in our possession, and it is the Art of constructing propositions from these materials. The first Book is devoted to the Science and Art of the proposition, the remaining Books to the Science and Art of reasoning, and in both cases the Science and the Art are treated concurrently.

The Science of the proposition and the Art of propositionising have reached, in Logic as hitherto expounded, a very rudimentary stage only. I do not pretend that I have treated them exhaustively, but I have treated them fully; and I regard the first Book, in which these topics are dealt with, as equal in importance to all the rest. The most important effect of the study of an adequate and correct Logic may be expected to be the cultivation of precision of statement; which is more important even than a

knowledge of the processes of reasoning, for it is not only a more desirable end in itself, but is also an indispensable preliminary to valid reasoning. Aristotle seems to have realised this when he included his fallacies *in dictione* among fallacies. Fallacies *in dictione* are not mistakes in reasoning; they are mistakes in statement—in the statements on which reasoning is founded, and which enter into reasoning. The prime value of the study of an adequate Logic is in the cultivation of precision in the expression of thought, by which thought is not only more clearly expressed, but in the process is itself clarified and made precise. It can never be too emphatically or too positively asserted that slovenly expression means slovenly thinking. It is nowadays assumed, as a matter of course, that obscurity of diction means profundity of thought, the truth being the very reverse; and the conspicuous success of a few writers, in attaining celebrity by confused and unintelligible utterance, has raised confusion of utterance into a cult. It is time that this bladder was pricked, and that obscurity of expression should stand exposed for what it is—the unpardonable literary sin. A writer whose meaning is not immediately apparent on a first reading, is either muddleheaded, and in that case is not worth reading; or he is too lazy and slovenly to put his meaning clearly, and in that case is offering his reader an insult; or he is trying to obtain a cheap reputation for profundity, and is then contemptible.

No nobler instrument of expression than the English language has ever been devised by the mind of man, which cannot conceive a thought that this language is incapable of expressing. It is eminently plastic, and not only takes readily to its ample bosom new formations that are legitimately born, but adopts, with almost regrettable facility, others that are marked with an ineffaceable bar sinister. He who pretends that his thoughts are too profound to be expressed intelligibly in the English language must not count on always finding readers sufficiently gullible to accept his pretension. Sooner or later he will be called upon to stand and deliver his meaning, and if his wallets are found to be empty, he will have no one but himself to thank for his humiliation.

A self-respecting potter does not put on the market cups and saucers that are out of shape, warped in the firing, or smudged in colour; a joiner would consider himself disgraced if he offered for

sale a table or a bench with gaping joints, or legs out of truth; authors alone among craftsmen hold that it is no disgrace to utter wares that proclaim aloud the unskilfulness, the carelessness, the ignorance, of their maker. Such authors are to be blamed; but their fault is venial beside that of him who foists upon us a stale loaf of bread, and gives us to understand that it is four-year-old mutton, or even manna direct from heaven. An adequate Logic is an Adulteration Act, that empowers us to take samples of literary wares, to test them, to analyse them, and to stamp them as what they are.

The remaining Books treat of the Science and Art of Reasoning in propositions; and this art is exercised in three several ways.

'The book is on the table.' By what means may I come into possession of this proposition? There are three ways. I may see the book there; I may get my proposition direct from experience, by the evidence of sense—by perception. When I perceive the book on the table, a relation is established in my mind between the two things, and is given direct in experience. This relation is expressed in the proposition 'The book is on the table.' It is true that perception is a rudimentary process of reasoning; but it is not a process of reasoning as reasoning is understood in Logic. I do not 'reason the matter out.' I do not arrive at the result by the rearrangement or combination of materials already present in my mind. It was presented to me ready made, and all I did was to adopt it. If a jug slips out of my hand, falls on the floor, and is smashed, I get, direct from experience, the proposition 'The jug is broken.' No process of reasoning is needed, and none is employed. I get my proposition direct from experience; and this is one mode of origin of propositions. It is the ultimate origin of all propositions, but it is outside the realm of Logic.

Another way of obtaining propositions ready made is to get them from experience second hand. I ask where the book is, and I am told it is on the table. I ask where the jug is, and I am told the cat broke it. In both cases a new relation is established in the mind, and is expressed in a proposition; but in neither case is it established by reasoning. I do not form the relation by the operation of my own mental exertion: I receive it ready made from without: I get it by hearsay. I may exert reasoning to decide whether to accept it or not; but if I accept it, I accept it ready made, and do not myself take any part in its establishment.

The process of attaining it, is a process, not of reasoning, but of learning, and has no place in Logic.

It is the third mode of attaining propositions from experience that alone belongs to Logic. This mode is the formation or establishment of new propositions, by combining, dividing or otherwise altering, without fresh experience, propositions already present in the mind. I can get the proposition 'The book is on the table' in this way, without seeing the book there, or being told that it is there; and there are three ways of constructing propositions by the activity of the mind working on materials that it already possesses.

By the first of these processes I ask myself the question 'Is the book on the table?' If I seek to answer this question by searching the table, I employ the direct appeal to experience, which is not, strictly speaking, among the operations of Logic. But I must have some experience *ad hoc* to go upon. I can never solve this problem by interrogating my own inner consciousness, and combining, dividing, and altering what I find there, unless what I find is the memory of some experience of the relation of the book to the table. But give me some experience bearing on the relation of the book to the table, and even though that experience may not directly give me the proposition 'The book is on the table,' I may be able to arrive at this proposition indirectly, by the help of remembered experiences present in my mind in the form of propositions. If, for instance, I see a parcel on the table, and remember that I tied the book up in that parcel, then, from the combination of that experienced proposition with this remembered proposition, I can get the result 'The book is on the table.' If I know, by experience or by hearsay, that the jug is made of glass, and has been dropped on the stones; then, combining this proposition with another, already present in my mind, that glass things break when so dropped, I can obtain, by logical process, the proposition 'The jug is broken.'

In the foregoing cases, the logical process is tied to experience, and reasoning in which appeal to experience is an integral factor forms the most important domain of Logic. But it is not the only domain. We can, if we please, cut the string that ties us to the ground of experience, and soar into the air of imagination. The knowledge that we gain from experience may be severed from experience more or less completely. It must always remain,

in a sense, bounded by the limits of experience, for we can never completely transcend experience, but in this sense the limits of experience are extremely elastic. Without appealing to experience at all, we may take components of propositions derived, as all such components must ultimately be, from experience, and treat them in various ways so as to form new propositions, that may or may not be consistent with experience. From 'men' and 'immortal' we can, if we choose, derive the proposition 'Men are immortal,' which is inconsistent with experience, it is true, but still is a proposition, constructed according to the rules of logical art, and susceptible of being modified in many ways in accordance with those rules, so as to form new propositions, such as 'Men do not die,' 'Men live for ever.' Or we can take a proposition and divide it into components, still without any appeal to experience. 'Men are mortal' can be divided into 'Some men are mortal and the rest of men also are mortal.' Here we get two propositions out of one. Or we can combine two or more propositions together, still without appealing to experience of their subject-matter. From 'this man is English,' 'that man is English,' and 'the other man is English,' we can get the single proposition 'All three of these men are English.' Or we can modify the construction of a proposition, still without appealing to any experience of its subject-matter, and still be proceeding according to the rules of logical art, as when we change 'Men are mortal' into 'Men are not immortal.' These are far from exhausting the modes in which new propositions may be constructed in the department of logic that ignores experience. As long as we are tied to the Logic of experience, we cannot reason except of the things that experience presents to us; but if we choose to leave this Logic behind us, we can reason of whatever things our imagination is capable of picturing, and even of any words we can form. We can reason about the gods and creatures of heathen mythology, about the characters of fiction, about infinity, eternity, and impossible quantities, and all other kinds of imaginary things.

In all these efforts of reasoning we are bound by one dominant rule. There is but one limit to our power and liberty of altering, combining, and dividing propositions so as to form new ones, and this is that the new must be consistent with the old. We may alter, combine, divide, transform, and transmogrify a proposition

in any way we please, so long as we preserve the consistency of the product with the original. Hence this field of Logic is sometimes called the Logic of Consistency.

There is yet a third method by which new propositions are constructed by the art of reasoning. Two relations may be compared, and may be discerned to be like or unlike; and this likeness or unlikeness may be stated in a proposition. It is evident that this method of forming propositions is, like the last, independent of any appeal to experience, and so differs from the first mode of reasoning. It differs also from the second mode, for it makes no alteration in the propositions it compares, nor does it pay any regard to their consistency or inconsistency. It looks to nothing but the likeness or unlikeness of the relations they express.

The first of these three modes of reasoning is Empirical Reasoning, so called because an appeal to experience is an integral and indispensable part of the process. It is the Logic of Discovery; of Truth; of Fact; of Matter. It is coterminous with Induction, as Induction ought to be understood; but the view that is here taken of the mode of discovering truth by Inductive reasoning, is not the same as the prevalent doctrine of Induction, though it is called by the same name. The true process of Induction seems to me very different from that which is usually so called, as is explained in the second Book, which is devoted to this mode of Reasoning.

The second mode of reasoning includes the Immediate and Mediate Deduction, or Inference, of Traditional Logic, and it includes a great deal more. The inferences deduced in the text books from simple and compound propositions, are but a small fraction of those that can be deduced by proper methods, which are set forth in the third Book. The Logic expounded in that book is the Logic of Inference; of Consistency; of Proof and Disproof; of Form. Useless in the discovery of Fact; ignoring the truth or falsity of the matter of which it treats; its value is in testing Consistency; in argument; in explicating; convincing; refuting. This is the field of Traditional Logic.

The third mode of reasoning is the Logic of Analogy. As concerned with qualitative relations, it aids neither Discovery nor Proof. It is concerned neither with Fact nor with Consistency. Its sole value is in explaining, expounding and enforcing statements.

But as applied to quantitative relations, Analogy is one of the most powerful engines in the hands of man. The largest and most important part of mathematical reasoning is analogical. Most of the operations of algebra and of geometry, and of their higher developments, are reasonings by analogy; and the higher and more abstruse calculi are founded entirely on analogy; which has been strangely neglected by logicians. The reasonings of Mathematics have always been excluded from Logic, and most illogically excluded; for, if Logic purports to be the Science and Art of reasoning, it must show how all reasoning is conducted, or confess its own inadequacy. The ground on which mathematical reasoning has been excluded from Logic is, apparently, that Logic does not include mathematics; nor does it. Nor does it include chemistry, or protozoology; but a Logic that pretends to be complete must find a place for the modes of reasoning by which the chemist and the protozoologist reach their conclusions; and so it must find a place for the modes of reasoning by which the mathematician reaches his conclusions. By excluding Analogical reasoning from its purview; or rather, by its incompetence to recognise Analogical reasoning, as a mode of reasoning distinct from Induction and Deduction, which alone it does recognise, Logic has shut out from its cognisance a large, important, and fertile field of reasoning, in which some of the greatest triumphs of the human intellect have been achieved. It is true that many logicians mention Analogy, and describe what they call analogical reasoning, but this is, in their mouths, but another name for Induction; and of Analogy in its proper sense, as defined by Aristotle and Euclid, they are profoundly ignorant.

In actual practice, these three modes of reasoning, or any two of them, are often combined, or rather alternated, in order to arrive at results; and a chapter is given to the modes of combination.

In order to reason correctly by any of these methods, certain Canons, or rules, appropriate to the method, must be observed; and the Canons appropriate to each method are stated in the book that investigates that method. Violation of any of these Canons results in fallacious reasoning; and fallacy cannot be committed in any other way than by violating or exceeding the provisions of a rule. All the fallacies are collected together, and set forth in separate chapters at the close of the volume.

This, then, is the scheme of the work. The first Book is devoted to an examination of the Proposition; the second to Empirical Reasoning; the third to Inference or Explicatory Reasoning; and the fourth treats of Analogical Reasoning, Composite or Combined Reasoning, and Fallacies; and concludes with a summary of the main errors and defects of the Logic that is now in vogue.

BOOK I

THE PROPOSITION

CHAPTER I

THE NATURE AND MEANING OF PROPOSITIONS

THE subject-matter of the science and art of Logic is the proposition; and the proposition is the verbal expression of the formation or establishment of a mental relation.

Words are not necessary to reasoning, and in fact an immense number, perhaps the majority of our reasonings, are conducted without the use of words, even of unspoken words. Without formally expressing the judgements in words, we judge that the book-case is too heavy to lift; that the tea is too hot to drink; that the cab will come if whistled for; that the door will be opened if we ring the bell; that if we go out in the rain we shall get wet; that the wind is too strong to put up the umbrella; that it is too far to walk in the time at our disposal; that it is dangerous to cross the street till the traffic thins; and innumerable others. But reasonings on abstract subjects usually require the use of words, for the abstract is embodied in the word, and until so embodied, it often exists vaguely only, and but half formed in the mind. And reasoning that is not expressed in words must remain for ever locked up in the mind of the reasoner. Logic, as the science and methodology of reasoning, must be expressed in words; and the subject-matter of Logic is, as aforesaid, the verbal expression of a mental relation; that is to say, the proposition.

Logicians distinguish between what they call 'verbal' propositions, and what they call 'real' propositions. The nomenclature is inappropriate in several ways, for 'real' as applied to proposition, is used in several senses by logicians; and 'verbal,' as a distinction between some propositions and others, is clearly a misnomer, for all propositions are expressed in words, and are therefore verbal. Here, therefore, at the very outset of our logical studies, we meet with a striking instance, the first of very many, of the inaccuracy, looseness, and ambiguity with which words, the material of their craft, are used by logicians.

'Verbal propositions,' like other terms of their art, are differently defined by different logicians. Some call them 'Propositions that

appear to convey knowledge, but in reality do not.' Others define them as 'Propositions from which we learn nothing,' 'Propositions only by satisfying the forms of language, not by conveying a knowledge of facts,' and so forth. The instances usually given are 'A triangle is a rectilinear figure with three sides.' 'The functions of an archdeacon are archi-diaconal functions.' It may be admitted that such sentences as these convey little knowledge; that we learn little from them; that they are propositions only by satisfying the forms of language, and not by conveying a knowledge of facts: all this may be true, but a proposition may be 'real' in the logical sense, and yet we may learn nothing from it, and it may convey no knowledge of fact; a proposition may be 'verbal' in the logical sense, and yet convey new and useful information; and, in any case, the objection to 'verbal' propositions that they convey no information, that we learn nothing from them, and that they convey no knowledge of facts, comes strangely from logicians, who unanimously and strenuously assert that the primary and fundamental law of all thought is 'Whatever is, is,' or 'A thing is identical with itself.'

That 'Rain falls from above' and 'A bird has feathers' are 'real' propositions in the logical sense, no logician would dispute; yet neither of these conveys any knowledge to anyone who has ever been in the rain and seen a bird. We learn nothing from them; and they convey to us no information. But they do satisfy the third definition or description of the 'real' proposition? They do convey a knowledge of fact? Yes, these particular 'real' propositions happen to do so, but let us take another, that no logician will have the hardihood to deny is 'real'—'Julius Cæsar is still alive.' Does this convey knowledge of fact? 'Oh, but,' says the logician, 'I don't mean fact in the same sense that you mean it.' 'My good friend,' is my answer, 'when people say things, they are bound by what they say, not by what they mean. If you meant something different from what you said, you should learn to express your meaning accurately. If you use a word in a sense different from its customary use, you must define the sense in which you use it, or you must suffer the consequence of having its customary meaning attached to it.'

On the other hand, 'A quadruped is a four-footed animal' would be acknowledged by every logician to be, in the logical sense, a 'verbal' proposition; and yet every child who does not

know the meaning of 'quadruped' learns something from this proposition. To him it conveys information, and a knowledge of fact.

It seems clear that to say that a triangle is a three-angled figure, or that the functions of an archdeacon are archi-diaconal functions, is to use propositions that are 'verbal' in quite another sense than that in which 'A quadruped is a four-footed animal' is 'verbal'; and in my view, propositions may be classified, with respect to their significance, in the following way.

A proposition may express a relation between words alone, without regard to their meaning. Such propositions may be termed Insignificant.

Or it may express a relation between the meanings of words as words, without more reference to the things to which the words refer than is inseparable from the use of the words. Such a proposition may be termed Definitive, or Defining.

Or it may refer primarily, not to the words, but to the things named by the words; and is then a Substantial proposition.

Insignificant Propositions.

These are propositions in which a relation is predicated between words alone, without regard to the meanings of the words. Strictly speaking, such propositions are not true propositions, but bastard, pseudo, or quasi-propositions, since the relation such a proposition purporte to express has no answering relation in the mind. Since, however, such propositions are occasionally used either legitimately, with full knowledge of their emptiness; or illegitimately, without appreciation by the user that they are but empty forms of words, it is necessary to include them in an enumeration of propositions. Insignificant propositions are of three kinds,—the Synonymous proposition, the Unintelligible proposition, and the Contradiction in terms.

The Synonymous Proposition.

This forms one kind of the propositions that are called verbal by logicians. It is a proposition whose terms are synonymous on the face of them, such as 'The functions of an archdeacon are archi-diaconal'; 'Opium causes sleep by means of its soporific virtue'; 'A quadruped is a four-footed animal'; 'A brighter light implies increased luminosity.' In each of these quasi-propositions, there

are two verbal terms, connected by a verbal indication of relationship; but as each of the verbal terms expresses the same concept, there are not two mental terms, but one only; and a relation cannot be established with one term only. A man cannot be a father who has never had a child. A thing cannot be below if there is nothing above it; nor before, if nothing comes after. The Synonymous proposition resembles the fraction $\frac{1}{1}$, which is no fraction, or the equation $1 = 1$, which is no equation, but means, after all, no more than one.

A synonymous proposition is not insignificant if it is not synonymous. That is to say, a proposition which is synonymous, and therefore insignificant, to one person, who knows that the terms are synonymous, is significant to another person, to whom the terms were not synonymous until they were declared to be so by the very proposition in question. To a child who does not know the meaning of the term quadruped, the proposition, 'A quadruped is a four-footed animal' is a significant proposition, because to him the terms are not synonymous until they are made so by the proposition. So the dictionary meaning of any word is a significant proposition when it first becomes known, and thereafter is insignificant.

The Unintelligible Proposition.

In this proposition or quasi-proposition, the terms are verbally different, but as one or both of them have no answering concept in the mind, the proposition resembles the fraction $\frac{0}{0}$, or the equation $0 = 0$. 'Brillig is a slithy tove' is an unintelligible proposition. It has the form and appearance of a proposition, but it is a pseudo-proposition only, for its terms represent no mental concepts. The form is empty. So, 'A seafaring man is a matross' is, to most Englishmen, an unintelligible proposition. One term is significant, but the insignificance of the object-term reduces the whole proposition to insignificance.

The Unintelligible proposition is insignificant so long only as its terms remain without meaning, and to those only to whom the meaning of its terms are unknown. 'Ponos is Kala-azar' is to you, reader, if you do not happen to know the meanings of both the terms, an unintelligible proposition; but to me it is significant, because I happen to know the meanings of the terms. 'Brillig is a slithy tove' is unintelligible, I expect, to both of us.

The Contradiction in Terms.

This is another form of meaningless proposition which should be enumerated among insignificant propositions. To say that matter is immaterial, or that it can be sublimated until its materiality is extracted; or that we have a subliminal consciousness of which we are not conscious; or that lying is a distorted way of speaking the truth; or that there is a reality that is not really real, but is a sham reality; or to speak of the contents of an empty vessel; or of an irresistible force being applied to an immoveable body; are all contradictions in terms. These quasi-propositions might be compared with the mathematical expression $1 - 1$, which $= 0$. They take away with one hand what they have just given with the other. Subject and Object cancel one another, and leave us with nothing.

THE DEFINING PROPOSITION.

This is the Synonymous proposition whose terms are not known to be synonymous until the proposition is stated. The Synonymous proposition of one person is therefore the Defining proposition of another, and the Defining proposition becomes synonymous as soon as it is known. The Defining proposition is the verbal proposition of logicians. It defines the meaning of a word. The subject of it is a word considered as a word, and not as the name of a thing; and it is the only form of proposition in which words as words, and not as names of things, can stand as Subjects. It is, therefore, as we shall find hereafter, the only form of proposition in which the Attributive term can stand as Subject.

THE SUBSTANTIAL PROPOSITION.

In the great majority of propositions, the subject is not a mere word, standing as a word only, and merely defined as to its meaning by the proposition, but is a word standing as the name of a thing to which the word refers. With respect to this thing two questions must be answered. First, what is the nature of the reference that is made to it in and by the proposition? And second, what is the nature of the predication that may be made with regard to it?

The different predications that may be made of the subject of a proposition when that subject is Substantial, will be considered in

their proper place when we come to examine the Ratio. But this is the place to consider the reference of the proposition and of its terms.

Every proposition expresses in words a mental relation, and is treated in Logic, not as a form of words, but as the expression of a thought; but this statement does not clear up all the difficulties connected with the meaning of the proposition. Granting that the proposition expresses a mental relation, we have yet to determine whether this is all that it expresses. Does the proposition express a relation in the mind alone, and does the reference of the proposition end here; or does it not also express a relation between things having an existence outside of and independent of the mind, which are represented in the mental relation? When I state the proposition 'Brutus killed Cæsar,' this verbal proposition expresses a relation in my mind—the imagination or idea of the killing of Cæsar by Brutus. All will agree to this: but there is a further question. When I think of the killing of Cæsar by Brutus, and express this thought in the proposition, am I expressing merely the thought in my mind, or am I not also expressing an historical fact—that a real man, who had an actual existence outside and independent of my mind, and was known to other real men as Brutus, did actually kill another really existing man named Cæsar? So stated, the problem admits of but one answer. The proposition expresses, not the idea of the killing of one mental idea by another, but the real killing of a real man named Cæsar by a real man named Brutus. The answer is prompt, decisive, and clear, and is given in favour of the Realists. But there is something to be said for the Conceptualists, which seems to me to be insufficiently appreciated by the exponents of Modern Logic, who are, to a man, uncompromising Realists. In the judgement, 'Gold is yellow,' says Lotze, 'the logical subject is not the idea of gold, but gold . . . the one idea is not predicated of the other.' 'Judgement proper,' says Mr. Bradley, 'is the act which refers an ideal content, recognised as such, to a Reality beyond the act.' 'Judgement,' says Professor Bosanquet, 'is the reference of a significant idea to a subject in Reality by means of an identity of content between them.' 'Our judgements express,' says Professor Minto, 'beliefs about things and relations among things *in rerum naturâ*; when anyone understands them, and gives his assent to them, he never stops to think of the speaker's state of mind, but

of what the words represent.' These doctrines must be admitted to be accurate, as far as they are intelligible—and I must confess some difficulty in clearly apprehending the meaning of some of them—as long as the subjects of the judgement are such known and admitted realities as Brutus and gold. But suppose my proposition is, not 'Brutus killed Cæsar,' but 'A centaur killed a phœnix.' How now? Does the proposition now refer to reality? Does it mean that a real centaur, really existing in the real world that we know, really killed a real phœnix? Mr. Bradley, if I understand him aright, says that it does; and so does Mr. Bosanquet; but as to the latter, I cannot be sure, for in another place he speaks of what is really real, as distinguished from sham reality. Such expressions seem to me to darken counsel; but it is clear, or I think it would be considered clear by anyone but a Modern logician, that the word 'real,' as applied to centaurs and phœnixes, must be used in some sense very different from that in which it is applied to Brutus, and Cæsar, and gold.

There are here two distinct and different questions, which seem to me to have been confused together by logicians of the Modern School. The first question is Do we understand a proposition as the expression of a relation in the mind alone, or do we not understand it as having a further reference to things outside and beyond the mind? Do we understand the proposition 'Brutus killed Cæsar,' or 'A centaur killed a phœnix,' to express an imaginary killing of the ideas of Cæsar and the phœnix by the ideas of Brutus and the centaur respectively, or do we not rather represent the action of killing as taking place in the world outside the mind, between the agents Brutus and the centaur, and the sufferers, Cæsar and the phœnix? To my mind it seems that it is the last question that must be answered in the affirmative; and that Professor Minto is right in saying that we never stop to think of the speaker's state of mind, but think only of what the words represent.

The other question is a very different one. It is this:—Is the reference to externality, which is admittedly contained in every proposition, necessarily a reference to the real world of experience; or may it not be to an imaginary world, existing in the mind alone, but referred to as if it were real? It seems to me that the second instance, of the death of the phœnix at the hands of the centaur,

conclusively answers this question in the latter sense. I do not see how it is possible to contend that the centaur and the phœnix are real, in any known, understood, or admissible sense of the word real; and when logicians of the Modern School speak of the judgement as referring a 'content,' or a 'significant idea,' to a 'Reality beyond the act,' it seems to me that they are either mistaken, or they are using the term Reality in some new and special sense, which unfortunately they never define, and which includes unreality. The want of any definition of this, the most important term in their most fundamental doctrine, renders their whole system unintelligible to the uninitiated. I can scarcely suppose that the exponents of Modern Logic mean, by their reference to Reality, that real centaurs or real phœnixes ever really existed in the real world in which we live, though the expressions used by these logicians may certainly be understood to imply that this is what they do mean. If by reality they mean merely that reference to externality or objectivity, which I agree and maintain is inherent in every proposition and in every judgement, then I respectfully agree with them, and regret that they do not express themselves more clearly.

In my view, the position is this:—With respect to their external or objective reference, there are two distinct kinds of propositions; or perhaps more accurately, propositions are understood in two different senses. There is the material proposition, that is understood and accepted as referring to real existence, to fact, to an external world which is the world of experience; and these propositions are the basis of Empirical or Material reasoning. This is the reasoning on which Conduct is founded. This is the reasoning that determines our action. This is the reasoning by which we solve the problems that confront us daily, hourly, and momentarily in the world of experience in which we live. This is the reasoning by which truths are discovered. The unit of such reasoning is the 'real' proposition—the statement of fact, of truth—and, without such propositions, Empirical reasoning cannot be conducted. To attain truth, we must start from truth. To reach fact, we must base our reasoning on fact. Material reasoning is based on material propositions, and, to the validity of the conclusions of this mode of reasoning, the truth of its premisses is vital.

But Empirical reasoning is not the only mode of reasoning. Besides the vast field of material reasoning, which is based solely on fact, or on what we believe to be fact, there is another field of reasoning of even greater extent; with which fact is in no way concerned; whose conclusions are unaffected by the truth or falsity of their premisses; in which any appeal to reality or to experience is out of place and irrelevant; in which the propositions do not refer to real existence, or to the world of experience, but to postulated existence, and to a world which is objectified, it is true, but may be wholly imaginary. This is the Logic of Postulation, of Consistency, of Form, of Proof. In this mode of reasoning, the proposition is postulated for the purpose of the argument. It may be true or false; it may be true of the world of experience, or it may be wildly impossible or absurd; but it is postulated for the purpose of the argument; and, being postulated, we may argue from it as if it were true, and maintain the postulate of its reality or truth in spite of experience, and as long as we please, so that we remain detached from experience. But the argument must be conducted throughout on the understanding that the propositions are postulated only. They may or may not be true in fact, but if they are, their truth adds nothing to the force, cogency, or validity of the argument. They may be manifestly false, impossible, inconceivable even; but their falsity, impossibility, or inconceivability detracts nothing from the validity of the arguments that rest upon them. They are postulated for the purpose of the argument, and for this purpose, postulation is sufficient.

A proposition has been defined, by a recent writer, as 'the verbal expression of a truth or falsity'; and it is added that a logical proposition implies belief in the statement made, and claims assent. My concept of the proposition is the direct contradictory of this. In my view there is an immense class of propositions that are false, and are known and understood to be false, both by those who utter and those who receive them, and yet are strictly within the domain of Logic. There is another immense range of propositions, whose truth or falsity is unknown to and disregarded by the utterer, and whose truth or falsity is utterly irrelevant to the arguments into which they may enter; but yet they may be the subjects of strict, valid, and useful logical reasoning.

'The earth is larger than the sun' is a proposition having a definite meaning, and capable of entering into logical argument; but it does not, to me at least, imply belief in the statement made; nor do I, in making it, claim the assent of the hearer. Yet I can argue from it, and deduce perfectly valid conclusions. If the earth is larger than the sun, then the sun is smaller than the earth; then the relative movements of the earth and the sun cannot be what they are supposed to be. These arguments are valid. They are irrefragable; but their validity does not rest on the truth of the premiss. They are equally valid whether the premiss is true or false.

Mill also denies that a proposition must necessarily be either true or false. He says that between and beyond the true and the false, there is a third possibility—the Unmeaning; and he gives as an example 'Abracadabra is a second intention.' Mill seems to have thought that unmeaning propositions are not susceptible of logical treatment, but if he did think so, he was mistaken. We can argue as easily, and as cogently, and with as complete validity, from 'Abracadabra is a second intention' as from 'All men are mortal.' If Abracadabra is a second intention—I don't say whether it is or not, nor do I care, but if it is—then one second intention at least is Abracadabra; then Abracadabra is not a first intention, nor a third intention; then it is not possible to deny that Abracadabra is a second intention. All these are logical arguments; all are valid; all follow of strict logical necessity from the postulate; none of them pays any regard to the meaning of the postulate, or is in any way vitiated if the meaning of the postulate is unknown.

Logic must pay regard to the objective reference of the propositions it employs; but it need not pay regard to their truth or falsity, unless the argument is a material argument. If the argument belongs to the Logic of Consistency, this Logic must not pay regard to the truth of its propositions. Chalk is harmonious; Whatever is harmonious is black; ∴ Chalk is black. This argument is nonsense. It is perfectly good in form, but it is nonsensical on account of its matter. A logical argument must be stated in propositions, and these are not propositions, for they have no answering relations in the mind. The argument is stated, however, as a material argument, and as a material argument it is absurd and nonsensical; but if stated as a formal argument, it is

perfectly sound. Chalk is not, in fact, harmonious, nor, in fact, is what is harmonious black; but we may, for the purpose of argument, postulate or pretend that chalk is harmonious, and that what is harmonious is black; and then, on these postulates, we may build an argument of consistency that is perfectly sound. *If* chalk is harmonious, and *if* what is harmonious is black, then chalk is indisputably black, and the inference is unescapable and irrefragable. The postulates are false, indeed; in fact, they are nonsensical; but of this falsity and nonsensicality the Logic of Consistency takes no heed. As a material argument, the reasoning is silly, and worse than silly. As an argument from postulates, or a formal argument, it is perfectly sound. In the argument of consistency, our postulates may be false, or nonsensical, or merely symbolic. We can reason, in this Logic, as readily and as validly from 'If the earth is larger than the sun,' or 'If chalk is harmonious,' or 'If S is M,' as from 'If men are mortal.' In either case, Formal Logic will show you what is implied and involved in your postulates, what are the consequences of your postulation, and to what you committed yourself when you made your assumptions. If your postulates are false, that is your affair. In that case, you must not act upon the conclusions that formal Logic attains; or if you do so, you do so at your peril. Formal Logic is a mill that will grind whatever you give it to grind, and will turn out the grist in a form different from that in which it was put into the mill. If you give it sound wheat, it will grind it up into wholesome flour; but if you give it canary seed, or linseed, or hemlock seed, or even flints and broken glass, it will grind them all impartially into flour; and if you are foolish enough to eat the grist, the consequences are on your own head. You must not blame the mill.

Some adumbration of this doctrine seems to have been present in the minds of those logicians who say that every categorical argument may be stated hypothetically. This is an imperfect half-truth. To state an Empirical or Material argument hypothetically would be destructive of its nature. Hypotheses often result from Empirical reasoning, and this mode of reasoning is often undertaken for the very purpose of obtaining an hypothesis; but the premiss of an Empirical argument cannot and must not be hypothetical. So to state the premiss would take the argument out of the range of Empirical reasoning, and remove it

into the realm of reasoning from postulation. But in the Logic of consistency, the argument must be stated hypothetically; or, if not actually so stated, it must be understood that the premisses are, in fact, hypothetical or postulated. The hypothetical form is not, as Traditional Logic supposes, a mere alternative, that may be adopted or not at pleasure; and that, if adopted, merely fails to vitiate the argument. It is vital to the mode of reasoning; and, if omitted, is productive of one of the worst forms of fallacy—the fallacy of confusion of the mode of argument, which will be described in the chapter on fallacies.

Postulation of premisses, in the Logic of Consistency, is not merely a duty; it is not only a necessity; it is also a very valuable privilege. Postulation places at our command an immense realm of reasoning that, without it, would be inaccessible. It gives us control of that powerful engine, the *reductio ad absurdum*. It enables us to reason about things whose real existence is not only doubtful, but impossible; not only impossible, but inconceivable. It enables us to reason, not only of the Regent's canal, but of possible canals in Mars; not only of the mounting of the forty-foot telescope, but of the mounting of a forty-mile telescope; not only of the square root of four, but of the square root of minus one. It enables us to argue what would happen if two straight lines should enclose a space; if space were of four or of forty dimensions; if matter were imponderable, and the ether impenetrable; of frictionless machines, rigid rods, perfect circles, infinitesimal quantities, infinite series, and a thousand other things that are outside, or inconsistent with experience. For the purpose of argument, there is but one limit to the privilege of postulation; and, for the purpose of argument, the truth or falsity of our postulates is utterly beside the question, and of no account.

This discussion of the nature and meaning of the Proposition has led us, therefore, to the following conclusions :—

1. A proposition is a verbal relation.

2. The verbal relation expresses a mental relation, sometimes called a Judgement, more accurately called a Thought.

3. The mental relation expressed by a proposition has an objective reference, or refers to a relation conceived as existing outside the conceiving or judging mind.

4. The external reference of the proposited or predicated relation is of two kinds :—

In one, the reference is to fact. The proposition expresses a relation believed to be true of real existence in the world of experience, and the validity of the argument depends on the truth of the proposition.

In the other kind of reference, the objective relation expressed by the proposition is postulated for the purpose of argument. It is not regarded as true or false in fact, and its truth or falsity is irrelevant to the argument.

CHAPTER II

KINDS OF PROPOSITIONS

THE kinds of propositions distinguished by logicians are numerous, including the Categorical, the Inferential, and the Disjunctive; the Affirmative and the Negative; the Universal and the Particular; the Discretive, the Remotive, and the Exponible; the Analytic and the Synthetic; and several others. Those who are curious in the matter may be referred to the larger text books for explanations of these terms, which appear especially adapted for the purposes of examinations. Here I will confine myself to a less complete enumeration, believing that those who are interested in the subject, and are in the habit of paying attention to modes of expressing thoughts, can easily work out for themselves the varieties usually described.

For logical purposes, the most important distinction between different propositions is that between the Incomplete and the Complete. This is a distinction new to Logic, but it is one of the greatest importance. An Incomplete proposition is, as its title implies, a proposition of which an element is missing. Every proposition expresses a relation; and, as we shall find further on, a relation consists of three elements—two related terms, and the ratio which expresses the relation between them. Any one of these elements may be missing. Taking as the type the generalised proposition 'A is B,' there may be missing from this proposition the term A, the term B, or the ratio 'is.' But if a proposition necessarily contains three elements, and if from a proposition one element is missing, the two remaining elements are not a proposition, but two incoherent and unrelated elements? Not necessarily. We may retain the form of the proposition, even if one element is missing, by introducing in its place a dummy element, that may serve to keep the proposition together, as a proposition, until the missing element can be supplied, and substituted for the dummy. Thus, in the proposition 'A is B,' the term A may be missing; but we can keep the proposition in form until the missing element can be supplied, and at the same

time introduce a reminder that the term is missing, and needs to be supplied, by putting in place of the missing term the relative 'what.' By this means we obtain the incomplete proposition, What is B. Similarly, if B is missing, we can throw the incomplete proposition into the form, A is what. These are manifestly questions, and should be characterised as questions by the addition of the interrogation sign; and we then get the incomplete propositions, What is B ?, A is what ?, which at once preserve the form of the proposition, and remind us that the proposition is incomplete and clamours for completion. If the missing element is the relational link that connects the terms together in a relation, we cannot thus supply a dummy for it. A what B ? is not English, and though no logician is ever deterred, by the hideousness of an expression, from adopting it into his scheme, it behoves A New Logic to show a better way, and aspire to better things. Remembering, however, that the incomplete proposition may be put in the form of a question, we can, when the link of the relation is missing, throw the incomplete proposition into the form 'Is A, B ?' or 'What is the relation between A and B ?'

These are ways in which the missing element of a problem may be supplied by a dummy, so that the form of the proposition may be preserved; but these are not the only ways. We may substitute for the missing element the sign of the unknown; and may express the incomplete proposition X is B; A x B, or A is X, which are the three forms that a Problem may assume.

The incomplete proposition is, in Logic, a Problem, and should be known as a problem; and the Problem is the foundation of Material or Empirical Reasoning. The whole and only function of Empirical reasoning, or Induction, is to solve problems by discovering the element in them that is missing, and substituting the discovered element for the dummy element. Induction, as commonly understood in logical text books, is the discovery of causation, and the discovery of causation by the direct appeal to experience. Induction, as I understand it, is the supply of the missing element in a Problem, whatever the missing element may be; and whether it refers to causation, or to any other of the thousand and one relations that we may desire to discover; and whether this element is supplied by the direct or by the indirect appeal to experience, the logical process is still a process of Induction.

The first division of Complete propositions is made according to the nature of their terms. The terms of a relation may be simple, or they may themselves be relations. The generalised form or type of the relation with simple terms is 'A is B,' or, more generally, A : B. This form of proposition we will call P. Instead of bringing an indivisible term B into relation with an indivisible term A, we may, however, bring into relation two terms, each of which is itself a relation, as when we say 'the relation between a parson and his parishioners *is like* the relation between a shepherd and his flock'; or 'the relation between three and six *is unlike* the relation between seven and twelve.' The generalised form, or type, of this kind of relation is '$a : b$ is like (or unlike) $c : d$,' or '$(a : b)$ is like (or unlike) $(c : d)$,' or '$(a : b) : (c : d)$.' Let us call this form of proposition Q.

It is manifest that if, in Q, we replace the term $(a : b)$ by A, and the term $(c : d)$ by B, we get the proposition A : B, which is identical with P. P and Q are therefore identical in form in material respects, and differ only in the character of their terms, which are simple or indivisible in P, and in Q are themselves relations. In P, the terms are indivisible wholes; in Q, they are wholes discriminable into the three elements of which every relation consists. Propositions of the type P are the propositions of Deductive reasoning; those of the type Q are the propositions of Analogical reasoning. We thus find that each of the three modes of reasoning employs its own form of proposition. The Problem is the foundation of Inductive reasoning, and is used in Induction alone. It has no place in Deduction or in Analogy. Propositions of the type Q are analogical propositions, or analogies, and are used in Analogical reasoning only. Propositions of the type P are used in Deductive reasoning, and no other form of proposition is employed in Deduction. Since, however, propositions of this type are utilised in Induction also, it would be misleading to call them Deductive propositions. They are known in Logic as Categorical propositions.

Many forms of the Categorical proposition are distinguished in Traditional Logic, some of the distinctions being important both in that Logic and in this; some of them important in Traditional Logic only; and some of no importance at all.

In Traditional Logic, the utmost importance is attached to the division of propositions according to their Quantity, into the

Universal and the Particular. In the Logic here propounded, the division on this ground has no place. I do not agree that quantity inheres in the proposition at all. In my view, quantity resides, not in the proposition as a whole, but in its terms, and may be in either term, in both, or in neither. I do not agree that quantity is limited to the Universal and the Particular; I think the quantities of terms are many; but my views on quantities are set forth in the subsequent chapter on that subject, and need not be given here.

Another of the great divisions of propositions made by Traditional Logic is that according to Quality; and as this also has a chapter devoted to it, I need not consider it here. All that need be said now is that I differ *in toto* from the doctrines of quality held by Traditional Logic.

The next great division of propositions made by Traditional Logic is the division into Pure propositions and Modal propositions. Pure propositions alone are wittingly admitted into Traditional Logic. For reasons that I am utterly unable to appreciate, the Modal proposition is ejected and excluded from Traditional Logic, which thereby condemns itself to inefficiency and practical uselessness.

The Modal proposition is that in which an assertion or denial is made, not simply, but *cum modo*—with a qualification. Originally, the mode of a proposition meant the degree of certainty with which the proposition was stated. Aristotle distinguished four such modes,—Necessary, Contingent, Possible, and Impossible. The logicians of the Schools extended the scope of modality, until it included every conceivable form of proposition with the exception of an insignificant remnant; and thus reduced Logic to practical impotence, and went far to bring upon it the contempt that it now enjoys. Mediæval logicians regarded every modification or qualification of the copula, however insignificant, as a 'mode'; and no modal proposition is susceptible of logical treatment. To such lengths was this ridiculous formality carried, that even the past and future tenses of the copula were excluded, as modals, from logical argument. 'Caius is not truthful,' was, according to Scholastic Logic, an admissible proposition. It could form the ground of Inference; it could enter into a syllogism; it could be converted, denied, contraposited, and subjected to all the operations of logical art; but 'Ananias was a liar' was extra-

logical. It could not form a ground of Inference. Nothing could be inferred from it, not even the useful and elegant deduction that some liar was Ananias. It could not be subjected to any of the operations that logicians performed upon propositions. Such absurdities go far to account for the neglect with which Traditional Logic is treated by practical reasoners, and for the contempt into which it is fallen ; and although even Traditional Logic does not now countenance such nonsense,* its scope and range are still artificially, and most unnecessarily restricted. The withered hand of the Schools still stretches over it, numbing and paralysing its usefulness. To be admitted within the sacred precincts of Logic, to form the basis of any process of logical inference, a proposition must still be purged of all suspicion of 'modality.' It must be either apodeictic or assertory. It must affirm that A is necessarily B, or deny without qualification that A is B. If the certainty and assurance of the affirmation or denial is in any way impaired or qualified, the proposition is cast out and rejected, and forbidden the joys of the logical heaven. Things are *seldom* what they seem ; You cannot *often* catch an old bird with chaff; He will *probably* burn his fingers; It looks *very likely* to rain ; They are *almost certain* to win ;—all these are extra-logical. Traditional Logic will have nothing to do with them. It is incapable of treating them. It rejects them as impracticable and refractory ; and can draw no conclusion from them, nor admit them as the ground of any inference. Yet how continually, throughout life, have we not to act upon inferences drawn from uncertainties ! If we could limit our conduct to the guidance of certainty, how simple, and how uninteresting would life not be ? 'Probability,' says Butler, 'is the guide of life' ; and of what earthly use is Logic if it does not assist us in the guidance of life ? What else is reason for ?

The exclusion of Modals is but one of the ways in which Traditional Logic has whittled away its subject-matter, till all the flesh and blood are taken from it, and nothing is left but dry bones; but it is perhaps the most comprehensive, the most important, and the most vital omission. More than any other of the futilities of Traditional Logic, it reduces an important and useful machine to the dimensions of a useless toy.

I assert, and assert without fear of contradiction, that we can

* This is premature. I find that one authoritative text book still maintains this doctrine.

argue, and do constantly argue, and what is more, we found our conduct on the arguments, on grounds of all degrees of certainty and likelihood, from 'A is necessarily B,' though 'A is almost certainly B,' to 'A is not likely to be B,' and 'It is scarcely possible that A can be B.' On reasonings from such grounds we act daily in the most important affairs of life. We buy and sell, work and rest, travel and remain at home, marry and are given in marriage, on the faith and on the strength of reasonings founded on such propositions. To every one but a logician, it is undeniable and indefeasible that as long as the qualification or mode runs through the argument, and appears unweakened in the conclusion, it does not affect the validity of the argument in the least. If he is probably travelling abroad, he is probably not at home. If it is very unlikely that he can walk a mile, it is very unlikely that he can walk two. If he may or may not come this way, we may or may not meet him. If he can scarcely get his breath, he can scarcely be expected to sing. If it is almost certain that he started too late, it is almost certain that he missed his train. What is wrong with these arguments? Not logical? I know they are not. That is my grievance. That is what I complain of. What is the use of a logic that cannot compass such elementary inferences as these? If it is frankly admitted that Traditional Logic does not profess to be of any use or value, I have no more to say, except that it is high time we had one that is; but if Traditional Logic claims, as by the mouths of some of its votaries it does claim, to furnish the Universal Principle of reasoning, then I say that these instances are enough to demolish that claim at once and for ever.

So far from Logic excluding from its purview the Modal proposition, I maintain that a competent Logic must include all forms and varieties of the Modal; and even Traditional Logic, which professes to exclude the Modal, cannot get on without it; and does, in fact, admit some forms of the Modal proposition, and discusses them freely, and formally, and at length, without in the least recognising their true nature, or appreciating that they are, in fact, Modals.

'A cannot possibly be B' is, in Traditional Logic, an apodeictic proposition, and as such, is admissible into Logic. 'A may possibly be B' is a Modal, and as such is inadmissible. 'A cannot under any circumstances be B' is apodeictic, and logical. 'A is

under some circumstances B' is Modal, and extra-logical. Every logician will, I think, agree to these statements. If, however, 'A is under some circumstances B' is modal and extra-logical, can it be contended that it ceases to be modal if we alter 'some circumstances' to 'these circumstances'? If 'A is in some circumstances B' is Modal, does it cease to be modal if it is altered into 'A is in these circumstances B'? If in the one case, the assertion made in the proposition is qualified, and made *cum modo*, is it not qualified in the other, and made *cum modo*, in that other also? I can hardly suppose that even a logician would make the distinction when the two cases are thus placed before him. But if we are using a Modal proposition when we say 'A is under these circumstances B,' is this proposition any the less modal if we particularise the circumstances, and say 'A, provided it is C, is B,' or 'A, whenever C is D, is B'? If these are not Modals, if these propositions are not stated with a qualification, and *cum modo*, then it seems to me that the distinction between the Modal and the Pure proposition disappears, and there is no longer any such thing as a Modal.

But 'A, provided it is C, is B' may be written 'If A is C, it is B,' and 'A, whenever C is D, is B,' may be written 'If C is D, A is B,' and these are the ordinary stock examples of the Hypothetical proposition, given in every text book of Traditional Logic. It is not true, therefore, that Traditional Logic excludes all Modal propositions from its purview. It excludes those Modals that it recognises as Modals, but it freely admits others that it fails to recognise. If Traditional Logic chose to say that the hypothetical proposition is a Modal sufficiently distinct in construction from other Modals to deserve separate treatment, I should have no quarrel with it on this ground, and no objection to make; but this is not what it says. It says, 'Under no circumstances will I admit a Modal within my sacred precincts' and then, when a Modal presents itself under a disguise so thin that any one but a logician can see through it in an instant, Traditional Logic welcomes the impostor with open arms.

Otherwise put, the Modal is a proposition stated *cum modo*—with a qualification. Very well. To what element in the proposition is the qualification attached? Which element does it qualify? It certainly does not qualify the subject. If it did, 'All A is B,' and 'some A is B' would be Modal propositions;

and no logician would admit this. Nor does it qualify the Predicate; for if it did, 'Some men are moderately honest,' 'All cornflowers are a particular shade of blue' would be Modal propositions, which no logician would contend. The qualification that converts a Pure proposition into a Modal, is a qualification of the copula. This is shown by the practice of considering those propositions Modal in which the copula is in the past or future tense, or in the first or second person. Any qualification of the copula, therefore, changes the Pure proposition into a Modal. Now the protasis of a hypothetical proposition is a qualification of the copula. 'A (provided C is D) is B,' is qualified in the copula, and in no other element. The qualification does not attach to the subject A, nor to the predicate B. It attaches to the copula, and qualifies the copula; and any qualification of the copula constitutes the proposition a Modal proposition.

The Hypothetical proposition is, therefore, a Modal proposition, a conclusion that must carry consternation to the votary of Traditional Logic, who has fondly thought that he had excluded all Modals from his scheme of logical doctrine. To the Logic here expounded, the admission, not only of the Conditional proposition, but of every other Modal, is not only legitimate, but also necessary. This Logic professes to treat of every mode of reasoning that is employed by the mind, and to pretend that we cannot, or do not, reason except on grounds of apodeictic certainty; or that reasonings from certainties are conducted in a manner in any respect different from that employed in reasoning from likelihood or unlikelihood; is a contention that cannot be admitted until it is proved. The onus of proof lies on those who make the assertion. Logicians have excluded Modal propositions from their scheme without rhyme or reason; or rather, they have professed and believed that Modals were excluded from Logic, and yet have admitted one form of Modal, not knowing that it is a Modal; and have arbitrarily excluded the remainder, because they would not fit in to the artificial and unnatural scheme of reasoning that Traditional Logic supplies. In the inductive portion of their scheme, logicians tell us that when it is found that an hypothesis does not cover all the facts, that hypothesis must be discarded. They admit, nay, they proclaim, that their hypothesis of the mode in which reasoning is conducted, does not cover all the facts; but do they on that account discard their

hypothesis? They cling to it all the more tenaciously. Inconsistency is, to other reasoners, a vice to be condemned and avoided. To logicians, it is a guiding principle.

Whether the Hypothetical or Conditional proposition is or is not a Modal, is of great importance to Traditional Logic. To the New Logic here expounded, it does not matter at all. What does matter to both schemes is that the Conditional proposition is sufficiently distinct from the ordinary Categorical to demand separate treatment, and to be regarded as a distinct variety.

A third variety of the Categorical proposition, sufficiently distinct to require separate treatment, is the combined or Compound proposition, in which two or more propositions, having a common element, are combined, and expressed as one; as 'A and B are both C,' 'A has been, will be, and is B,' 'A is both B and C.' In each of these cases, more than one relation is expressed, and there is more than one proposition. The first contains the two propositions, 'A is C and B is C'; the second contains three propositions, 'A has been B,' 'A will be B,' and 'A is B'; the third contains the two propositions, 'A is B' and 'A is C.' In each case more than one proposition is expressed in what purports to be a single, if a compound proposition; and the combination is more than a mere artifice of language. It corresponds with a combination of the relations in the mind, through and by means of the element common to both. If there is no common element, no Compound proposition can be constructed. 'A is B, and B is C' is a Compound proposition, by virtue of the common element B; but 'A is B and C is D' is not a Compound proposition, and cannot be combined into a Compound proposition.

According to the scheme of Traditional Logic, there are two primary kinds of proposition, the Categorical and the Hypothetical; but as it is admitted by all logicians that the Categorical proposition may be expressed as an hypothetical, the distinction breaks down in practice; and, for practical purposes, there are, in Traditional Logic, but four kinds of proposition, distinguished by variations of quantity and quality in the Categorical proposition. These kinds are as follows:—

The Universal Affirmative or A proposition—All A is B.

The Universal Negative or E proposition—No A is B.

The Particular Affirmative or I proposition—Some A is B.

The Particular Negative or O proposition—Some A is not B.

For this classification, I substitute, in the Logic here propounded, the following :—

1. The Incomplete Proposition, or Problem—What is B ?

2. The Complete proposition with unified terms, or the Categorical Proposition—A is B.

3. The Complete proposition with relations for terms, or the Analogical Proposition—The relation between A and B is like the relation between C and D.

Each of these forms of proposition is divisible into sub-varieties, some of which are important, and some unimportant.

The forms of the Problem are three, according to the element that is missing :—

a. The missing element is the Subject—*What* is B ?

b. The missing element is the Ratio—*Is* A, B ?

c. The missing element is the Object—A is *what ?*

The forms of the Categorical Proposition also are three :—

a. The Categorical Proper—A is B.

b. The Compound proposition—A and B are both C.

c. The Conditional proposition—A is conditionally B.

The forms of the Analogical Proposition are two, according to the nature of the relation :—

a. The relation of *a* to *b is like* the relation of *c* to *d*.

b. The relation of *a* to *b is unlike* the relation of *c* to *d*.

Further divisions of the Problem, and of the Categorical proposition will come into view when we consider them separately and in more detail.

CHAPTER III

THE CONSTITUENTS OF PROPOSITIONS

THE constituents of propositions are to be discovered by analysis; and propositions may be analysed in three ways, of which the way of Traditional Logic is incomparably the worst.

Aristotle analysed the proposition into Subject and Predicate; or the Subject, and that which is predicated concerning the Subject. According to him, the propositions Man—is mortal, A—is unequal to B, were thus divided. The division is a reasonable and defensible division; but it is not well adapted to logical purposes, for it does not reveal the true structure of a proposition, as the expression of a relation; nor does it lend itself readily to the operations of Inference. For instance, a proposition so divided cannot be reciprocated or converted. If we attempt these operations we get Is mortal—man, and Is unequal to B—A; which are useless and nonsensical.

It may have been this insusceptibility to conversion, of the Aristotelianly divided proposition, that led the Schoolmen to devise another mode of analysing the proposition; a mode that has endured to the present day, and is taught in every text book of Logic, although it is manifestly, radically, and incurably vicious. The logicians of the Schools detached the copula from the predicate, and divided the proposition into three elements, still retaining for the third element the title of predicate, although, as a predicate, it is destroyed by the mutilation. According to the Scholastic analysis, the proposition consists of Subject, Copula, and Predicate; and is in the form Man—is—mortal, A—is—unequal to B. It is manifest that, in this division, the so-called predicates 'mortal,' and 'unequal to B,' are not predicates at all. They do not predicate anything of their subjects. A predicate is no more a predicate after its copula is torn away, than a man is a man after he has been beheaded. The so-called predicate predicates nothing. 'Mortal' and 'unequal to B,' tell us nothing about 'man' and 'A' respectively, until the copula is added to them. Not until the copula is explicitly

stated do we know even whether it is affirmative or negative. Mr. Bosanquet, as an exponent of Modern Logic, speaks of the copula as a fiction, and declares that the proposition consists of Subject and Predicate only; but whether he understands the predicate in the Aristotelian sense, as incorporating the copula, and so expressing all that is predicated of the Subject, or whether he uses the word in the Scholastic sense, is not clear. In another place he declares that Subject, Copula, and Predicate, are all of them mere fictions. To this I do not agree. The division of the Aristotelian predicate into copula and pseudo-predicate, is, unfortunately, not a fiction. It is a patent and deplorable fact. The fiction is that the division is a natural or logical division; and if this is what Mr. Bosanquet means when he says that Subject, Copula, and Predicate are all mere fictions, I should agree with him; but as I scarcely ever know what he does mean, I always hesitate to agree or disagree.

The Scholastic analysis of the proposition, into Subject, Copula, and pseudo-predicate, does not even effect that convertibility of the proposition that may be conjectured to have been its purpose. Mortal—is—man is no converse of Man—is—mortal; nor is Unequal to B—is—A, an intelligible converse or reciprocal of A—is—unequal to B. In order to obtain an intelligible converse of a proposition so divided, it must be further manipulated and transmogrified, and then all we can obtain is 'Some mortal is man' and 'Something unequal to B is A,' propositions which no one but a logician would ever dream of devising, and which not even a logician could find any use for, outside of his text book, or the examination room. If it is permissible to make the Scholastic division of 'A is equal to B' into A—is—equal to B, I see no reason why it may not be divided into A—is equal—to B. The Scholastic division yields a converse, Equal to B—is—A, which is nonsense; but it yields no reciprocal. The other division yields not only a nonsensical converse, 'To B is equal A,' but a nonsensical reciprocal also—'To B equals A'—and is therefore, presumably, superior.

One merit, however, the Scholastic division of the proposition does possess. It does indicate, erroneously and imperfectly it is true, but it does indicate the structure and nature of the proposition, as the expression of a relation. A relation must contain three elements; and the Scholastic division of the

proposition does yield three elements, in place of the two of the Aristotelian division. The two elements of the Aristotelian division, do, however, correspond with a real division in the sense and meaning of the proposition. The three-fold division of the Schools does not correspond with any partition in the meaning.

Every relation must contain three elements. It must contain two related terms, and must contain also the link that relates them. Take away any one of these three elements, and the relation vanishes. Master and servant are united in the relation of service. Take away the master and there is neither service nor servant. Take away the service, and there is neither master nor servant. Take away the servant, and there is no longer master or service. Slayer and slain are united by the relation of slaying. Without the slayer, there is neither slaying nor slain: without the slaying, there is neither slayer nor slain: without the slain, there is neither slayer nor slaying. Every logician is, I suppose, agreed that the proposition expresses a relation; and if it expresses a relation, then it must contain the three elements of which every relation consists—the two terms, and the link that binds them together.

The first term, that about which the predication of the proposition is made, is called the Subject; and as the name is appropriate, I propose to retain it. But, for reasons already given, Predicate is a very inappropriate title for the second term of the proposition; and I propose in future to call it the Object-term; a name that expresses and emphasises the fact that it is complementary to the Subject, and balances the Subject in the proposition. The link that binds Subject and Object in the proposition, is the relation between them; but as the name 'relation' is often given to the completed whole, consisting of Subject, link, and Object, it is inappropriate to apply it to one of the parts of this whole. Traditional Logic calls the link the Copula; but the Copula of Traditional Logic, even when it includes, which it usually does not, the whole of the link between the terms, is but one form of this link, and moreover, is an ambiguous and misleading word. I propose, therefore, in future, to call the link of the proposition the Ratio, a name that is already given to quantitative relations, and that undergoes, therefore, but little diversion in being applied, in the same sense, to the qualitative relations that are the subject-matter of Logic.

According to this mode of division, the proposition 'A is unequal to B' is analysed into the terms A and B, and the Ratio of inequality that subsists between them. A is the Subject: B is the Object: and the Ratio is the expression 'is unequal to.' The proposition is A—is unequal to—B. The superiority of this mode of division to the division of Traditional Logic, A—is—unequal to B, is apparent and great. The terms 'A' and 'B' are complementary elements in the proposition, and balance each other. The terms 'A' and 'unequal to B' are incongruous, and not *in pari materiâ*. A—is unequal to—B, admits of conversion into B—is unequal to—A, a rational converse, obtained without distortion or manipulation of the convertend. 'A—is—unequal to B' cannot be so converted. The one mode of division represents, and expresses accurately, the judgement; which contemplates A and B, and discerns inequality between them. The other pretends that the thought is concerned with 'A' and 'unequal to B,' and discerns between them a relation of existence. I know not what may be in the minds of logicians when they form the judgement 'A is unequal to B,' but I am very sure that I do not myself mean that A stands in a relation of existence towards 'unequal to B,' and I doubt very much whether that is the meaning in the mind of anyone but a logician.

Every proposition and every judgement consists, then, according to the doctrine here advanced, of Subject and Object related by a certain Ratio, and then forming, with the Ratio, a Relation. In many propositions, however, but two elements are apparent; and in many other Simple propositions there appear to be more than three elements. It is very important in reasoning to be sure that all three elements are present in any proposition we use, and to be able to identify them all; and it is not less important to distinguish between propositions that are complicated, but Simple in the sense that they are neither Compound nor Conditional; those that consist of more than one proposition expressed as one; and those which are Modal, or qualified in the Ratio. Not less important is it to identify and discriminate each of the elements in a proposition. None of these tasks is always easy.

In many propositions, two elements only are apparent. Babylon fell; James II. abdicated; William III. died; It rains; The ether exists. All these are good sound propositions; each expresses a definite notion, a complete thought, and therefore a relation; and

yet each appears to consist of two elements only; and the same is true of every proposition expressed by an intransitive verb. Of course, if a proposition consists of Subject and Predicate only, there is nothing in these propositions to explain; but if a proposition expresses a relation, it must contain the three elements that are present in every relation; and our task is to find what is become of the element that, in these propositions, is missing.

To say that James II. abdicated, seems, on the face of it, an incomplete expression. The full sentence would be 'James II. abdicated the throne'; and the intransitive verb seems to be, and perhaps is, in this case, formed by merely omitting the Object-term, and leaving it to be understood. But 'William III. died' is a different case. Here, no such Object-term is missing; and the sentence is complete as it stands. If we look at the sense, however, we see that the relation the proposition expresses is a relation of change, or of suffering change; and would be more completely expressed by saying 'William III. changed from living to dead,' or better, 'William III. underwent the experience of dying.' These are not expressions to be used in ordinary discourse; but they expand the proposition to its proper dimensions, and reveal the whole of the three elements it does, in fact, contain.

Such expressions as 'The plant grew,' 'Babylon fell,' 'Carthage perished,' may all be expanded in the same way; but other cases are less easy. 'He walked,' 'She danced,' 'The tiger sprang,' 'The snake struck' cannot be expanded on this plan. We cannot say, or it would be incorrect to say 'He underwent the experience of walking'; 'She underwent the experience of dancing'; and so forth. The expressions are inappropriate, translating, as they do, a relation of action into a relation of passion. But we can very well expand them into 'He performed the act of walking,' 'She performed the act of dancing,' and so forth. These express the meaning accurately, and display all the three elements that exist in the relation.

'It rains' may be correctly expanded into 'Rain is falling,' but 'The Pyramids endure' is a more difficult case. We cannot say that the Pyramids perform the act of enduring, nor that they undergo the experience of enduring. To get at the true relation we must violate the practice of Traditional Logic, and go behind

the words, to the sense they express. The judgement is, in fact, a negative judgement in an affirmative form. Its meaning is that the Pyramids do not change, or at any rate do not perish. It denies a relation between the Pyramids and change, or perishing.

'The ether exists' is more difficult still. The proposition expresses a relation between the ether and existence, but what relation? A relation, it seems, of existence. Here, then, Ratio and Object seem to be one; and the three elements necessary to every relation appear to be reduced to two. The only way to express it as a relation, with the three elements complete, is to say 'The ether is in a state of existence,' and this is a tautological expression. But 'The ether exists' also is tautologous; for, implied in every proposition is the postulate that its subject exists for the purpose of the argument. What the proposition gives us is that the ether exists, not only for the purpose of the argument, but over and above this purpose it has a real existence.

At the other end of the scale are propositions that evidently contain their full complement of elements, and appear to contain a good deal more. 'It would have made my story much better to have begun with telling you that at the time my mother's arms were added to the Shandys', when the coach was repainted on my father's marriage, it had so fallen out that the painter, whether by performing all his works with his left hand, like Turpilius the Roman, or Hans Holbein of Basel,—or whether it was more from blunder of his head than hand—or whether, lastly, it was the sinister turn which everything relating to our family was apt to take,—it so fell out, however, to our reproach, that instead of the bend dexter, which, since Henry the Eighth's reign, was honestly our due,—a bend sinister by some of these fatalities had been drawn quite across the field of the Shandy arms.' In this and other long and complex propositions, how are we to distinguish and separate the several elements? The discovery is not difficult if certain rules are observed, and the rules are as follow:—

1. First find the Ratio. The Ratio is what the proposition asserts or denies. It is what constitutes the proposition; and it is expressed by the principal verb. But the Ratio is not confined to the principal verb. It may be more—much more. The proposition may be modal. The postulate may be granted with qualifications or conditions or consequences; and all such

modifications of the postulate are part of the Ratio. In 'He took it,' the Ratio is simple, and unqualified. In 'He took it quickly,' the Ratio is qualified as to manner. In 'He took it at once,' the Ratio is qualified as to time. In 'He took it then and there,' it is qualified as to both time and place. In 'He took it from your hands,' it is qualified as to circumstance. In 'He took it to throw suspicion on you,' it is qualified as to motive; in 'He took it because he was greedy,' it is qualified as to cause; and in 'He took it with the result that suspicion fell on you,' it is qualified as to effect; but in every one of these cases it is the Ratio that is qualified. Any expression which answers any of the questions How, When, Where, In what circumstances, Owing to what cause, With what motive, or With what result, the fundamental relation which is asserted in the judgement existed or took place, is a part of the Ratio; and may be known by its quality, as an adverb or adverbial phrase, qualifying the principal verb, which is the gist of the Ratio.

2. Next find the Terms. The Subject is that part of the proposition which expresses the person or thing about which the assertion or denial is primarily made. It may always be discovered by asking Who? or What? of the Ratio. The Subject is always, therefore, a substantive or a substantival phrase. To find the Subject in 'He took it,' we ask, Who took it? and the answer is He. 'He' is the Subject of the proposition. In this case, the Subject is unqualified, but it may be qualified to any extent. 'The man who had been born and brought up amid the refinements of luxury; who had never had a want unsupplied; who had been nourished amid the influences of religion and morality, and enjoyed all the advantages of a University education; who owned land and houses, stocks and shares, wealth in every form, and luxury unlimited; stole a penny from a blind man's hat.' In this proposition, the whole of the clauses preceding the principal verb 'stole' are qualifications of the Subject.

3. The Subject and the Ratio being identified, the Object is, of course, the remainder of the proposition. It expresses that which is asserted, by the Ratio, of the Subject—that which stands to the Subject in the relation expressed by the Ratio,—and is ascertained by following the Ratio by Whom? or What?

Now apply these rules to the sample proposition given above. First find the Ratio, which is expressed by the principal verb.

What does the proposition assert? We have not far to seek. What is asserted is 'It would have made'; 'Would have made' is therefore the Ratio, or the principal part of the Ratio. Is the Ratio qualified in any way? Yes. A little further along we find the words 'much better,' which answer the question, How would it have made? This, therefore, belongs to the Ratio, which is, in full, 'Would have made much better.'

Now to find the Object. The Ratio expresses a relation of making: to find the Object, we are to ask making what? You say it would have made much better. It would have made what much better? The answer is, 'My story.' This, then, is the Object. We have now identified two out of the three elements; it remains only to find the Subject. This is found by asking who or what of the Ratio. Who or what would have made my story much better? The answer stares us in the face. *It* would have made my story much better. There is a whole complete proposition. Then what in the world is all the rest, from 'to have begun' down to 'Shandy arms' at the end of the sentence? If we have already found all three of the necessary elements, what is all this superfluous matter? It is the Subject, placed in apposition. The proposition says, It would have made my story much better. What would have made my story much better? Why, 'to have begun with telling you' all the rest of the sentence. If, however, this long Subject had been placed in its natural position, in front of the Ratio, it would have been necessary to suspend the expectation during the whole utterance of the Subject, and to keep it suspended until the Ratio was reached. Few people are capable of so long a suspension without falling into confusion; and, in any case, it is an immense saving of fatigue to have the necessity for such a suspension abolished. Therefore the sentence is rearranged. The Subject is at first represented by 'It' until we have the Ratio clear in our minds; and then, having apprehended the general relation of the elements in the proposition, we have attention to spare for the long elaborate qualification of the Subject that follows.

Further, we learn from this example, that the qualification of the Ratio need not be immediately attached to the Ratio, but may be separated from it by the interposition of the Object.

'When the scintillations of vanity betake themselves for aid to the flippancy of frolicsome levity, and would question the

sage conclusions of the philosopher, and the moral inculcations of the divine; they must expect to meet with that grave reprobation, which can only be properly awarded by the asperity of virtuous indignation.' In this proposition, the Ratio is manifestly 'must expect to meet with.' To find the Object, we ask, Must expect to meet with what? and the answer is 'that grave reprobation' &c. To find the Subject, we ask who or what must expect? and the answer is 'They.' But who are they? For an explanation we look to the previous clause, and we find 'they' refers to 'the scintillations of vanity.' The rest of this clause is not, however, a qualification of the Subject. It states *when* the action takes place, and is therefore a qualification of the Ratio. In logical order, the proposition should run 'The scintillations of vanity must, when they betake themselves &c., expect to meet with' the dire consequences predicted.

It is clear that, in this proposition, 'When' might be replaced by 'If,' and then it would be in the regular form of a conditional proposition,—If A is B, it is C. We learn, therefore, that the condition of a Conditional proposition is a qualification of the Ratio.

'In later English, the infinitive, the imperative, and the plural and first person singular of the present indicative of the derived verb, have the same form as the primary noun, so that what takes place seems to be not the making of a new word but the using of a noun as a verb.' Reading this sentence, we come to the principal verb 'have,' and, following the rules already exemplified, we find that the Subject is 'the infinitive, the imperative,' and the rest of it down to 'derived verb.' These are what have, and these are, therefore, the Subject. The Object is clearly 'the same form as the primary noun'; for this is what they have. The opening clause 'In later English' shows in what circumstances they have, and therefore is a qualification of the Ratio; but what is the rest of the sentence, from 'so that' down to 'verb'? This has the appearance of a separate proposition. It has a separate and independent principal verb, —'seems to be.' The whole sentence is not a simple proposition, but an argument, consisting of two propositions. It could be equally well expressed by '*Because* the infinitive and the rest of them have the same form as the primary noun, *therefore* what takes place &c.' It could be expressed in Conditional form,—

If the infinitive &c. have the same form, *then* what takes place &c. But we have already seen that the condition under which a postulate is granted forms a qualification of the Ratio. We may, therefore, regard the first proposition as a qualification of the Ratio of the second, and in strict logical order the proposition would run :—The using of a noun as a verb, not the making of a new word, seems (since the infinitive &c. have the form of the primary noun) to be what takes place. Here the Subject is in its natural place, heading the sentence; the Ratio, with the whole of its qualification, intervenes between Subject and Object; and the Object terminates the proposition. This form, however, unless the proposition is skeletonised in the manner just shown, would be too cumbrous, and would require too long a suspension of attention during the consideration of the part in brackets, to be easily intelligible in practice.

In this example, we are introduced to a new modification of the proposition, which does not seem to have received attention in books on Logic,—the form 'not this, but that.' This is evidently a compound proposition of the form A is both B and C, with the modification that one of the constituent propositions is negative—A is not B, and is C. The form, 'A is not B but C,' means more than this, however. It implies that the hearer would have expected A to be B, and that this expectation is disappointed. It implies that the statement 'A is C' is paradoxical. The distinction of these nice shades of meaning belongs, however, more to composition than to Logic.

In the analysis of the last sentence, we found that the Subject and Object had been transposed, the order being 'what takes place seems to be the using of a noun as a verb,' whereas the logical order is 'the using of a noun as a verb seems to be what takes place.' This is rhetorical inversion. That is to say, the inversion is made in order to transfer the emphasis from the Subject to the Object. The emphatic portion of the proposition is the beginning, and whatever part of a proposition we wish to emphasise, we may place at the opening if we choose. The whole sentence opens, in the example, with 'In modern English.' This is the condition that it is desired to emphasise, and for this reason it is placed at the beginning; and this transfer of emphasis is one reason for the operation of conversion of propositions which will be explained in the next Book. In

spoken language, emphasis can be conveyed by inflections of the voice; and a poor attempt to convey these inflections is made, in writing by underlining, and in print by italicising, the words we desire to emphasise; but these are poor and inefficient expedients. The proper way to indicate emphasis, and to balance the sentence, is by the arrangement of its constituent parts. When the constituents are in their natural order of Subject, Ratio and Object, the Subject is not much emphasised, for it is in the place in which we expect to find it; but if either of the others is transferred to this place, it gains emphasis, not merely by position, but by the surprise we feel at its unusual position. 'He robbed me' states, but does not emphasise, that it was he who robbed me; but 'Me he robbed' states emphatically that I was the person robbed; and 'Rob me he did' throws dominant emphasis on the action of robbing. The means of conveying emphasis belongs, of course, to Rhetoric rather than to Logic, but it is desirable here to show one of the reasons for altering the natural order of the elements in a proposition.

So far, we find that the logical analysis of propositions into their three elements demands a little care, but presents no great difficulty, and ought not to be a stumbling block to a careful person. So far, however, we have been at some pains to avoid the really difficult cases; and difficulties cannot be put off for ever, and should not be put off longer than is necessary to prepare against them, in spite of the practice of Traditional Logic, which has succeeded in evading for two thousand years some of the main difficulties by which it is confronted.

The logical proposition is the grammatical sentence; that is to say, the same form of words that is regarded in grammar as a sentence, is regarded in Logic as a proposition. But although the form of words is the same, the different mode of contemplation introduces differences into the contemplate, and the logical proposition has certain differences from the grammatical sentence which need explanation.

A grammatical sentence may have more than one verb, but a logical proposition cannot have more than one Ratio. When Grammar presents to the consideration of Logic a sentence containing more than one verb, how is Logic to understand the sentence? The proposition 'Brutus killed Cæsar' presents no difficulty, and no ambiguity. There is but one possible Subject,

but one possible Ratio, and but one possible Object-term. But the sentence 'Brutus tried to kill Cæsar' contains two verbs, and therefore two possible Ratios. It is only one sentence, but it contains two propositions; yet it is not a compound proposition, for the two propositions it contains are contained, not simultaneously, but alternatively. Logic may accept the sentence as meaning Brutus—tried—to kill Cæsar, which is one of the alternative propositions; or may accept it as meaning Brutus —tried to kill—Cæsar, which is the other alternative. Logic has the right to make its selection between these alternatives; and more, Logic is not only possessed of the right, but charged with the duty of selecting; and until the selection is made, Logic is debarred from accepting the sentence as a proposition. The intention in the mind of the proposer may have been to assert either what it was that Brutus tried to do, or whom it was that Brutus tried to kill. In the one case, the verb 'to kill' belongs to the Object-term; in the other case, it belongs to the Ratio. It may belong to either, at discretion; but it cannot belong to both at once.

A grammatical sentence may have more than one Object, but a logical proposition cannot have more than one Object. In Grammar, 'She gave him beans' has two Objects,—the direct Object, 'beans,' what she gave; and the indirect Object, him, to whom she gave them. The Logical proposition, however, which expresses a relation, cannot have more than the three elements common to all relations, and cannot, therefore, have two Object-terms simultaneously. But as it may have more than one alternative Ratio, so it may have more than one alternative Object, and Logic may regard the proposition 'She—gave him—beans' as stating what it was she gave him, or may accept the proposition as meaning 'She—gave beans to—him,' that is to say, as stating to whom the beans were given. Logic may select either alternative for the purpose in view; but Logic may not read into the sentence both propositions simultaneously. It is bound to make its selection, and until the selection is made, we have before us no logical proposition, but only a grammatical sentence.

It is evident that with more than one alternative Ratio, and more than one alternative Object, the possible alternative propositions that may be contained in a grammatical sentence may become quite numerous, and it may become an academic exercise

requiring some ingenuity to state all the possible logical propositions that are contained in such a sentence as ' He tried to persuade some of them to seek to prevail upon the others to attempt to scale the cliff.' The prospect of devising such elaborate traps to catch the unwary ought to go far towards consoling professional logicians for the loss of the flat-traps constituted by the Figures and Moods of the Syllogism.

CHAPTER IV

THE RATIO

By this title is denominated the link that binds the two terms together in the relation. We have seen that in Scholastic Logic, the link was the third person of the present tense of the indicative mood of the verb 'to be,' and that no other link was admissible. 'S is P' was the only admissible form of proposition. 'S was P' and 'S will be P' were as much outside the realm of Logic as 'S is probably P' or 'S may be P for anything I know to the contrary.' Some logicians now formally permit a relaxation of these absurd restrictions, and all logicians relax them in practice; but nothing in logical doctrine is more settled than that the copula must be some person in some tense of the indicative mood of the verb 'to be'; and, in Logic, the meaning of the copula is as follows:—

The Copula expresses either inclusion in a class or attribution of a quality (or their negations).

The Copula never expresses anything but inclusion, attribution, or their negations.

Which of these meanings it expresses in any given case, is doubtful; but

It ought always to be understood as expressing attribution, not inclusion; and

In fact it always is understood to express inclusion, and not attribution.

According to Traditional Logic, the proposition 'A is B'—for instance, 'Logicians are mistaken,'—may have any one of four, and cannot have any but one of these four meanings. It may mean:—

1. Members of the class of logicians *are included* in the class of mistaken persons.

2. Members of the class of logicians *possess the attribute* of being mistaken.

3. Persons possessing the qualities of logicians *are included in* the class of mistaken persons.

4. Persons possessing the qualities of logicians *possess the attribute* of being mistaken.

These are the meanings the proposition may express. According to the precepts of most logicians, it ought to be understood always in the second sense. According to the practice of all, it is always understood in the first.

Though these are respectively the accepted doctrine and the universal practice of logicians, it is not quite correct to say that the possibility that other relations can be conceived by the mind, and expressed in propositions, has been completely ignored by Traditional Logic. Mill admitted that the proposition may express any of the five relations of Existence, Coexistence, Sequence, Causation, and Resemblance; and sixty years ago, Martineau pointed out that there are other relations that are not attributive, and cannot without much artificial manipulation be put into a form that expresses attribution. Moreover, most text books give a corner of a page to the mention of such relations as 'A is before B,' 'George I. succeeded Anne,' 'England is north of Spain,' and a few others. Even Martineau, however, adds relations of time and space only, and whatever other relations are allowed by logicians, such as those of father and child, king and subject, master and servant, are considered with reference to their terms only; are assumed to be the expressible only in terms; and are ignored when propositions are treated of. It is assumed that these relations can be conveyed only by appropriate terms, and cannot be conveyed by the Copula.

Of late years, still further latitude has crept into the interpretation of the copula. It may, according to some logicians, express coexists with, coinheres with, is like, is identical with, and may have certain other meanings. But though these interpretations are formally allowed, they have no leavening influence on logical doctrine or practice. They exercise no influence on the interpretation of the syllogism; they are allowed grudgingly, and not by all logicians.

For all practical purposes, the doctrine of the Copula as applied by Traditional Logic, is as follows:—

1. The only relations conceivable by the mind are class inclusion and attribution.

2. If there are any other mental relations, they can be reduced to, or expressed as, those of class inclusion or attribution.

3. Whatever other relations, if any, are conceivable, must be reduced to either class-inclusion or attribution before they can enter into argument, from the basis of reasoning, or the ground of inference.

4. The relations of class-inclusion and attribution are expressed by the copula, and cannot be properly or logically expressed in any other way.

5. These two relations alone can be expressed by the copula.

6. One of them, but not both, is expressed in every proposition.

I do not say that these doctrines are explicitly stated in any book on Traditional Logic; but I affirm that they are implied in the manner in which propositions are understood and treated in the text books; and that, unless it is assumed that these are the doctrines applicable to the Copula, the whole treatment of propositions by logicians is unintelligible. It is necessary, therefore, to examine the validity of these doctrines.

1. Are relations of class-inclusion and attribution the only relations that can be conceived by the mind? The question carries its own answer. 'Relations can be conceived by the mind' itself expresses a relation of conception between relations on the one hand, and the mind on the other. Relations may be a class; but the mind is certainly not a class; nor is it, nor is it in this proposition affirmed to be, an attribute of relations; nor does the proposition declare that relations are included in the class of mental things, or that the mind is attributed to relations.

If logicians do not recognise any relation other than these two, grammarians have recognised others. Mental states and mental processes are expressed in words, and words have originated in response to the need that has been felt for expressing mental states and processes. We may be sure, therefore, that the different kinds of words are a safe guide to the different kinds of mental states and processes. What class of words express relations? Verbs. Verbs express relations; and every sort and kind of relation is expressed by a verb. Hence there is a *primâ facie* likelihood that, if there are different kinds of verbs, they will express different kinds of mental relations. Are there different kinds of verbs? Grammarians say there are. They say there are three kinds of verbs, expressing, respectively, relations of Being, of Doing, and of Suffering; or Existence, Action, and Passion. For the purposes of Grammar, these are doubtless

enough; but Logic demands a recognition of other relations, not all of which can be reduced to any of these three, or brought under them.

The fundamental relation of Logic, as of Psychology, the relation on which all reasoning depends, and out of which all reasoning develops, is the primary relation of Likeness, which, with its complement, Unlikeness, is the foundation of all thought. Materially, existence precedes likeness, for things must exist before they can be compared; but mentally, likeness precedes existence, for things cannot be known as existing, except by their likeness and unlikeness to other things.

Appreciation of likeness and unlikeness gives us knowledge and discrimination of things as existing, and of the respects in which they are alike and unlike, and thus we come to know of Existence and of the relation of Substance to Attribute.

The processes of mind are in their nature serial, and therefore temporal ; and unlikeness in series gives us the relation of Change, as well as of Sequence, or Time.

Experiences of our own activity, together with the changes that accompany it, give us, in well-known ways, knowledge of the relations of Space, of Action, of Passion, and of Causation. Finally, in a way that will be explained hereafter in treating of the origin of terms, we attain the conception of classes, with the corresponding relations of Inclusion and Exclusion. Thus the several kinds of relations that may subsist between terms, and are predicable of them are

Likeness and Unlikeness.
Existence and Change.
Attribution and Non-attribution.
Action, Passion, and Causation.
Temporal and Spatial relations.
Class-inclusion and Class-exclusion.

Of these twelve classes of predicable relations, and of the infinite multitude contained under them, Logic recognises four only, viz:—Attribution, Class-inclusion, and their negatives. It is indisputable and manifest, and needs no insistence, argument, or proof, that the mind can and does entertain, and can and does express in words, relations of all these orders. Logic denies that

we can express in propositions, or modify by argument, any relation whatever but those of attribution and class-inclusion; and whatever other relation a proposition may purport to express, must, so Logic asserts, be reduced to one of these before any inference can be deduced from it.

The reason of this strange contention, manifestly untrue as it is, is utterly incomprehensible until we remember that the relation of class-inclusion is the relation on which the syllogism rests, and with which alone the syllogism is competent to deal. Without the relation of class-inclusion, there can be no syllogism; and as the syllogism is the only mode of reasoning known to Traditional Logic, this Logic, without the relation of class-inclusion, is a fish with its fins and tail chopped off. It cannot move. But this explanation takes no account of the relation of attribution, which is very different from class-inclusion, and is admitted into Traditional Logic? If Logic admits the relation of attribution, it does not restrict itself to class-inclusion, and my account of its narrowness is exaggerated. The answer is that though Logic professes to admit attribution as a possible relation, yet this relation is not in fact admitted by Logic into argument. Every 'attributive' term admitted into Logic is instantly invested with 'distributed' or 'undistributed' quantity, which means that it is instantly turned into a class, or part of a class. Once admit that any other relation than class-inclusion exists, or at least, that any other relation can be reasoned about, and the whole time-honoured structure of Traditional Logic comes crashing to the ground. Is it any wonder that Logicians guard the meaning of the copula so carefully, and restrict it so narrowly?

Unless we keep in view the necessity that Traditional Logic is under of bolstering up the syllogism, the restrictions, and artificialities, and futilities of this Logic are unintelligible. Why should we be allowed to argue from the proposition 'Cæsar possesses ambition,' and forbidden to argue from the proposition 'Cæsar possesses land'? Why should we be forbidden to argue from 'Cæsar possesses land' and allowed to argue from 'Cæsar is a landowner'? Why should we be permitted to draw from 'Cæsar is a landowner' the astonishing inference that 'some landowner is Cæsar,' and be forbidden to draw, from the proposition 'Cæsar possesses land,' the very natural and obvious inference 'Some land is possessed by Cæsar'? Simply and solely because the one set

of propositions can enter into the syllogism, while the other can not. But for the necessity of bolstering up the syllogism, the logical doctrine of the copula could not stand for an hour. In fact it has stood for hundreds of years.

Not being infatuated with the syllogism; not regarding it as a necessary, or even a very useful, mode of reasoning; I am free to admit into propositions all the relations that the mind can conceive and that words can express. My view is that relations are expressed by verbs; that a proposition may contain any verb; and that any proposition, no matter what verb it contains, no matter what relation it expresses, can as well form the basis of argument, and the ground of valid inference, as the proposition with the copula. To reduce the proposition to 'logical form' by twisting it about and garbling its meaning until it can be expressed by the copula, seems to me like loading oneself with fetters as a preparation for marching. It appears to me that arguments as valid can be formed from 'Logicians make mistakes' as from 'Logicians are mistaken.'

Thus, the first three questions are answered in the negative. Relations of class-inclusion and attribution are not the only relations conceivable. That abundance of other relations are conceivable is proved by the abundance of verbs that have been devised in order to express them. Relations of class-inclusion and attribution are not the only relations that can be expressed in words, for we can use any verb we please to form a proposition. These two are not the only relations that can form the subject of argument, for we find it is as easy to argue from one relation as from another. There is no need, therefore, except the need of dry-nursing the syllogism, to express relations in the form that alone is regarded by Traditional Logic as the legitimate form. Reduction to this form is an unnecessary exercise of perverted ingenuity. It cannot often be done without garbling the meaning of the proposition; it may result in linguistic monstrosities from which the mind revolts; and it effectually deters practical reasoners from seeking the aid or adopting the formulæ of logic, since they cannot do so without distorting the propositions concerned into forms that are difficult to reach, and are abhorrent to common sense when attained.

To keep on perfectly safe ground, I will not make any translation of my own, but will take an example from a popular text book. 'Democracy ends in despotism.' To reduce this to logical form,

so that it can enter into logical argument, and perhaps attain the supreme distinction of a place in the syllogism, it must be translated into 'all democratic governments are things ending in despotism.' We will pass the cumbrous and inelegant form of the paraphrase, since Logic is not bound to consider elegance; but we cannot pass that it materially alters the sense of the original. The two propositions do not mean the same thing. Not only the Ratio, but the terms are altered. 'Democracy' is not the same as 'All democratic governments.' 'Ends in despotism' has not the same meaning as 'are things ending in despotism.' 'Democracy' is as different from 'all democratic governments' as the abstract is different from the concrete. The original asserts something of Democracy,—of a form of government—of an abstract. The logical substitute affirms something else of all democratic governments,—of a group of concrete things. The original asserts what Democracy *ends in*, or *becomes*. It affirms a relation of Change. The substitute asserts what democratic governments *are*. It affirms a relation of Existence. The two things are as different as existing and changing. The original asserts the ending of democracy in *despotism*—an abstract. The substitute asserts that all democratic governments are *things ending in despotism*—concrete things that are clearly different from the state in which they end. Would the ingenious logician who made this substitution be satisfied to exchange a contract, giving him the right to receive 'value' for a thing, for a contract giving him the right to receive 'a valuable thing' in lieu of it? Would he be content to exchange an obligation that 'value' is due from him into an obligation that 'All valuable things' are due from him? The original answers the question What does democracy *end in?* The substitute answers the question What *are* democratic governments? The first is a prophecy: the second is a definition or a description.

And this translation into a cumbrous, awkward proposition, having a different meaning, is not in the least necessary to enable the proposition to enter into an argument. It is necessary, indeed, to make it express class-inclusion, and thus to fit it for entrance into the syllogism; and on this I shall have something to say when the syllogism comes under review; but it is not in the least necessary for the purpose of reasoning. If Democracy ends in despotism, then Despotism terminates democracy. The conversion is manifestly sound and valid. It commends itself to the reason

just as completely, just as effectually, just as conclusively as 'some things ending in despotism are democratic governments' follows from 'All democratic governments are things ending in despotism.' If, indeed, the mind could conceive no relation other than those of class-inclusion and attribution, there would be some reason for retaining the copula with its restricted meaning; but in that case, no proposition expressing any other meaning would ever have come into existence; there would be no other verbs, and no reduction to logical form would be needed. But in fact, the mind does constantly form relations of all orders—likeness and unlikeness, existence and change, sequence, causation, action, passion and the rest; and is as competent to draw inferences from any one as from any other. If democracy ends in despotism; then it does not end in freedom; then despotism terminates democracy; then democracy ends in autocracy; then democracy leads to despotism and autocracy; then democracy has a termination; it does not last indefinitely; and so forth, and so on. These arguments are manifestly valid. They commend themselves to the reason. Supposing the premiss to be true, we could safely found our conduct on them; and if arguments conduct us to this result, what more do we want? The answer of Traditional Logic would probably be somewhat as follows:—'These arguments may be sound; but they have this inherent vice, that not being in syllogistic form, they cannot be tested. We cannot be sure that there may not be lurking somewhere an undistributed middle, or an illicit major or minor.' This objection may be left over until we come to the consideration of the syllogism. At present we are dealing with the copula only; and we are arrived at this conclusion—that the relation of sequence cannot be correctly expressed by means of the copula.

Nor can a relation of action be so expressed. 'Brutus killed Cæsar.' According to the precepts and practice of logicians, this must be reduced to logical form, and then becomes 'Brutus was a person who killed Cæsar.' Again the sense and meaning of the proposition are seriously altered. The original expresses a relation of action. The substitute expresses a relation or mode of existence. The one asserts what Brutus did to Cæsar, the other asserts what kind of a person Brutus was. The meanings are widely different, and cannot, by any artifice, be identified. The Subjects alone are the same. The Ratios and Object-terms are

widely different. The one proposition answers the three questions —What did Brutus do to Cæsar? Who killed Cæsar? and Whom did Brutus kill? The other does not answer either question directly, but answers instead the question What sort of a person was Brutus?

The third assumption of Traditional Logic is that if any other relations than class-inclusion and attribution, are conceivable, such relations must be reduced to those of class-inclusion or attribution before they can enter into argument. The onus of proving such an assertion is on those who make it; and it is easily refuted by adducing an instance to the contrary. Such instances are abundant in the experience of everyday life. If John went out, it is a safe inference that he did not remain at home; if he gave away his dinner, he did not eat it himself; if he lost money, he became poorer; if he lost his temper, he did something foolish; if he drank too much, he became intoxicated; if the bank breaks, it will ruin many people; if the tide rises high enough, the ship will float. So far from the copula being necessary for argument, the vast majority of arguments are carried on in propositions from which the copula is absent.

The fourth assumption of Traditional Logic is that relations of class-inclusion and attribution can be expressed in no other way than by the copula. An assumption more manifestly false was never made. The copula, so far from being the only way, is not even the correct way of expressing these relations. The copula is an abbreviation. It is an approximate expression. It is an inefficient substitute for the proper expression. It is ambiguous. Not even a logician can tell, when he meets with the copula, whether it expresses class-inclusion, or attribution, or something else. On his own showing, it may mean either class-inclusion or attribution; and many pages of text books on logic are filled with discussions as to which meaning is to be read into it. But it is easy to express either relation without ambiguity, and with certainty. If, by 'Camels *are* ruminants,' I mean 'Camels are included in the class of ruminants,' what is easier than to say so in those words? If I mean 'Camels possess the faculty or quality of rumination,' what is easier than so to express my meaning? Why, if I have a definite meaning, should I be compelled to adopt a form of expression which leaves my meaning in doubt, and be prohibited from expressing it in a form which leaves

no room for doubt? Approximate expressions, ambiguous expressions, slipshod expressions, are frequent enough in the spoken communications, even of educated and careful persons, in the hurry and worry of daily life; and are then pardonable. In deliberate compositions, written down and sent to press, corrected in the proof, and revised with the care that is inspired by respect for the reader and regard for the reputation of the writer, they are excusable with difficulty; but what is to be said of the practice of choosing an ambiguous expression, as the very foundation of reasoning, in works on Logic?

Nor is the confusion between class-inclusion and attribution the only ambiguity that lurks in the copula. Traditional logic makes no discrimination between the verb 'to be' as an independent verb, and the same verb as an auxiliary. 'The calf will be slaughtered' is in the form of the conventional logical proposition, with subject, copula, and predicate, all complete. But it has not the meaning of the conventional logical proposition. It means neither that the calf will be included in slaughtered animals, nor that the calf will have the attribute of having been slaughtered. It means that the calf will undergo the experience of being slaughtered. It means that slaughter is what will happen to the calf. The proposition has the same form as 'The calf will be dead,' but the meaning of the verb is totally different. In the last proposition, the verb 'will be' is the copula, and expresses the state of existence in which the calf will be. In 'The calf will be slaughtered,' the verb 'will be' is auxiliary to 'slaughtered,' and expresses, not existence in the future, but passion, or being acted on, or undergoing. The meanings are as distinct as existence and suffering, and yet, in every text book on Logic that has ever been written in English, they are confused.

The fifth assumption of Traditional Logic with respect to the copula is that no relation can be expressed by it except those of class-inclusion and attribution. One additional meaning has just been given, and this is not the only one. The copula, in its strict meaning, expresses existence, not solely existence in a class. There are many modes of existence besides existence in or out of a class, and all these may be expressed by the copula. When it is asserted that Britons never *shall be* slaves, what is meant is not that they shall never be included in the class of slaves, nor that they shall never have the attributes of slaves. No one who ever made

the declaration ever had in his mind any thought of classes or attributes. What he has in his mind, what he intends to convey, and what he is understood by every one of his hearers to convey, is that Britons shall never stand in the *relation* of slavery towards a tyrant or a despot. If I hear that they were all drowned, I do not understand that they were all included in the class of the drowned, or that they all possessed the attribute of drownedness. What I understand, and what my informant meant me to understand, is that they all underwent the experience of drowning. When I say 'mules are barren,' I do, indeed, predicate of mules the attribute of barrenness; but when I say 'a mule is the product of an ass and a mare,' I do not assert that it is included in the class of things produced by an ass and a mare, nor assert of it the attribute of being so produced. What I mean, and what I am understood by everyone but a logician to mean, is to assert a relation of parenthood. That, I say, is the parentage of a mule.

Lastly, it is assumed by Traditional Logic that every proposition expresses either class-inclusion or attribution, but not both. I meet this assumption with five different negatives. In the first place, as already shown, the copula need not express either class-inclusion or attribution. In the second, multitudes of other relations besides class-inclusion and attribution are expressed in propositions. In the third, a proposition may express class-inclusion and attribution alternately. In the fourth, it may express them simultaneously; and in the fifth, the universal practice of Traditional Logic itself is to understand the proposition as expressing class-inclusion alone, and to reject attribution altogether.

When it is said 'Logicians are mistaken,' what is meant? What is the relation that the proposition asserts, conveys, and expresses? The four meanings that logicians read into it have already been given. It may mean that all persons in the class of logicians have the attribute of being mistaken, or that they are included in the class of mistaken persons; or it may mean the same of persons having the attributes of logicians. These are what logicians say it may mean, but what does it actually convey? I assert that it may mean logicians both in intention and in extension; that it may mean the class of persons who have the attributes of logicians. In any given case, the utterer or the receiver may be thinking more in intention than in extension, or *vice versâ;* but in that case he should express himself without ambiguity. He should

say, in the one case, 'the class of logicians' and in the other 'men having the qualities of logicians.' If he means the Object in extension, he should be careful so to express himself by saying 'mistaken persons.'

But the exponents of Traditional Logic, though they pay lip-service to the intensive meaning of the proposition, do not, in practice, allow that a term is ever to be understood in intention. So long as they are discussing the import of propositions, they allow and assert that a proposition may be and ought to be understood attributively, but the moment the last page of the chapter on import is turned, they seem to obliterate the assertion from their minds, and never refer to it again. According to traditional Logic, the Subject should usually be understood in intention, the Predicate in extension. The Subject is a thing, or class of things, the Predicate an attribute of the Subject. Yet, when they convert a proposition, they invariably drop the intensive character of the Predicate, and regard it solely in extension. In vain shall we search the books to find 'Logicians are inconsistent' converted into 'Inconsistence is a quality of logicians.' It is always converted into 'Some inconsistent persons are logicians.' The reason for this strange *volte-face* is evident enough. Syllogistic reasoning is reasoning about class-inclusion, and nothing else; and unless a proposition expresses class-inclusion, it cannot enter into a syllogism. Since the syllogism is the only form of reasoning, it follows that no proposition can enter into reasoning unless it expresses class-inclusion.

In contradistinction to Traditional Logic, I assert, and have given reasons to show, that a proposition may express any relation whatever; that relations are expressed by verbs; that any proposition containing any verb whatever can be reasoned from, and argued about, as readily as any other; that the copula is an ambiguous form of expression, which should be employed as seldom as possible; that, so far from every proposition being translated into one containing the verb 'to be,' every proposition containing this verb should, if possible, be translated into a more accurate form; that, so far from every proposition being translatable into one containing the copula, none, except those expressing existence, can be so translated without perverting its meaning; while, contrarily, most propositions containing the copula can be expressed more accurately by some other verb.

If the Ratio must be the verb 'to be'; and if the verb 'to be' in a proposition is always the copula; and if, in construing a proposition, we are to look always at the verbal form and never at the sense, then observe the consequence in the proposition 'He is certain to fall.' This has the form of the conventional logical proposition, with Subject, Copula and Predicate all complete. He—is—certain to fall. That is the construction according to Traditional Logic. But what is the sense the proposition expresses? Does it predicate certainty of him? Manifestly it does not. The relation expressed is not one of certainty, but one of happening. The correct construction is, He—will certainly—fall, or, in strict logical correctness, He—will certainly undergo—the experience of falling. It is a modal proposition; and, if Traditional Logic were consistent, would be inadmissible on this account, but as the mode is apodeictic, it would be allowed to come in, though not in the form that expresses accurately what is in the mind of the proposer. The converse, in Traditional Logic, is 'A person who is certain to fall is he,' which, as Pepys says, is a pretty strange expression. In common sense, the converse is, 'Falling is the experience he is certain to undergo,' or 'Falling is what will certainly happen to him.'

Such being, in my view, the nature of the Ratio, the question presents itself, What are the relations that the Ratio may express? This question asks, in effect, What can be predicated of a Subject, or What are the Predicables? It also asks What are the Categories? for these also are predicable of a Subject. It is true that logicians regard the Categories or Predicaments as possible terms, and the Predicables as possible Predicates; but as the predicate is, in Logic, a term, it is difficult to understand what the distinction is that Logic makes between them. The discussion as to what Aristotle's purpose may have been in enumerating the Categories, and what value is to be attached to them, has been a favourite battle ground for logicians, and a volume might easily be filled with an account of these discussions. They remind me irresistibly of the controversy that raged between the Big-endians and the Little-endians; and the questions at issue seem to me equally important. What the soldier said is not evidence; and what Aristotle had in his mind when he formulated his scheme of Categories really does not matter to anyone who does not regard Aristotle as an inspired writer, whose lightest words are to be

treasured as precious possessions, and whose opinions are to be received with unquestioning reverence. At first sight, the Aristotelian Categories appear to be a hodge-podge of irrelevant and disconnected words, thrown together anyhow; but on examination it is found that they relate to the various parts or constituents of the proposition, and are best left over, therefore, until these constituents have all been examined.

CHAPTER V

TERMS, THEIR ORIGIN AND KINDS

Quantity

The proposition expresses a relation, and in every relation there are two related things. These things, between which the relation exists, are called the terms of the relation. The proposition expresses the formation, in and by the mind, of a relation; and the verbal terms of a proposition express mental terms, which are images, ideas, or concepts, all of which may be included in the term thoughts. When we inquire into the origin of terms, we are inquiring, therefore, into the origin of thoughts.

All thoughts are derived from experience. They may be derived directly and immediately, and are then images of things and events that have been presented to sense; or they may be derived indirectly or mediately from experience, by the operation of the mind upon the images derived directly from experience. This mental operation consists in discerning likeness and unlikeness between things, in combining or associating in the mind what are discerned to be alike, and in separating in the mind what are discerned to be different. This is the primitive process of thought, and to this process all thoughts, that are not mere images, are due.

When chalk, foam, snow, certain flowers, certain clouds, and certain other things, are successively contemplated, they are discerned to be all alike in a certain respect. A fundamental capacity of the mind enables us to combine, or associate together in the mind, all the things that we discern to be alike in any respect. This capacity is called Generalisation. A fundamental capacity of the mind enables us to set apart in the mind the group of things thus generalised by the discernment of their likeness in one respect, and to discern that they are different in some other respect from other things. This capacity is called Differentiation Division, or Classification. A fundamental capacity of the mind enables us to contemplate the respect in which things are alike or

different, separately from the things themselves. This capacity is called Abstraction.

I have distinguished these as different capacities of the mind, but they are not different processes. They are different aspects of one process. In the same mental act in which we discern that things are like one another, we discern that they are unlike other things, and we discern the respects in which they are like one another and unlike other things. The whole process I call Syncrisis, and this account of Syncrisis affords us an introduction to many of the fundamental terms of Logic, and an explanation of them.

The respect in which things are discerned to be alike or different is called a *Quality* of those things.

Things which possess qualities are called *Concrete* things, or *Concretes*.

A quality may be contemplated as inherent in, or manifested by, a concrete: it is then abstractible from the concrete, but not abstracted. Such qualities are called *Attributive* qualities or *Attributes—e.g.*, a *white* horse.

A quality may, however, be contemplated apart from the things in which it inheres or by which it is manifested. It is then called an Abstracted or Abstract quality, or an *Abstract—e.g.*, whiteness, hardness.

An abstract quality has qualities of its own, abstractible from it—*e.g.*, *moderate* hardness, *excessive* hardness. Contemplated with respect to these qualities of its own, a quality is a *Concrete Quality*.

The same quality is, therefore, abstract with respect to the concrete from which it is abstracted, and concrete with respect to the qualities it possesses. These qualities may be discerned in it while it is still abstractible, and not completely abstracted; so that an Attribute as well as an Abstract quality may be concrete. Concreteness is, therefore, not necessarily opposed to abstractness. It is complementary to abstractness, but not inconsistent with abstractness. The true opposite or contradictory of Abstract is not Concrete, but Attributive. The true opposite of Concrete is Qualitative.

The quality in respect of which several concretes are alike is called a *Common quality* of those concretes. A quality that is possessed by some concretes and not by others is a *Proper quality*

of those by which it is possessed. The same quality that is common to some concretes, regarded as like one another in respect of its possession, is proper to those same concretes, regarded as different from other concretes that have it not.

An attribute may inhere in more than one concrete; and a concrete may possess more than one attribute.

The attributes of a concrete, taken together, form the *Connotation* of the concrete.

The concretes that possess an attribute form the *Denotation* of that attribute.

The same name that is given to a group of attributes found together in a concrete is given to the concrete or concretes in which that group of attributes is found. The group of attributes forms the *Connotation* of the name; the concrete, or group of concretes, forms the *Denotation* of the name.

When a group of attributes, with the concretes that possess them, are contemplated together, but the attributes or connotation are more prominent in the mind, the connotation and denotation together form a *General Idea* or *Concept* of the concretes.

When a group of concretes with their common attributes are contemplated together, and the denotation is more prominent in the mind, the denotation and connotation together are called a *Class.*

The process of Syncrisis places us in possession, therefore, of several kinds of terms, in addition to the individual images and ideas from which all other kinds of terms are derived. It places us in possession of Concretes, of Concepts, of Classes, and of Qualities, and of several classes of qualities.

Since, as we have seen, qualities may be concrete, and may be gathered into classes; since both concretes and classes possess qualities inherent in them; since classes are themselves necessarily concretes; and since each class is in some sort an individual; it seems that these several kinds of terms are so inextricably blended, that no absolute distinctions can be drawn between them; and that, in treating them as terms, we must treat them in the mass, and cannot usefully distinguish one from another. Such a view would, however, be erroneous. It is true that concretes may be concrete qualities, and that classes may be classes of qualities; it is true that qualities may be concrete, and may be grouped into classes; but, as we have found, and

as we shall find again and again, logical differences depend on the different ways in which the subject-matter is contemplated by the mind; and the several kinds of terms may be disentangled from one another and disposed in distinct classes, if we rightly contemplate them. When we speak or think of an individual, we are contemplating the subject of thought from its quantitative aspect alone; and thus contemplated, it does not matter whether the individual is a concrete or a quality; and if it is a quality, it does not matter whether it is an attribute or an abstract. We regard it purely quantitatively, and quantitatively it is an individual. Similarly, when we speak or think of a class, we contemplate the subject of thought in its quantitative aspect only. We contemplate the class as quantitative, that is to say as made up of a group of concrete individuals; and thus contemplated, it is evident that classes and individuals may be associated together as Quantitative Terms.

A quality may, as we have found, be a concrete; but when it is viewed or contemplated as a concrete, it is no longer regarded qualitatively. It is regarded as itself possessing qualities, and therefore as a concrete individual or class. It is regarded quantitatively, and not qualitatively, and falls into the class of quantitative terms. But when a quality is contemplated with respect to the concretes in which it inheres, or from which it has been abstracted, then it is regarded qualitatively; and, so regarded, qualities, whether attributive or abstract, from a class of terms quite distinct from that which includes them when they are regarded quantitatively.

The two primordial kinds of terms are, therefore, the Quantitative and the Qualitative; and, while Quantitative terms are divisible into Individuals and Classes, Qualitative terms are divided into Abstracts and Attributes. These, then, are the primary classes of terms that we are to consider in detail.

TABLE I.

Primary Classification of Terms.

- Terms
  - Quantitative
    - Individuals.
    - Classes.
  - Qualitative
    - Abstracts.
    - Attributes.

The Traditional doctrine of quantity is not only miserably defective, but is also in such inextricable confusion that it is difficult to give any intelligible account of it. The following statements are authorised by a leading text book; all of them are corroborated by other text books, and all but one by every text book that I have been able to consult.

In the examination and description of terms, quantity is not mentioned; nevertheless, terms are divided into Singular and General, and General terms into Collective and Distributive.

Quantity means, in Logic, the quantity of propositions, as Universal or Particular. The logical doctrine of quantity does not apply to terms, which cannot be either Universal or Particular; at any rate, neither the Universal term nor the Particular term is ever mentioned in Logic. Nevertheless, every term must be either distributed or undistributed; which means that it is viewed quantitatively, and must possess one of these two quantities.

The quantities known to Traditional Logic are two only, viz: —the Universal, the Particular, the Distributed, the Undistributed, the Singular, the General, the Distributive, the Collective, and the Indesignate.

The predicate of a proposition is never quantified: it is always, however, of either distributed or undistributed quantity.

Universal propositions are those in which the predicate explicitly refers to the whole of the subject.

Particular propositions are those in which the predicate does not refer to the whole of the subject.

There is no proposition in which the predicate does not refer to the whole of the subject. This rule is not to be found in any book on Logic. It is, however, indisputably true.

How logicians reconcile in their own minds these several statements, is no business of mine. Whether they forget, when they come to one page, what they have said on a previous page; or whether the Universal quantity is the same as the Distributed quantity, and the Particular the same as the Undistributed; or whether they are respectively sometimes the same and sometimes different; or whether the Singular and General quantities are, in the estimation of Logic, not quantities; or whether Logic does not know what quantity is; or whether Distributive quantity is or is not the same as Distributed quantity; or whether logicians are

unable to count up to more than two; I do not know, and it is no business of mine to determine. These subtle questions must be left to the acumen of logicians themselves; but there is one matter on which I am clear, and that is that in no circumstances whatever does the predicate of a proposition refer to part only of the subject of that proposition. The subject of a proposition may, indeed, be but a small part of an individual or of a class, but however small a part it may be, the predicate refers to the whole of that part. If I say that a ten-millionth of a grain of radium is a recognisable quantity, or that one of the innumerable host of stars is brighter than the rest, or that one of the countless grains of sand on the sea-shore is blown into my eye, the predication refers not to part of the one-millionth, very small part though it is of a very small part; nor to part of the star or part of the grain of sand, one only though each is of an incalculable multitude. The predicate refers in each case to the whole of the subject, small part of a whole though that subject is. What logicians mean when they say that a Particular proposition is one in which the predicate does not refer to the whole of the subject, is, no doubt, that the subject of a Particular proposition is part of a class; and this, though not universally true, is at any rate sometimes true; but this is not what they say, or what most of them say, and what they do say is never true. According to their definition, there is no such thing as a Particular proposition.

Another distinction between Universal and Particular propositions is said to be that, while the subject of the Universal is understood in its whole denotation, the denotation of the subject of the Particular proposition is left indefinite. According to this distinction, 'Some of the men were killed' is a particular proposition, and to this logicians would, I suppose, agree. But according to this distinction, 'Twenty-two of the men were killed' is a Universal proposition; yet 'twenty-two of them' is certainly part of a class, so that the proposition is Particular according to one definition of Particular, and not Particular—in fact Universal—according to another definition. No doubt, if twenty-two of them were killed, all of the twenty-two were killed, and in this sense, the proposition is Universal; and no doubt if twenty-two of them were killed, it is not specifically asserted that more than twenty-two of them were not killed, and logicians may claim that this renders the numbers indefinite,

and determines decisively that the proposition is Particular; but if logicians make this claim, they are confusing definiteness with exactness, which are very different things. For my own part, I am unable to decide, on the principles of Traditional Logic, whether 'Twenty-two of them were killed' is, in that Logic, a Universal or a Particular proposition; and I shall be very much surprised if logicians give a unanimous answer to the question. Fortunately for themselves, however, logicians are always ready with a short way to deal with difficulties. If any example, found in experience, of a Ratio, a term, a quantity, a mode of argument, or anything else, will not fit in with the scheme of Traditional Logic, out that example has to go. Such a Ratio, such a term, such a quantity, such a mode of argument, is 'not logical.' It doesn't count. We are reminded of little Curran's offer to his gigantic antagonist who complained of the unfairness of a duel between them. Curran offered to chalk out a figure of his own size on the body of his huge adversary, and to agree that every bullet that hit outside the chalk marks should not count. It is little consolation to a reasoner, whose arguments have been smashed, shattered and pulverised, to be told that the crushing retort of his adversary is outside the scheme of Traditional Logic. The Austrian generals who were defeated by Napoleon proved to their own satisfaction that Napoleon's methods were not warranted by the rules of war. The demonstration was irrefragable, but it did not alter the results of the campaigns. What were altered were the rules of war.

The doctrine of Traditional Logic, that quantity inheres in the proposition, seems to me fundamentally erroneous. In my view, quantity resides in the terms alone, and the proposition as a whole can no more be Universal or Particular than it can be white or soft. A proposition expresses the formation in the mind of a relation; and though, with some straining of the meaning of words, a relation may be said to be Universal or Particular, the formation of a relation cannot possibly be either. If there is a relation that subsists between all things, that relation may properly be termed Universal; and in this sense the relations of space and time are approximately Universal. They are universal in the material universe. And relations, such as likeness and unlikeness, that exist between certain things only, may be termed Particular relations. But the formation of a relation, cannot be either

Universal or Particular; and it is the formation of a relation that is expressed by a proposition.

Traditional Logic, as now taught, denies utterly that the Predicate is quantified; and abjures, abhors, and repudiates the Hamiltonian doctrine of the quantification of the Predicate, as utterly heretical and damnable. Nevertheless, Traditional Logic still teaches, by the mouths of those very logicians who pour contempt upon the Hamiltonian doctrine, that the predicate of every proposition must be either distributed or undistributed. Of the four forms of propositions that alone exist, E and O distribute their predicates, A and I leave the predicate undistributed. In no proposition is the predicate quantified, but in every proposition the predicate possesses either distributed or undistributed quantity. That is the doctrine taught by every logician at the present time. How the two portions of the doctrine are reconciled is no business of mine, I am thankful to say, for, not having been brought up in Traditional Logic, I find some difficulty in reconciling flat contradictories.

In my view, we may or may not quantify the predicate, or rather, the Object-term, of a proposition; and if we do choose to quantify the Object-term, we must apply to it a quantity that is applicable to it, and not one that is inapplicable. There is one mode of quantity—the Extensive—that is applicable to quantitative terms alone, and cannot rightfully be applied to qualitative terms. There is another mode of quantity—the Intensive—that is applicable to qualitative terms only, and cannot rightfully be applied to quantitative terms. Traditional Logic does not explicitly or formally deny these doctrines, but its practice is completely inconsistent with them, and we may therefore take it that if Traditional Logic did know of them, it would deny them.

As already shown, Traditional Logic, though it formally and verbally denies that the predicate is quantified, yet declares that the predicate always possesses quantity. It declares moreover that the predicate is always, or ought always, to be understood as a qualitative term; and that, being a qualitative term, it must be invested with extensive quantity, of which qualitative terms are not susceptible. I say that in 'All gold is heavy,' the predicate 'heavy' is to be understood qualitatively, that is to say, as a quality belonging to gold; and so far Logic agrees. But I say

further, that 'heavy' cannot be every heavy, or a few heavy, or many heavy, or half heavy, or have any other numerical quantity attached to it. As a quality, it is susceptible of intensive quantity only. It may be very heavy, or moderately heavy, or rather heavy, or extremely heavy. This Logic does not admit, or at least does not declare; for no mention of intensive quantity is to be found in books on Logic. On the contrary, Logic declares that 'heavy' in the given proposition, does possess extensive quantity, for it is undistributed, and an undistributed term 'refers to a portion of a class' and 'leaves the extent of the denotation absolutely indefinite.' The sole aim, purpose, and meaning of conferring distributive quantity upon a term is to enable us, or disenable us, to include some other term within it. Logicians are compelled, by their doctrine that all reasoning is inclusion in classes or exclusion from classes, to make every term a class. They do not seem able to appreciate the difference between a quantitative term and a qualitative term, or to recognise that any change has taken place when the term 'heavy' is altered into 'heavy things.'

But although logicians are forced by their erroneous doctrine of reasoning to pretend that every qualitative term is quantitative, and expresses a class or part of a class, it seems never to have occurred to any logician, from the days of Aristotle down to this present time of writing, that the predicate or Object-term of a proposition may explicitly express a class or part of a class. That All men are mortal is a proposition that every logician can understand, appreciate, and admit within the precincts of Logic; but that Mortality can be an attribute of all men, is beyond the utmost range of his imagination.

The teaching of every logician is that the subject is to be understood in Extension, the Predicate in Intension. The practice of every logician is to understand both in Extension. '"All men are mortal,"' say logicians, 'means Every man has the attribute of mortality; and therefore we will always take it to mean Every man belongs to the class of mortal beings. "No man is perfect" means No man possesses the attribute of perfection; and therefore we will always take it to mean No man is included in the class of perfect beings.'

The sole justification—no, that is wrong; there can be no justification for the constant infraction of a rule that is laid down

as universally applicable. The sole foundation for this strange doctrine of the quantification of the predicate, which logicians formally repudiate and universally adopt, is the fancied necessity of finding means to convert the proposition according to the conventional rule. Unless we understand 'All men are mortal' to mean 'All men are included in the class of mortals,' we cannot get the logical converse, 'Some mortals are men,' and without this converse, the Moods of the Syllogism must go by the board.

In my view, the signs of quantity, whether of Extensive or Intensive quantity, can as readily be affixed to the Object-term as to the Subject-term, and are, in the actual reasonings of daily life, as often affixed to the one as to the other. Either Extensive or Intensive quantity may be expressed in the Subject alone, in the Object alone, or in both, or in neither.

Extensive Quantity.

Subject alone quantified—All men are liars.
Object alone quantified—Lying is common to all men.
Neither term quantified—Cloven-footed mammals are ruminants.
Both terms quantified—One volunteer is worth twenty pressed men.

Intensive Quantity.

Subject alone quantified—Gross ignorance is deplorable.
Object alone quantified—Lying is very shameful.
Neither term quantified—Patience is virtuous.
Both terms quantified—Intense hunger is very demoralising.

All of these variations of quantity except the first, would, I suppose, be rejected by logicians as 'not logical,' but, as I owe no allegiance to Traditional Logic, I accept them all, and have no difficulty in arguing and drawing conclusions from them. If Lying is common to all men, then All men are liars. If Cloven-footed mammals are ruminants, then we may expect any cloven-footed mammal to ruminate. If One volunteer is worth twenty pressed men, he is worth more than ten pressed men. If Gross ignorance is deplorable, we should not encourage it. If Lying is very shameful, it is not to be commended. If

Patience is virtuous, it is virtuous to be patient. If Intense hunger is very demoralising, starving them is not the best way to cultivate bravery in troops. These arguments are no more difficult to construct than they are easy to refute; but none of them can be reached by any method known to Traditional Logic as I understand it.

If the distribution or non-distribution of the predicate is as important, nay, as necessary, in our estimation of propositions, as Traditional Logic asserts, then it is not justified in rejecting Hamilton's scheme of quantification of the predicate, which, however, all logicians do reject. Hamilton's quantification merely carries to its logical conclusion that quantification of the predicate which all logicians admit and proclaim. It merely states explicitly that which they assert is implicit in the proposition. Hamilton says in effect, 'It is admitted that in every proposition the predicate is either distributed or it is not. It is admitted that this quantification is not explicit in the proposition, but must be inferred from the quality of the proposition. It would be much more satisfactory to state the quantity of the predicate openly and explicitly; and this I do. When the quantities of the predicate are thus formally displayed, it is found that the quantification in vogue is imperfect. My scheme brings to light quantities that have lain unsuspected. Logic declares that "All A is B" means, of necessity, "all A constitutes a part only of the class B." But this does not exhaust the possibilities. All A may constitute the whole of the class B; and it is not justifiable to make an assumption that may be inaccurate. Moreover, not only is the assumption, that all A is some B, not necessarily true, but when it happens that All A is all B, we can obtain, by so stating it, a more precise and correct conclusion than we can by limiting our statement to All A is some B.'

It seems to me that this reasoning is irrefutable. If quantification, in the logical sense of 'distribution' does reside in the predicate; if the predicate may be either 'distributed' or 'undistributed'; and if the 'distribution' or 'non-distribution' of the predicate is as important as Traditional Logic says it is; then it seems to me beyond the pale of discussion that it is desirable to state openly on the face of the proposition whether or not the predicate is distributed, and not to leave the distribution to be inferred from the quality of the proposition.

Hamilton's scheme, as far as it relates to the affirmative propositions, A and I, of Traditional Logic, is as follows :—

1. The Toto-total—All A is all B.
2. The Toto-partial—All A is some B.
3. The Parti-total—Some A is all B.
4. The Parti-partial—Some A is some B,

and there is a corresponding series of negatives.

Now, it cannot be denied, that if the proposition does in fact state the inclusion of the Subject in a class, or its exclusion from a class, these alternatives are possible, and do give us more insight into the meaning of the proposition,—do state more clearly the relation of predicate to Subject—than the mere statement All A (or some A) is B. Logicians find, however, that when the negative series is examined, it leads to self-contradiction and absurdities; and for this reason they reject the Hamiltonian scheme of quantification of the predicate. They do not recognise, however, that that scheme is a strictly logical extension and application of their own doctrine; and that if it is rejected, their own doctrine must go with it. If an hypothesis, when strictly applied, leads to absurdity and self-contradiction, the logical conclusion is that the hypothesis is erroneous. No Logic but Traditional Logic would allow us, in such a case, to retain the hypothesis with respect to the cases it covers, and reject it with respect to the cases it does not cover. The Ptolemaic hypothesis of crystal spheres accounts perfectly for the movements of the fixed stars; but when applied to the movements of the planets and comets, it breaks down, and is found inefficient. Would astronomers, then, be justified in retaining it in the case of the stars, and rejecting it as far as the planets and comets are concerned? No practical reasoner would countenance such a proceeding for a moment; but this is what Logicians do with respect to the quantification of the predicate.

Consideration of other propositions also destroys the scheme of quantity enunciated by Traditional Logic. 'Cæsar was killed by Brutus.' Neither the Subject nor the Predicate is a class, and neither, therefore, can very well be considered 'distributed.' By some logicians, the proposition is regarded as a Universal, since the Predicate refers to the whole of the Subject; but in the first place, as already shown, in every particular proposition, the Predicate refers to the whole of the Subject; and in the second,

it is incongruous and anomalous to speak of the whole of Cæsar being killed. We do not think of Cæsar, in this connection, as a whole composed of parts. We think of him as an individual; and if we think of Cæsar as a whole, we do not, unless we are logicians, think of killed-by-Brutus as a class or as an attribute. The proposition certainly does not express, as Traditional Logic asserts that it does, that Cæsar was one of the class of persons killed by Brutus. It expresses, not the inclusion of Cæsar in a class, but that Cæsar underwent an experience—that he, as patient, suffered an experience at the hands of the agent, Brutus. Some logicians, recognising these difficulties, relegate the singular proposition to a separate class, that is neither Universal nor Particular; but then the logical scheme of quantity falls to the ground.

My view is that quantity is not vital in reasoning. In Traditional Logic, in which all reasoning consists in inclusion in classes, or exclusion from classes, quantity is, of course, of paramount importance; but to a Logic which looks at reasoning by and large, and reasons of relations of all orders, of which the relations of class inclusion and exclusion form but a small minority, quantity is of less importance.

But if quantity is to be admitted into reasoning at all, it must be admitted freely, and in all its kinds, and degrees, and varieties. To admit the two quantities, All and Some, and to exclude all other quantities, every one of which is quite as important as these, and quite as frequently employed in argument, is monstrous, and cannot be allowed. Nothing but the blind infatuation with which logicians regard the syllogism, would render such a course possible; and it speaks loudly for the strength and depth of this infatuation, that the multitude of quantities other than All and Some should have been ostracised by Logic for so many generations. The time is come, however, to break down this absurd restriction.

CHAPTER VI

NEW DOCTRINE OF QUANTITY

My view of quantities is as follows:—

Terms, whether quantitative or qualitative, may be contemplated intrinsically, that is to say, without regard to any term of the other kind; and thus regarded, are susceptible of quantity; the quantity of quantitative terms being different in kind from the quantity of qualitative terms.

Or terms of either kind may be contemplated in association with a term of the other kind, as follows:—

Quantitative terms may be contemplated with respect to the qualities they possess; and, thus contemplated, become susceptible of classification.

Qualitative terms, on the other hand, may be contemplated with respect to the concretes they qualify; and, thus contemplated, they form the means of classification.

It follows that our task is first to investigate the quantity of quantitative terms, then the quantity of qualitative terms, and then to investigate the means of classification, and the process of classification.

Quantitative terms are either individuals or classes, each of which has its characteristic intrinsic quantity, but both these kinds of quantity have the common character of extensity, and the two may be considered together as Extensive quantities.

Qualitative terms are either abstracts or attributes, each of which, again, has its characteristic intrinsic quantity, but both kinds of quantity have the common character of intensity or degree, and the two may be considered together as Intensive or Graduate quantities.

Extensive quantity is, then, of two kinds, one of which is applicable to individuals only, while they are regarded as individuals, and are not compared, or grouped, or contrasted, or associated, with other individuals. Thus regarded, an individual is susceptible of contemplation as a whole composed of parts, and we may con-

centrate our attention on the whole, or on a part, or on whole and part in association, or on parts associated together. When contemplated as a whole, without regard to its parts, a thing is an individual, or unit, and its quantity is Singular; when contemplated with respect to its parts it is a Composite individual, and is susceptible of a quantity that is no longer Singular, but that for want of a better name I call Massive quantity.

The other kind of Extensive quantity is applicable to individuals, contemplated, not singly, but with respect to other individuals, associated together in one or more classes. Such Extensive quantity is Numerical quantity.

Intensive quantity also is of two kinds, according as it is applicable to Abstract or to Attributive quality. Abstract quality is in a sense absolute—in the sense, that is, that abstract quality is absolved from its connection with any concrete but itself, and is contemplated alone. Attributive quality, on the other hand, is always related to the concrete by which it is manifested, and therefore may be termed relative. It must be admitted, however, that absolute and relative, in this connection, mean little, if anything more than abstract and attributive.

The complete scheme of quantity will therefore be as follows :—

TABLE II.

Scheme of Quantity.

The Quantitative term refers to individuals—	*Kind of Quantity.*
	Extensive.
Singly, and contemplated	Singular.
As not composite	Unit.
As wholes composed of parts ...	Massive.
Grouped in classes, and	Class.
Unspecified as to Discrimination	Indesignate.
Specified as taken	Designate.
Indiscriminately	Collective.
Discriminately	Distributive.
The Qualitative term refers to qualities—	
Regarded as to their degree in	Intensive.
Abstracts	Absolute degree.
Attributes	Relative degree.

Qualities, regarded with respect to the concretes they qualify are	COMPREHENSIVE.
Either	Common.
Or	Proper.
Individuals regarded with respect to the qualities they manifest, constitute	
Either	A Class of individuals.
Or	A Class of classes.
Or	Classes within a class.

This is the proper logical order, but Traditional Logic gives such enormous preponderance to the Distributive quantity, that in order to bring my scheme into comparison and contrast with that of Traditional Logic, it will be desirable to bow myself in the House of Rimmon, and rearrange the Extensive quantities so as to take the Distributive before the Singular and the Collective. The order in which these quantities will be taken is therefore as follows:—

TABLE III.

EXTENSIVE QUANTITIES.

The Quantitative term refers to individuals—	*Quantity.* EXTENSIVE.
Grouped in classes and	Class.
Unspecified as to discrimination...	Indesignate.
Specified as to discrimination and taken—	Designate.
Discriminately	Distributive.
Indiscriminately	Collective.
Singly and contemplated as ...	Singular.
Wholes composed of parts ...	Massive.
Individuals without regard to composition	Unit.

Extensive quantities refer to individual things, either singly, or aggregated into classes by the possession of some common quality. The class is of course conceptual; that is to say, when we speak of things being grouped, or associated, or aggregated, together in classes, we do not mean that the things are grouped or associated together in physical propinquity;

we mean that they are regarded or contemplated together by the mind, as alike in some respect. Similarly, all logical quantities are conceptual. They are aspects of things. They are ways of looking at things ; and, as the same thing may be looked at from different aspects and contemplated with respect to different qualities, so it may have different quantities, according to the mode of contemplation.

When we contemplate individual things as grouped together in classes, we may contemplate them in two ways as thus grouped. We may contemplate them in the class discriminately, or one by one, preserving their separateness from one another, and saying what we have to say of them of each and every indvidual in the class. Thus contemplated, they are contemplated distributively, and the quantity is the Distributive Extensive. But we may contemplate them otherwise. We may contemplate them indiscriminately, without distinguishing one from another, or keeping them separate in thought; and then whatever predication is made about them is made of all taken together in bulk or in the mass, and is not true of each and every one. Thus contemplated, the individuals are contemplated collectively, and the quantity is the Collective Extensive. In ' Every one of the books is a first edition ' the Subject term is Distributive. In ' All the books together cost £300 ' the Subject term is Collective.

The Indesignate Quantity.

An indesignate quantity is, strictly speaking, no quantity. In many propositions no quantity is designated, either in the Subject or in the Object term; and, as Traditional Logic cannot construct an argument with unquantified propositions, such propositions have always been to it a stumbling block. In such propositions as ' The weather is fine,' ' Beauty is skin deep,' ' The falling out of faithful friends renewing is of love,' there is no quantity in either term. This being so, what can Traditional Logic do, since it cannot construct an argument with an unquantified proposition? The obvious expedient, and one that is adopted by many cautious logicians, is to refuse to such propositions any place in Logic. Such logicians are wise in their own generation, for they evade an insuperable difficulty. That the price paid for this relief is such a narrowing and

restriction of the province of Logic as reduces it to inefficiency in a large field of reasoning, is a consideration that has never troubled logicians. Indeed, there is no reason why it should trouble them in this case; for, when all Modals are excluded; when all propositions not expressed by the copula are excluded; and when all quantities but All and Some are excluded; the diminution, by the exclusion of the Indesignate out of the attenuated remnant that is left, is really of little consequence. When a man's arms and legs have been amputated, it makes little difference to him to lose one of his ears; and the difficulty of bringing the Indesignate proposition into the scheme of Traditional Logic is so great, that those logicians are wisest who exclude this proposition altogether.

Other logicians, however, admit it; and the difficulty of deciding whether it is Universal or Particular is neatly surmounted, by some logicians making it Particular, and others making it Universal. A third class declare that it is Universal in some cases and Particular in others; while a fourth decide that the indesignate quantity results from carelessness on the part of the proposer, who might have investigated and declared the quantity of the indesignate Subject, but failed to do so.

In my view, the Indesignate term is neither Universal nor Particular, but Indesignate. It remains indesignate until its quantity is designated, and it is just as capable of entering into arguments and of forming the basis of sound and valid conclusions as are propositions that are specifically and definitely quantified. If I say 'The poor are discontented' or 'Traditional Logic is unduly restricted,' my statement must go for what it is worth; and any conclusion I may draw from it must be as indesignate in quantity as the premiss from which I started; but as long as it remains indesignate throughout the argument, and appears indesignate in the conclusion, the argument and the conclusion are, as far as quantity is concerned, perfectly sound; and it is just as easy, just as logical, just as permissible, to argue from an indesignate, as from a definitely quantified proposition.

The poor are always with us;
The poor are discontented;
∴ The discontented are always with us.

Beans are indigestible;
She gave him beans;
∴ She gave him what is indigestible.

These are perfectly valid arguments. In the second the Predicate, and in the first both the Subject and Predicate of the conclusion are indesignate; and in both arguments the middle term is indesignate in both premisses. Yet the arguments are valid, and why? Because the term which is indesignate in the premiss remains indesignate in the conclusion. The Indesignate term is neither Universal nor Particular. It is, and it remains throughout the argument, Indesignate.

The Designate Quantity.

If a Class term is preceded by a sign of quantity, it becomes a Designate term, for the sign designates the quantity that is to be attached to the term. As already stated, Designate terms are of two kinds, Distributive and Collective, the Distributive referring discriminately and separately to every member of the class, and the Collective term referring indiscriminately to all the members of the class taken together in the lump. In either case, the class designated by the sign of quantity may be regarded as a whole, without reference to any larger class of which it is a part; or it may be regarded as part of a larger class. In the first case, the quantity is called universal; in the second, it is called particular. Thus far, the statements made are true of both the Distributive and the Collective terms, but from this point they must be considered separately.

The Distributive Quantity.

This is practically the only quantity treated of by Traditional Logic. It is true that most logicians mention the Collective term, and point out the difference between it and the Distributive. It is true that, in modern times, logicians have admitted the Singular quantity as a possible subject of predication and argument. It is true that, under the name of the Substantial term, a logician here and there has shown that he is aware of the Uniform quantity; but beyond a bare mention, or a very perfunctory description, these quantities receive no consideration or

examination at the hands of logicians. No logician known to me recognises that the Collective quantity as well as the Distributive is divisible into the Universal and the Particular; no logician of recent times discusses the nature of the Individual, or is aware of more than two kinds of Individual. Every logician confuses the Aggregate individual with the Collective class, and both with the Uniform individual; and no logician has ever yet recognised that there is an Intensive quantity as well as a Numerical quantity; nor has any logician regarded the Comprehensive quantity as one of the quantities of terms, or relegated it to its proper place in Logic. To all intents and purposes, the logical scheme of quantity is limited to the Distributive quantity alone.

Nor does the irrational limitation of the logical scheme of quantity end here. Logic divides the Distributive quantity into the Universal and the Particular, and then sits down contentedly in the belief that the last word has been said, and that no further division is required. It does not appear to have dawned upon the minds of logicians that any further division is possible or practicable, or that there are, in fact, any other quantities of terms than the bare Universal and the bare Particular; or any other signs of quantity than All and Some. Of the three varieties of the Universal it knows but one; of the innumerable classes, sub-classes, varieties and sub-varieties of the Particular quantity, Traditional Logic knows not one.

The following is the skeleton Table of Distributive quantities:

TABLE IV.

Distributive Quantities.

Reference of Term.	*Sign.*	*Quantity.*
The Distributive term refers to all the individuals in a class discriminately, or one by one, and regards the class as		Distributive.
A whole, and refers to the individuals	All	Universal.
Simultaneously ...	Every	Simultaneous.
In turn	Each	Successive.
At random	Any	Alternate.
Part of a larger class ...	Some	Particular.

THE UNIVERSAL DISTRIBUTIVE.

When all the individuals in a class, regarded as a whole class, are referred to discriminately, or one by one, the quantity is the Universal Distributive, and the sign of this quantity is All. The Universal Distributive quantity is, however, itself a class, and includes three separate individuals, as follows :—

The Simultaneous Universal quantity is characterised by the sign Every. This is the Universal of Traditional Logic, and the only Universal known to that body of doctrine. When Traditional Logic uses the sign All, it means Every one, and has not, until lately, recognised that 'All' includes three different meanings. The Universal Distributive term refers to all the individuals in a class taken discriminately, or one by one; but things can be taken one by one in different ways. If two things are on the table, we may take one in each hand simultaneously, and then we take every one of them. If there were fifty things on the table, and we were Briareus, we could lift them all, simultaneously and separately, and then we should lift every one of them; and the universal lifting is the Universal of Traditional Logic. Or without lifting them, we may contemplate them simultaneously, and make the same predication simultaneously of each separate one, and still we contemplate and speak of every one.

But there is another way of taking them one by one, besides taking them simultaneously. We may lift them one by one in turn, taking them one after the other until all are lifted; or we may contemplate or speak of them one by one in turn, going on until all have been thus contemplated or predicated of; and in this case we deal with each one. By Each we mean one by one in turn until all have been taken. If we take each, we may not arrest the process until the tale is complete: we must go on to the end. Any predication made about each is not true unless it includes all.

But a predication made about every individual of a class is true of any one of them taken at random; and *vice versâ*, what is true of any one of them, is true, as far as the class likeness extends, of any other, and of every other. If we select one, as we must if we take them in turn, then we are not entitled, until we have selected every other one, to predicate of all what is predicable of that selected one; because the very fact that it was selected raises a presumption that it was in some respect different from the rest.

But if we take one at random, the very fact that it is so taken indicates the absence of any difference between it and the rest, and what is predicable of one taken at random is predicable, as far as the class likeness extends, of every other. Hence Any one, though it refers ostensibly to an individual only, is in practice a sign of the Universal. This, which we may call the Alternative Universal, is very closely akin to the Representative Individual. 'Any pen is useful' has very nearly the same meaning as 'A pen is a useful thing.' It has not quite the same meaning, however, as will be shown when we examine the Representative Individual.

These, then, are the three varieties of the Universal quantity; but though they are here explained in detail in connection with the Distributive quantity, it must be clearly understood that the Universal is not restricted to the Distributive quantity, but is common to it with the Collective quantity and the Unified Individual. The Collective quantity, however, has but one form of Universal.

The Particular Distributive.

If Traditional Logic lumps together not merely the three varieties of the Distributive Universal, but the Collective and some forms of the Individual; if it makes no distinction between things so different as the Aggregate and the Corporate Individuals; if it is blind to Intensive quantity and deaf to Indesignate quantity, we need not be surprised that it fails to distinguish some of the varieties of the particular Distributive, for the characterisation of some of them is subtle and elusive; but that Logic should fail to distinguish or acknowledge any variety whatever of the Particular, except, in a halting way, one additional meaning of 'Some,' is really portentous, and calls to mind Dr. Johnson's saying with respect to Thomas Sheridan. 'Sherry is dull, Sir, naturally dull; but he must have taken great pains to become what we see him. Such an excess of stupidity is not in nature.' Logicians are blind to the obvious, naturally blind; but they must have taken great pains not to see some at least of the varieties of the Particular. Such an excess of unobservation is not in nature.

A Particular Distributive term refers discriminately to the individuals in a class; but the class is regarded, not as a whole, but as part of a larger and including class. Now, in examining the Universal term, we have already found that the individuals composing a class may, when contemplated discriminately, or one by one,

be contemplated simultaneously, or successively, or alternately; and this is equally true whether the class they compose is or is not part of a larger class. But when the individuals compose a class within a larger class, the double composition offers us more ways of contemplating them than when they are regarded as forming a primary class only. The individuals composing the subordinate class, or sub-class, may be grouped together in the mind, and contemplated either with respect to the larger or including class, or with respect to other sub-classes within that including class.

Every quantity has its appropriate sign, which, when prefixed to a term, determines the quantity of the term; and every such sign is the answer to a question that may be put with respect to the quantity of the term. The following Table gives a fairly complete list of the Particular Distributive quantities, together with a specimen sign of each.

TABLE V.

PARTICULAR DISTRIBUTIVE QUANTITIES.

Reference of Term.	*Quantity.*	*Specimen Sign.*
The Particular Distributive term refers discriminately to all the individuals in a class, regarded as part of a larger class, and contemplates them		
Simultaneously		
As to their number ..	Enumerative	Many.
As to their proportion to the whole ...	Proportional	Most.
Successively as to their order	Ordinal	The first.
Alternatively		
with respect to the whole	Residual	The rest.
with respect to other parts	Comparative	More.
with respect to one another	Selective	
Indefinitely ...	Indefinite	Certain.
Definitely ...	Demonstrative	This.
with respect to the purpose in hand ...	Purposive	Enough.

Each of these quantities is a class, and includes several distinct sub-classes; and most of the sub-classes are again divisible into varieties and sub-varieties, of which the individual members are, in many cases, indefinitely numerous. The Enumerative, the Proportional, the Ordinal, the Comparative, and the Indefinite Selective, have each their Indefinite, Semi-definite, and Definite sub-classes. The Residual quantity is divisible into the Universal Residual, and the Particular Residual; and has as many varieties of these as has the whole class. The Demonstrative quantity is divisible into Appropriative and Repudiative, and each of these into Singular and Plural; and the Purposive quantity is divisible into the Suitable and the Unsuitable, the latter being again sub-divided. The total number of Particular quantities is therefore indefinitely multitudinous.

The weary student will be disquieted to learn that the varieties enumerated above by no means exhaust all the recognisable and distinguishable varieties of the Particular Distributive quantity. Every particular quantity is further susceptible of three Forms, in addition to the unqualified, vague or Indesignate form that alone has hitherto been referred to. The three additional Forms are the Minimal, the Maximal, and the Exact.

The Minimal form of a quantity fixes that quantity as a minimum, below which the quantity does not extend, but fixes no maximum, and leaves it uncertain whether the part referred to in the term, does or does not extend beyond the minimum, and even to the whole class. The signs of the minimum are 'not less than' and 'at least,' and the indefinite 'Some at least' fixes a minimum, in this case an indefinite minimum, to the quantity to which the term refers, but leaves the maximum in doubt, and lets it be understood that the quantity may, for aught it expresses, extend to the whole class.

The Maximal form of a quantity has the opposite effect. It fixes as a maximum the quantity referred to by the term, but leaves the minimum uncertain. It gives us the assurance that the quantity is not more than is expressed by the term, but gives us no assurance that it is as many, or even that there are any at all. The sign of the maximum is 'Only,' or 'Not more than,' to which it may be necessary, in some cases, for the sake of greater precision, to add 'If any.' The indefinite 'Some only if any' positively fixes the maximum at some, and assures us that it is

not all; but it fixes no minimum, and the 'Some' may be an inappreciably small number, or even none at all.

The Exact form of a quantity fixes both the maximum and the minimum, and assures us, first, that the quantity does not extend to all, nor to any more than the quantity expressed, and second, that the whole of the quantity expressed is certainly within the reference of the term, which, therefore, does not, as the maximal form does, or may, express a vanishing quantity. The indefinite quantity cannot be expressed in its exact form by any sign less cumbrous than 'Some certainly, but some only,' or 'Some only, but certainly some'; in other quantities, however, it admits of much neater expression, and there are several forms of quantity in which the quantity itself and its form can be expressed in a single word.

Out of the three primary kinds of quantity enumerated in Table II., p. 81, Traditional Logic selects the Extensive, and explicitly or implicitly declares that we can reason of no other. Out of the two kinds of Extensive quantity, Logic selects one, the Class-quantity, and, though Logic does not now declare that we can reason of no other, there was a time when it did make this declaration, and it now gives no more attention to the Singular quantity than is barely decent. Out of the two kinds of Class-quantity, Logic selects one, the Designate, and proclaims its inability to reason of the other. Out of two kinds of Designate quantity, Logic selects one, the Distributive, and though it goes so far as to admit the existence of the other, Logic does not allow that this other, the Collective quantity, is susceptible of sub-ordinate quantities. The two primary kinds of Distributive quantity, the Universal and the Particular, are, indeed, distinguished by Logic, but here its discrimination ends, or almost ends. Of the three kinds of Universals, Logic uses but one, though it is aware of the existence of the other two; and of the eight classes of Particular Distributive quantities, each with its sub-classes and varieties, Logic knows nothing at all.

Logic selects one form of one variety of one kind of the Particular quantity, and explicitly excludes another form of this variety; while of all other kinds, with their varieties and forms, incalculably numerous though they are, Logic is profoundly ignorant. It never recognises their existence, and apparently has never realised or imagined that they do or can exist. Out of

them all, Logic selects the Minimal Indefinite Enumerative, and declares that this is the only Particular quantity of which we do or can reason. It would be nearer the mark to say that it is the quantity of which we reason least often. It is clear that if we are to restrict our statements and reasonings to All and Some, we must divest these statements and reasonings of all precision and definiteness, and can reach none but vague conclusions. That the reasonings of Logic are but vague must be apparent to everyone who has ever opened a book on the subject. The first thing with respect to these reasonings that strikes a new comer is that they seem to have so little practical application; and when he seeks the reason for this detachment and aloofness from practical affairs, he finds it in the indefiniteness of the Particular quantity that alone is used. In the practical statements and reasonings of daily life, we do not restrict our dealings to 'Some.' We never do and never ought to employ this quantity if it is possible to use one more definite. In our household and family affairs, in business and professions, in Parliament, in the pulpit, in the shop, the factory, the mine, and the railway, in work and in play, we never, if we can help it, use the indefinite 'Some.' What sort of a world would it be, how much business could be transacted, how many things could be done, if assertion and reasoning were limited to All and Some? 'A house to let, with some rooms in it, some distance from some town in some county, rent some pounds per annum, fare from London some money, distance some miles. The trains run sometimes, and the journey takes some time.' 'Please sell me some shares in some stocks and buy me some shares in some other stocks. My address is some number in some street in some town.' 'He is sure to be elected, for though some voters are pledged to vote for his adversary, some have promised to vote for him.' 'I am not in your debt, for though it is true that I owed you some money last week, I paid you yesterday all I had.' 'Since some people live to fifty, and some live to a hundred, it is evident that the same number of people live to a hundred as live to fifty.' No? Do you doubt? Well, you may perhaps have reason, but Logic has no terms to express differences of quantity more precise than that between All and Some, and therefore in matters of such extreme exactitude it would be unfair to expect guidance from Logic. 'An excursion train will start for some place next week, at some time in the

day, and the return fare will be some shillings.' 'Ample provision has been made for the party, for some people are coming and some food has been provided.' Are these the modes of statement and reasoning that are in use?

'And slimy things did crawl with legs
Upon the slimy sea.'

Do we understand Some slimy things, or All slimy things? and did they crawl with Some legs, or with All legs? and if with Some, did they necessarily crawl with some-at-least-and-perhaps-all legs?

'From that hour he never put pen to paper.' Some pen or all pens? Some paper, or some at least, it may be all paper?

Let us try how the General Confession looks in logical terms:—'We have erred and strayed from some, it may be all, of thy 'ways, like some, it may be all, lost sheep. We have followed 'too much some or all the devices and some or all the desires of 'our own hearts. We have offended against some, it may be all, 'of thy holy laws. We have left undone some, it may be all, of 'those things that we ought to have done, and we have done 'some, it may be all, of those things that we ought not to have 'done. And there is no health in us. But thou, O Lord, have 'mercy upon some and perhaps all of us,' &c. These are the terms in which we ought to express ourselves if we follow strict logical form.

But Logic is not content with excluding from its purview all Particular distributives except the indefinite Some. We have seen that there are three forms of Some—the miminal form, Some at least; the maximal form, Some only; and the exact form, Some certainly, but not all, or Some at least, but some only. To these may possibly be added a fourth, viz.:—'Some, but I do not say whether some at least or some only.' Of these three and possibly four, Logic selects the first, drives the second out of its precincts, and does not recognise the existence of the third. Why Logic should take to its bosom 'Some at least,' pitch 'Some only' neck and crop out of the house, and wilfully shut its eyes to the exact 'Some,' it is difficult to conjecture. Logicians make it a grave charge against Sir William Hamilton, that he has polluted the virgin purity of the logical Some, by befouling it with the hateful meaning Some only; but for the exclusion of the

maximal Some only, Logic gives neither rhyme nor reason. And there is no reason for it. There can be no reason. 'Some only' is a quantity as useful, as accurate, as frequently employed, as capable of entering into statement and reasoning, as 'Some at least,' and its exclusion from Logic is utterly unwarrantable.

If Some were drowned, Logic declares that all may have been drowned, and will not admit the possibility that some must have been saved; nor will it allow us to count on the probability that some may have been saved, for this is a modal, and modals are excluded from Logic. I aver, on the contrary, that if some only were drowned—a possibility that Traditional Logic will not admit—then it is certain that some were not drowned; and the anxiety of us, who are not logicians, as to the fate of Some at least of the party, is relieved; but logicians must still remain in anxious uncertainty. We, who are not logicians, know that, if logicians recognise some modes of argument only, and some Particular quantities only, it is certain that there are other modes of argument and other Particular quantities that logicians are not aware of; but logicians themselves are precluded by their own rules from drawing this inference, or making this admission. They claim that as they are acquainted with Some modes of argument and Some particular quantities, and as Some has, in Logic, but the one meaning of 'Some, it may be all,' the modes of argument and the quantities with which they are acquainted may be all there are. We know better, but we cannot convince a logician of his error, for to him every Some is potentially All.

If Some aquatic animals at least are fish,
And Fish are the only animals that have true fins,
then Logic permits and compels us * to draw the conclusion that
Some aquatic animals at least have true fins;—
and leaves us groping in the dark as to the rest of aquatic animals.

But if Some aquatic animals only are fish,
And Fish are the only animals that possess true fins,
then common sense allows and compels us to conclude that
Some aquatic animals do not possess true fins.

* I am ashamed to say that not until too late did I recognise that this is not a logical argument at all. The predicate of the major is explicitly quantified, and though the predicate of every proposition must be quantified, it must be quantified *sub rosâ*, and must not brazenly avow its quantification. Consequently, the major not being a logical proposition, the argument is not a

This conclusion Logic forbids us to draw. Such an argument, such a conclusion, is illicit, illogical, illegitimate, and impossible. Why?

If logicians know of some particular quantities only, then they do not know all particular quantities; then there are some particular quantities of which they are ignorant; then their knowledge of particular quantities is imperfect, it is defective: and then there are quantities of which they do not know. These are all valid inferences from the premiss, but logicians are happily ignorant of them, and doubly ignorant; for, in the first place, the premiss is inadmissible into Logic, and, in the second, the conclusions are arrived at by a process unknown to Traditional Logic. They are Immediate Inferences, but none of them is a converse, an obverse, a contra-positive, or an inverse.

If one particular quantity only is to be chosen to represent them all, the indefinite Some is the best that could be chosen, for it may be made, with little difficulty, to cover nearly all the rest. Many, a few, a very few, one, two, most, few of, three more, twice as many, the rest, the others, the first, the last, certain, this, those, enough, too many, and so forth, may all be included under Some; but apart altogether from these more definite interpretations, bare indefinite 'Some' is susceptible of twenty or thirty different meanings, as against the two that are recognised and the one that is used by Logic.

'Some' may mean an indefinite and unselected number taken distributively; or it may mean an indefinite but selected number taken distributively; or it may mean an indefinite unselected number taken collectively; or an indefinite selected number taken collectively; or it may mean an indefinite proportion, either selected or unselected, and in either case taken distributively or collectively; or it may mean an indefinite ordinal number, selected or unselected, and taken distributively or undistributively; and in any case it may mean the particular Some minimally, maximally, exactly, or vaguely, that is, without specifying whether it is minimal, maximal, or exact.

logical argument. I can only plead in extenuation that the limits of Traditional Logic are so extremely narrow, that a mere amateur cannot be expected to make a bull's-eye at every shot. So few valid arguments are 'logical,' that one really ought to recognise that the more cogent an argument, the stronger the presumption that it is 'not logical.'

The exclusion from Traditional Logic of all these meanings, except one, of the indefinite Some, and of all the semi-definite and definite varieties of the particular quantity, in both the distributive and the collective quantities, and in all the three or four forms of this quantity, is not, however, as important as it seems at first sight; for already, by excluding Modals, and all Ratios except the copula, Traditional Logic had so narrowed the field of its operations as to deprive itself of almost all practical usefulness; and the addition of one more unnecessary restriction makes no important difference. Logicians declare that they can make no reference to any part of a class without assuming that that part may be the whole. Well, if their minds are so constituted that this is true of them, I have no more to say, except that they must not seek to impose the same restrictions upon others, whose minds are more capacious. The restrictions of Traditional Logic are so surprising, and are so discrepant from common experience, that if it should declare that it can entertain no argument, and accept no conclusion, unless the premisses are written in red ink, or in black letter, I should accept the statement without a murmur, as true of logicians themselves, as long as they are engaged in reasonings that they are pleased to call logical; but I should not accept it, any more than I accept the exclusion of Modals, of Ratios other than 'is' or of Particular quantities other than 'Some at least,' as true of myself, or of reasoners in general, or of logicians themselves, apart from their books.

The exclusion from Logic of all the semi-definite and definite Particular quantities, of all exact and maximal forms of quantity, of the Residual and Purposive quantities, not only deprives such reasonings as Logic can effect, of all precision, and therefore, in most cases, of all practical usefulness, but it also shuts out from Traditional Logic an immense range of arguments that are in constant use, but that this Logic cannot compass, for want of terms in which to express them. When these subordinate varieties of the Particular quantity are admitted into argument, it is found that the methods and principles of reasoning, as formulated by Traditional Logic, are not only defective, but also very erroneous. The rules of the Syllogism are applicable to deductive reasoning so long only as that reasoning is confined to the minimal indefinite distributive quantity. As soon as

other quantities are admitted into statement and argument, every one of the Canons of the Syllogism is found to be false, and the Square of Opposition is blown to pieces. It will be necessary, therefore, even at the cost of some tedium, to examine in detail each of the Particular quantities that has been enumerated.

CHAPTER VII

PARTICULAR DISTRIBUTIVE QUANTITIES

The Enumerative Quantity.

When a term refers discriminately to all the individuals in a class, regarded as part of a larger class, and contemplates them simultaneously with respect to their number, the quantity is Enumerative, and answers the question, How many?

The Enumerative quantity may be Indefinite, Semi-definite, or Definite.

The Indefinite Enumerative.—The sign of this quantity is Some, which includes, not only the 'Some at least it may be all' of Traditional Logic, but also 'Some only, it may be none,' and 'Some certainly, but not all.' Of these, the minimal form, 'Some at least,' is sufficiently explained in the text books, and the exact form, 'Some only, but some certainly,' has been examined on a previous page. It remains to consider the maximal form, 'Some only, and perhaps none.' This maximal indefinite is not very often used, though the maximal semi-definite and definite, 'Few if any,' and 'Not more than so many,' frequently occur in reasoning. The maximal quantity is an uncertain quantity. It may or may not exist; and as its existence is uncertain, it may lead to an uncertain conclusion. It is excluded from Traditional Logic, therefore, on the double ground, that it is not 'Some at least' and that the proposition into which it enters may be Modal. Its exclusion from Traditional Logic need not, however, hinder us from employing it in statement and in reasoning. If Some only and perhaps none were drowned, then it is certain that some, and possible that all, may have been saved. If some only and perhaps none of the messengers arrived, some at least, and perhaps all, stopped or were diverted on the way, and all the messages were not delivered. If some only and perhaps none of the eggs hatch out, some at least and perhaps all will be addled; certainly some will not hatch out; there will be fewer chickens than eggs; the whole clutch may be a failure; and the money paid for it will

be partly or wholly wasted. What is the matter with these inferences?

If There were some only and perhaps no days on which he played truant,
And He was never punished unless he played truant,
Then He was not punished every day.

If Some only and perhaps no logicians appreciate the defects of their Logic,
And The defects of Traditional Logic are numerous and glaring,
Then Logicians as a class must be blind.

The Indefinite Enumerative quantity may qualify not the Subject-term only, but the Object-term, either instead of or together with the Subject-term. Vegetarianism is adopted by some men. Some rats were caught in some of the traps. This form of proposition is unknown to Traditional Logic, but the statements thus made are valid; and valid arguments may be deduced from them. If vegetarianism is adopted by some men only, it is not adopted by all men. If some of the rats only were caught in some of the traps, all the rats were not caught in those traps; and if some rats were caught in some only of the traps, there were other traps in which no rats were caught.

If Vegetarianism is adopted by some men,
And Vegetarianism is a faulty diet,
Then A faulty diet is adopted by some men.

If Some rats were caught in some of the traps,
And All the traps were baited with cheese,
Then Some rats were caught in traps baited with cheese.

THE SEMI-DEFINITE QUANTITY. — Before entering on the examination of the Semi-definite Enumerative, it is necessary to consider certain features that are common to all semi-definite quantities. The first of these is the Emphatic or Unexpected form, the sign of which is 'Such' or 'So.' 'Such a great many,' 'So many,' 'Such a few,' 'So few.' The meaning conveyed by the addition of this qualification of the semi-definite is that the quantity is unexpected. It surprises us that there should be so many or so few as we find.

The next modification is more important. Every semi-definite, like every other quantity, exists in three forms, the minimal, maximal, and exact. These have already been described; but in addition to differences of form, and differences of emphasis, there is a third way in which semi-definite quantities may be classified. They may be referred to a certain standard or medium, and may be arranged in sets, according as they reach, exceed, or fall short of this standard. Moreover, the excess above the standard may be moderate or great, and the defect below it may be moderate or great, and this gives us a set of five degrees of semi-definite quantity, to one of which every such quantity may be referred. The degrees may be made more numerous than this, but five are enough for most purposes. This set of degrees applies to every semi-definite quantity, whether Enumerative, Proportional, Comparative, Ordinal or Selective. Omitting intermediate and excessive degrees, the degrees of semi-definite quantity include:—

The Maximative.
The Magnative.
The Medium.
The Parvative.
The Minimative.

Combining these degrees with the forms already discovered, and omitting the Indesignate form, we arrive at the following table:—

SEMI-DEFINITE ENUMERATIVE QUANTITIES.

	Minimal.	*Maximal.*	*Exact.*
Maximative ...	A great many	—	Very many.
Magnative ...	(A) many	—	Many.
Medium ...	A good many	—	A good many.
Parvative ...	A few at least	Few	A few.
Minimative ...	—	Very few	A very few.

'A great many' is a minimal form, though, like other terms, it is often misused. It means certainly a large number, and possibly all. 'A great many men are honest' states that certainly a large number of men are honest, and for aught we know, all may be. 'There are a great many people on the cricket ground' is an incorrect expression, for we know that the large number there are not all the people there are. The quantity referred to is an exact,

though not a completely definite quantity. It means a large number certainly, but not all. It means a large number, no less and no more; and the proper sign of the exact semi-definite is not 'a great many' but 'very many.' 'A great many specimens were damaged' leaves in doubt whether all the specimens were or were not damaged. 'Very many specimens were damaged' clears up this doubt, and assures us that there were a very few that were not damaged.

The proper magnative minimal of this quantity is 'A many,' which meant 'certainly many, and perhaps all'; but 'A many' is unfortunately become a vulgarism, and its ostracism from polite speech deprives us of the means of expressing a useful distinction.

No maximative or magnative quantity can be maximal. When we speak of a great many or of very many, or of many, we never make the reservation 'Perhaps none.' This reservation is confined to quantities less than the medium.

The sign of the medium semi-definite is 'A good many.' It may be minimal or exact, but can scarcely be maximal. We can scarcely have occasion to speak of 'A good many only, and perhaps none.'

The parvative is the only degree that runs through all the forms, and the minimal form is a little incongruous, and is seldom employed. 'A few at least, and it may be all' is not often used or implied. In practice, the two forms are the maximal, 'Few,' meaning 'Few only, and perhaps none,' and the exact 'A Few' meaning 'A few, neither more nor less.' If we do desire to express the minimal form, the addition of the article, which invests the quantity with positive character, and fixes it as 'certainly a few,' is not enough. We must add 'at least,' which effectually adds the meaning 'perhaps more or even all.' 'A few men at least are honest' leaves it possible that all men may be honest. 'Few men are honest' denies that all are, and leaves it possible that there may be no honest men. 'A few men are honest' declares that certainly a few, but not more than a few men are honest.

The sign of the minimative Enumerative is 'Very few'; and it is evident that this quantity can have no minimal form. 'A few at least, it may be all' is a possible, though not a very frequently used quantity: but 'A very few at least, it may be all' is not a possible quantity. The addition of the ampliative, 'Very,' at once fixes a maximal limit to the quantity, and prevents its encroachment

upwards, just as, at the other end of the scale, the addition of the ampliative to Many fixes a minimal limit. 'Very few' shouts 'not many,' says 'few only,' and whispers 'perhaps none.' In this, as in the other cases, the addition of the article at once invests the quantity with positive character, minimises it, and is equivalent to the addition of 'certainly.' 'Very few' may mean 'perhaps none,' but 'A very few' means 'Certainly some, but a very small number,' and is therefore exact in form.

The degrees that have been enumerated are not all the degrees there are. Beyond 'A great many,' there are 'A very great many,' 'An enormous number,' and so on; between 'A good many' and 'A few' there are 'A good few'; and below 'A very few' are 'A very few indeed,' 'Extremely few,' and so on.

It is unnecessary to insist upon the frequency with which the semi-definite Enumerative quantities enter into statement and argument. That is at once apparent to everyone; but it is desirable to point out and insist that there are many arguments for the construction of which the semi-definite enumeratives are necessary —arguments that cannot be effected except by means of these quantities, and arguments that lead to conclusions utterly inaccessible to Traditional Logic. The following illustrate a few types of these arguments :—

If there are a great many books in the British Museum, then they must occupy a great deal of room, and it would take a very long time to read them all. If very few modes of argument are known to Traditional Logic, it does not know of many. If it is profitable to keep a hen when it lays a few eggs, it will certainly be profitable to keep it when it lays many. If a good many people go out for wool, and come home shorn, this unpleasant experience happens to more than a few people, and more than a few leave their wool behind them, and come home without it.

If Many are called,
And Few are chosen,
Then More are called than are chosen;
And Some who are called are not chosen, and some are both called and chosen.

If There's many a slip twix't the cup and the lip,
And Every such slip is a disappointment,
Then There are many disappointments in life.

If Many overladen ships go to sea,
And Few ships are lost at sea,
Then Some overladen ships reach port in safety;
And Overloading does not necessarily result in the loss of the ship.

If Few birds are incapable of flying,
And Few of these birds are destitute of wings,
Then Very few birds are destitute of wings.

If There are very many particular quantities,
And Logic knows of very few particular quantities,
Then There are many particular quantities of which Logic is ignorant.

In the last example, it is the object-term that is semi-definitely quantified; yet the argument is valid.

The Definite Enumerative quantity is a cardinal number. Traditional Logic always assumes, though the text books do not definitely state, that Logic has nothing to do with the cardinal numbers, which are supposed to be susceptible of mathematical reasoning only, and to be outside the province of Logic. This doctrine, if it be a doctrine, is doubly erroneous. It is erroneous in supposing that numerical quantities are excluded from Logic, and it is erroneous in supposing that mathematical reasoning is distinct from Logical reasoning, and is not included in it. Still, although Logic is mistaken in supposing that its powers do not enable it to reason of numerical quantities, the numerical quantities of which Logic reasons are not the same as those employed in the reasonings of mathematics. Arithmetical numbers are doubly limited. They are exact in form. Logical numbers, unless formally stated to be so, are not limited, either minimally or maximally. In Arithmetic, three, or thirty, or three hundred, means that number exactly, neither more nor less. No excess or deficiency is permitted, for if any were allowed, the operations of Arithmetic would be impossible. We could not satisfactorily add two and three together, or subtract two from three, if the two might be more or less than two, and the three less or more than three; but in Logic, the statement that two men entered a house does not preclude the possibility that three men entered it, and necessarily implies that one man entered it. In Logic, a number means that number at least, or that number only;

and if that number only, it may be that number exactly, or not more than that number. Since Mathematics cannot, except under very limited and rigidly defined conditions, reason of inexact numbers, such as more than seven, or fewer than five, it follows, if numerical reasonings are excluded from Logic, that there is a field of reasoning that is neither Mathematical nor Logical. Where do such arguments belong? They belong to the New Logic here propounded.

If two men left the house, and three men entered it, Arithmetic assures us that the number of men in the house was augmented by one; and in so concluding, Arithmetic is reasoning according to its lights, and within its limitations. Granting the assumptions of Arithmetic, that two and three mean, respectively, two and three exactly, neither less nor more, Arithmetic is justified in coming to this conclusion. But such a conclusion would be wholly unwarranted in Logic. Before Logic would be justified in concluding that the number of men in the house was augmented by one, or was augmented at all, Logic must know whether the two men who left the house were two at least or two only, and whether the three who entered it were three only or three at least.

If ten men entered the house and two men left it, Arithmetic assures us that eight remained indoors. But if ten men only entered and two at least departed, Logic is not justified in concluding that any at all remained. The two at least may be the whole ten.

If ten men at least entered the house, and eight men only left it, then Logic can tell us that two men at least remained in the house, a conclusion that is within the scope of Arithmetic also; but Logic can conclude further, that more men entered the house than left it, and this conclusion is beyond the capacity of Arithmetic.

If ten men at least entered the house, and not more than three left it, Logic can derive the conclusion that seven at least remained; but Arithmetic knows no such number as 'not more than three,' and can derive no conclusion from these premisses. If not more than ten men entered, and seven at least departed, Arithmetic can arrive at no result, but Logic can tell us that there remained in the house not more than three, and perhaps none at all.

THE PROPORTIONAL QUANTITY.

When the individuals in a class, regarded as part of a larger class, are contemplated discriminately with respect to their proportion to the whole of the larger class, the quantity thus contemplated is the Proportional quantity, which may be an indefinite, a semi-definite, or a definite proportion of the whole.

The Indefinite Proportional.—This quantity, as well as the Indefinite Numerical, is signified by Some, and it is another disadvantage of this multiguous adjective that its enumerative meaning is not clearly distinguished from its meaning as a proportion of a class. It is true that it does not greatly matter, when 'some' is used, whether the 'some' is understood as enumerative or proportional, but it does matter that the constant use of 'some' in both senses tends to confuse the two quantities, to obscure the differences between them, and to lead to the employment of more definite signs ambiguously. Generally, 'some' *simpliciter* is enumerative. The proportional indefinite is signified by 'Some of the.' 'Some men are honest' means that an uncertain number of the whole class of men are honest. 'Some of the men' are honest means that an uncertain proportion of the men in a certain class are honest. The distinction is not made in Traditional Logic.

The Semi-definite Proportional.—This is subject to the same forms and the same set of degrees as other semi-definite quantities.

SEMI-DEFINITE PROPORTIONAL QUANTITIES.

	Minimal.	*Maximal.*	*Exact.*
Maximative ...	Nearly all	—	Nearly, but not quite all.
Magnative ...	Most	—	Most.
Medium ...	A moiety	—	A moiety.
Parvative ...	A few of	Few of	A few of.
Minimative ...	—	Scarcely any	A very few of.

It is scarcely necessary to go through these quantities and show that they answer generally to the description implied by their places in the table. The reader who has followed me thus far can do that for himself. The Proportional Parvative is, in its minimal form, 'A few of,' in its maximal form, 'Few of.' 'A few of' means 'certainly a small, and perhaps a large proportion, and it may be the whole.' 'Few of' means 'A small proportion only,

and perhaps none.' Commonly, the possibility of 'Few of' vanishing into none is emphasised by adding 'if any,' but this is not necessary. 'Few of' is already maximal.

The use of the proportional quantity enables us to conduct many arguments and reach many conclusions that are unattainable by Traditional Logic. If most men are honest, not only are all men not dishonest, but honest men are in the majority, and outnumber dishonest men. If nearly all were drowned, it follows that a few of them only, in fact scarcely any, were saved; and if nearly, but not quite all, were drowned, then a very few of them were certainly saved.

If Nearly all people can reason,
And Scarcely anyone learns logic,
It follows that Most people reason without learning Logic;
And Ability to reason does not depend on knowledge of Logic.

If Most of those in the pit were miners,
And Nearly all those in the pit were killed,
Then Certainly some, and probably most, of the killed were miners.

If Most of the speakers were teetotallers,
And Most of them were sensible,
Then There were some sensible teetotallers.

The Definite Proportion is, of course, a fraction. It is a half, two thirds, three fourths, or some other numerical proportion. Logic, of course, excludes such quantities, on the ground that, lying within the domain of Mathematics, they are necessarily outside the realm of Logic; but in examining Enumerative quantities, we found that the boundaries of Logic and Mathematics are not rigidly marked by the exclusion and inclusion of definite numerical quantities. An argument concerned with exact definite numerical quantities, that is with figures, whether integers or fractions, exactly limited in both directions, and with nothing else, is an arithmetical argument; but many arguments contain indefinite proportional as well as definite proportional quantities, and many contain inexact as well as exact proportions; and such mixed arguments belong to Logic, just as those which contain a mixture of definite and indefinite integers belong to Logic. I

aver that if two thirds of the company at least were drunk, then, according to the New Logic here propounded, not half of them were sober. Traditional Logic, in order to reach this conclusion from this premiss, must call in the aid of a Mathematician; and the Mathematician is entitled to say 'Mind your own business. "Not half" is not a mathematical quantity. The argument is not arithmetical, but logical. See ye to it, for I will be no judge of such matters.'

In Arithmetic, two thirds, three fourths, nineteen twentieths, and so forth, are exact fractions of an integer; in Logic, they are classes, each containing some definite proportion, that may be exact or inexact, of a larger class. In Arithmetic, each fraction is an exact form, and no maximal or minimal form is known: but in Logic, two thirds may be two thirds exactly; or it may be two thirds at least, and perhaps all; or it may be two thirds only, and perhaps less or none. If at least two thirds of the company were drunk, Arithmetic cannot tell us what proportion were sober; but Logic can conclude without difficulty that not more than one third were sober, and that not half of them were sober. If not more than one third were sober, Arithmetic cannot tell us what proportion were drunk, but Logic concludes without difficulty, that not only more than half, but at least two-thirds of them were drunk, The Definite Proportional quantity is, therefore, in strict propriety, a logical quantity; and Logic is very incomplete without it.

If Two thirds of the company were drunk;
And Not half of those who were drunk were able to stand,
Then The New Logic can reach the conclusion, unattainable either by Arithmetic or by Traditional Logic, that
At least a third of the company were unable to stand.

If The ship carries two thirds only of the number she is licensed for,
And Nearly half of these will land at the next port,
Then There will be plenty of room on board for more,
And At the next port she can take in nearly twice as many as will land.

These are not arithmetical arguments. 'Not half,' 'at least a third,' 'nearly a half,' and 'plenty,' are not arithmetical quantities, and Arithmetic would rightly exclude the arguments from her domain. Traditional Logic is incapable of effecting them, and would shirk them on to Arithmetic if it could. Failing this effort, the only consistent course open to Traditional Logic is to deny that they are arguments at all. It would probably content itself, however, by saying that they are 'not logical,' and would then feel that its duty was done.

The Ordinal Quantity.

When we contemplate parts of classes in succession, with respect to the order in which they present themselves, or in which we choose to take them, the quantity is Ordinal, and, like the other quantities that we have examined, may be definite, semi-definite, or indefinite. It will be noted that the order is always definite; it is the quantity that varies in definition.

The Indefinite Ordinal quantity is signified by 'the Former,' 'the Latter.' It indicates the position in order of the individuals, but does not indicate their number; nor does it indicate with precision the ordinal position. It indicates the position with respect to one other part only of the class, not to every other part.

The Semi-definite Ordinal term is characterised by an ordinal number followed by the sign of a semi-definite quantity, which is almost always few—the first few, the last few. We do not speak of the first many, though there is no reason why we should not.

The Definite Ordinal is an ordinal number—the first, the second, etc. It does not specify an individual except by his position in the class, for the same individual may successively occupy more than one position, and the same position may be occupied successively by different individuals; but it indicates with precision the individual that for the time being occupies that place.

Predications and arguments with respect to Ordinal quantities are not infrequent; they cannot be expressed without the use of this quantity, and therefore Traditional Logic, which has not discovered the quantity, is incompetent to deal with them. If the first comer is first served, he is not put off until others are served, he is not served second, or last; he has the largest choice; he has the opportunity of getting first away; he does not have to

wait so long as others; the second comer is not first served. If it is the last straw that breaks the camel's back, it is not the first straw, nor the second, that produces this disaster; a single straw will not break a camel's back; if the last straw is not added, the camel's back will not be broken.

If Order is Heaven's first law;
And The first law of Nature is self-preservation;
Then Heaven and Nature are different things;
And The first law of Heaven is not the first law of Nature.

If The last thing a logician considers is consistency,
And Consistency is the first thing a logician ought to consider,
Then Logicians take things in the wrong order.

The Residual Quantity.

When any part of a class is removed, set aside, selected, or distinguished in any way, the rest of the class outside of the distinguished part, regarded alternatively, forms a quantity of a special kind, which may be called the Residual quantity. As has already been pointed out, the Residual quantity is not divisible, as the quantities are that we have examined hitherto, into Indefinite, Semi-definite, and Definite quantities. When a portion of a class is removed, the residue is itself a class, and is susceptible of all the quantities, including even the residual, that could be attached to the whole class; and thus it is primarily divisible, not into Indefinite, Semi-definite, and Definite Residual, but into Universal Residual and Particular Residual.

The general sign of the Universal is All, which includes the three Universal quantities already examined; and correspondingly, we may predicate and reason of All the rest; of every one, each one, and any of the rest.

The general sign of the Particular quantity of the whole class is Some, but the general sign of the Residual Particular is Others; and there are as many classes, sub-classes and varieties of the Particular Residual as of the common Particular quantity.

Every Particular quantity has its complement in a Residuum,

which remains undistinguished when the Particular is selected out of the class; but in the majority of cases, we do not take the residuum into account. It has already been shown that we possess the power of concentrating our contemplation on any aspect of a subject before us, and neglecting the rest; and when we select or distinguish a part of a class, we commonly ignore the remainder. But there are occasions on which the recognition and use of the Residual quantity are of the utmost service, and enable us to reach conclusions that would be utterly unattainable without it.

Every Particular quantity may of course leave its residuum; but it would seem that no Universal quantity can leave a residuum. If all are taken, there can be none left. This is true if all are taken simultaneously; but if all are taken in succession or alternately, there is at any rate a temporary residuum. If each man in turn takes a step forward, the rest remain for the time stationary; and though any stick may be taken out of a bundle, the rest may be left in it.

The Minimal Particular may or may not leave a residue, according as it does or does not extend to all; and one of the virtues of the residual quantity is that it settles decisively the form of the otherwise formless Some. If some men desire money, the some may, for aught that appears in the statement, be all there are: but if some men desire money and others do not, the some is fixed at its maximal form, and cannot be some, perhaps all.

Many arguments require the residual quantity for their statement, and cannot be effected without it. It differs from the quantities hitherto examined in that it must be preceded by a proposition containing some other quantity, to which it is residual, and therefore every argument containing the residual must be stated in the form of a compound proposition, and must be of the nature of what is called, in Traditional Logic, Mediate Inference. If some men desire money and others do not, then the desire for money is not universal among men; and with respect to the desire for money, men are divided. If two or three men were drowned, and the rest were saved, then neither were all drowned nor all saved; then all were saved but two or three; then very few were drowned; then some at least were saved, and some only were drowned; and then, moreover, the fate of all was not the same.

The Residual may be preceded by more than one other quantity, and argument may be founded on a compound proposition of many members, containing many quantities. If some of the balls were red, others were blue, four were green, twice as many were black, certain of them were yellow, more were purple, and the rest crimson, then it is an irrefragable conclusion that none of them was white.

None of these reasonings can be conducted by any method known to Traditional Logic.

Three children sliding on the ice,
All on a summer's day;
As it fell out, they all fell in;
The rest, they ran away.

Traditional Logic, which knows not the Residual quantity, is incapable of examining this statement, and cannot tell us whether it is valid or not.

The Comparative Quantity.

When the individuals in a class are contemplated discriminately, as part of a larger class, and alternatively with respect to other parts of the larger class, the comparison with the other part or parts results in the formation of the Comparative quantity, and the comparison may be indefinite, semi-definite, or definite, and the resulting quantity shares the degree of definition. The result of the comparison must be that the respective numbers are adjudged to be alike or different, and if different, the number in the class that is the chief object of attention, is adjudged to be more or less than that in the other. Thus the comparative quantities are primarily three, and, when the comparison is indefinite, are More, Fewer, and About as Many.

Without being completely definite, the comparison may be more definite than this.

. . . . . .

. . . . . .

On comparing these two lines of dots, it is at once apparent that the lower line contains two more dots than the upper. It is quite unnecessary to count each series, or to know how

many dots in all each series contains. The excess of one, and the defect of the other, can be stated definitely, without the totals being definitely stated; and thus the signs of the Semi-definite Comparative are So many more, So many fewer, and As many.

The *Definite Comparative* is a multiple or sub-multiple. It is Twice as many, Two thirds as many, Half as many again, and so forth.

It seems incredible that Traditional Logic should have ignored the Comparative quantity, so frequently is it employed, so valuable are its uses, and so impossible is it to reach, without its aid, conclusions of the utmost practical importance.

If more money is put into the bank than is taken out of it, the balance will increase. If more money is withdrawn than is paid in, the balance will be diminished. If more geese than swans now live, more fools than wise, then the geese outnumber the swans, and the wise are rarer than fools. If more people were thrust into the Black Hole at Calcutta than the air would support, it was inevitable that some of them should die. If there are fewer teats than there are little pigs, one little pig must go without. If there are three more people than there are seats, then three people cannot sit down unless they share a seat with some one else. If there are twice as many carts as horses, at least half the carts must go unhorsed.

If There are more geese than swans,
And There are twice as many ducks as geese,
Then There are many more ducks than swans.

If 'The true bug had been organised with only two antennæ,
And The humbug in the copperplate would have them twice as many,'
Then The copperplate engraving was erroneous.

The Selected Quantity.

As its name implies, the Selective term selects a certain individual or certain individuals out of a class, and the individuals selected may be definite or less than definite in two senses. They may be indefinitely selected, and indefinite, semi-definite, or definite in number; or they may be definitely selected, and indefinite, semi-definite, or definite in number.

The *Indefinitely Selected Quantity* is characterised by the sign 'Certain,' and Certain, standing alone, is a completely indefinite enumerative, and means some individuals selected out of a class, but neither indicates the individuals nor mentions their number. We may, however, select a proportion of a class, and indicate our selection by the sign 'A certain proportion,' and we may select a number out of the residue or a proportion of the residue, and signify our selection by 'Certain others,' or 'A certain proportion of the others.' These are all indefinitely selected indefinite quantities.

But the Indefinitely Selected quantity, whether Enumerative, Proportional, or Residual, may be semi-definite with respect to the number of individuals it indicates; and then is characterised by the signs, 'Certain few,' 'A certain few,' of the whole, or the rest, as the case may be.

Or this quantity may be completely definite as to the number or proportion selected, though this selection remains indefinite. The sign is then, 'A certain' as in 'A certain one,' 'A certain three,' 'A certain half' or 'quarter.'

The individuals may be *definitely selected* and may or may not be definite in number or proportion. The signs of definite selection are This, These, That, Those. This, These, apply to a selected number or proportion near at hand or appropriated; That and Those apply to a selected number or proportion at a distance or repudiated.

'A certain man drew a bow at a venture,' selects one man out of the army, and places the bow in his hand. It was not any man in the army who drew the bow, it was a selected man; but beyond the fact that it was not any man taken at random, he is not identified. He may have been this man or that; he may have been the first in the army or the last, or in any intermediate position. He is not identified, but he is identifiable.

> Swans sing before they die; 'twere no bad thing
> Did certain people die before they sing.

This selects, but does not identify, the people in question. They may be these people or those; they may be the first people you meet, or the last that you wish to meet; they may, for aught we are told, be you and me, reader; they may be but two in number, or they may be all the people in the world except Madame Albani; but they are selected as possessing some

quality, and, though not identified, are identifiable, provided we know their distinctive quality.

This and These, That and Those, not only select, but identify the individuals they characterise; and not only do they identify the individuals, but they indicate also the proximity or otherwise of those individuals to ourselves, or our attitude, as appropriative or repudiative, towards them.

The Selective quantity is not free from the complication of 'forms.' Any Selective quantity may be Minimal, Maximal, or Exact. 'Certain,' 'A certain proportion' and 'Certain others' may be at least, only, or exactly; and similarly, the definitely selected or Demonstrative quantity may be This or These only, That or Those at least, or exactly.

Many predications, and therefore many arguments, can be conducted by means of the Selective quantity only; and many others by the Demonstrative quantity only. If certain people only should die before they sing, then other people should not die before they sing, and it is not true that any one taken at random ought to die before he sings. Moreover, it follows that certain other people should sing before they die.

If A certain man went from Jerusalem to Jericho;
And The way from Jerusalem to Jericho was infested with thieves;
Then That man ran a risk of being robbed.

If He lectured to certain students;
And Those students were attentive;
Then Those students may have benefited.

If this little pig went to market, then there was a little pig who went to market; it was not that little pig who went to market; and this little pig did not stay at home. If this is the house that Jack built, it is not the barn that Jack built; it is not the house that Tom built; nor is that the house that Jack built. If there is no way but this, there is no other way. If that is the way the money goes, then we know in what way the money goes, and in what ways it does not go.

If This is our portion,
And Our lot is this;
Then Our portion and our lot are the same thing,
And That portion and that lot are not ours.

If Any book that treats of Logic is uninteresting,
And This book treats of Logic;
Then This book is uninteresting.

All of these arguments are beyond the range of Traditional Logic, and *ultra vires* of it.

The Purposive Quantity.

The last quantity on our long list is the Purposive. In using this quantity, we regard the individuals with respect to the suitability or unsuitability of their number to the purpose in hand; and if it is unsuitable, as unsuitable by excess or by defect. The Suitable quantity has its minimal and exact forms, but the Unsuitable are known in the exact form only. We cannot say too many only, or too many at least, or too few only, or too few at least, or if we do, such expressions are meaningless; but we can say of a number that it is enough at least, or enough only, if by only we mean just enough, for though a certain quantity may be suitable to the purpose, the purpose may perhaps not be defeated if we have more than enough. There can be no maximal suitable quantity, however, for if there are less than enough there are not enough. We see, therefore, that there is a clear difference between more than enough and too many. More than enough is excessive, but does not defeat the purpose in hand. If there are more than enough stamps for all the letters, the letters can still all be stamped; but if there are too many plants for the pots, all the plants cannot be potted, and if there are too many letters for the stamps, all the letters cannot be stamped.

If the number is unsuitable, it may be deficient or excessive by an enumerative, a proportional, or a selective quantity, and the excessive or defective quantity may be definite, semi-definite, or indefinite. It may be one too many, or many too few, or more than enough; it may be too many by half, or deficient by a third; it may be this one too many, or that, or those, or may be defective by a certain few.

As with other quantities, the Purposive has its own field of reasoning, and enters into predications and arguments that cannot be conducted without its aid. If there are enough glasses to go round, no one need go without a glass, and every one can have a glass to himself. If there are not enough glasses to go round,

some one must go without, or share with some one else. If he is one too many, he is not wanted; he would be better away; there are enough without him. If too many cooks spoil the broth, it is a disadvantage to have too many cooks. If the Universal and Particular quantities of Traditional Logic are too few for the expression of all our thoughts, we must employ additional quantities or leave some of our thoughts unexpressed. If the number of quantities enumerated here is too many to be easily remembered, it will need an effort to commit them to memory, but it does not follow that they are more than enough to express our thoughts.

If Too many cooks spoil the broth,
And Broth spoilt means meat wasted;
Then Too many cooks are a cause of waste.

If Enough is as good as a feast,
And A feast is more than enough;
Then Enough is as good as more than enough.

The Collective Quantity.

If the reader will turn back to the Table III. on p. 82 he will be able to see how far our researches into quantity have extended. We have examined none but Extensive quantities, and of the two classes of these, we have examined part only of the Class-quantity, namely, the Indesignate, and the Distributive variety of the Designate. When we have examined the Collective quantity we shall have completed the consideration of the Class-quantities, and may turn to the examination of the Singular.

The Collective term is recognised by Traditional Logic, and is by it distinguished from the Distributive term, but the notion that Traditional Logic has of the Collective quantity is sadly defective, and is, in some respects, completely erroneous.

The Collective term is briefly referred to in that chapter in books on Logic that treats of terms, but when propositions are considered, the Collective term is completely ignored, and no logician entertains the possibility that a term in a proposition can be Collective, or if it can, that its quantity can be other than Universal. The Collective Particular is unknown to Logic, and the whole logical scheme of quantity is based on the

assumption that there is no quantity but the Distributive, for, if the Collective quantity is admitted, that necessary part of logical doctrine, the Square of Opposition, is broken up, disorganised, and dispersed, as will be shown in a subsequent chapter.

The same name is often applied to the Collective Class as to the Compound Individual, and Logic never distinguishes between them. Indeed, most text books adduce Compound Individuals, such as a regiment, a library, a committee, as examples of the Collective Class. Yet the distinction between them is plain and manifest. The Compound individual term refers to a number of individuals, aggregated or incorporated together into a single thing. The Collective term refers to, it may be, the very same individuals, collected into a class in which they are not discriminated from one another. The test is simple. If one or more of the constituent individuals of the compound individual is withdrawn or ejected, the integrity of the individual is not impaired. In spite of the loss, it remains an individual, and any predication made of it as an individual is still true. But if any one or more of the constituent individuals of a collective class is withdrawn, that collective class is destroyed, and any predication made of it before the mutilation is no longer true, or may be no longer true. The House of Commons is a compound individual, and though the full House consists of some 670 members, yet if only forty are present, it is still the House of Commons. But all the members of the House of Commons, as a collective class, number 670, and if even one is withdrawn, or dies, or accepts the Chiltern Hundreds, the House of Commons no longer numbers 670. If only 40 members of the House of Commons are present, the House, as a compound individual, can pass a Bill, or vote money, or adjourn ; but if even one member is absent, the House of Commons, as a collective class, no longer occupies as many seats, needs as much standing room, or consumes as much food and drink. If half or two thirds of the men in the regiment are absent on leave, or sick, or killed in action, the regiment, as a compound individual, still exists ; but if all the men in the regiment, as a collective class, outnumber all the men in another regiment, or are sufficient to line the street, or occupy so many berths in the transport, then if only one man is withdrawn, these predications may all be falsified. If several cups and saucers are broken, the tea set, as a compound individual, still exists, and is still a product

of the Worcester factory; but if one is broken, the set no longer, as a collective class, consists of thirty pieces.

Traditional Logic recognises the Collective Universal, and, in the chapter on Terms, every text book of Logic distinguishes the Collective Universal from the Distributive Universal; but it does not appear to have dawned upon the mind of any logician that the Collective is susceptible of any quantity but the Universal. In fact, however, the Collective may be Particular, and there are as many varieties and as many degrees of the Collective as there are of the Distributive Quantity, and every statement and argument made of the one can be paralleled by a statement or argument made of the other. The only Distributive quantities that have no parallels in the Collective series, are the subordinate Universals. Every, Each, and Any, refer discriminately, not indiscriminately, to all the individuals in a class, and are therefore excluded from Collective quantities.

The sign of the Collective quantity is the definite article, following the common sign of quantity; but though the Collective cannot be accurately conveyed without the use of the definite article, this article is not characteristic of the Collective, but may be used for the Distributive also. 'All the men in the regiment took part in the charge,' does not convey all the men collectively: it means every man taken discriminately. But 'All the men in the regiment were only just enough to man the rampart' does mean all the men collectively. The test by which we distinguish between the Collective and the Distributive 'All the' is our ability or inability to substitute 'Every' for 'All.' If we can make the substitution without destroying or altering the meaning, the quantity is Distributive; if not, it is Collective. The only way to designate the Collective quantity without possibility of mistake, is to add to the term the words 'taken together.'

It is unnecessary to go through again all the Particular quantities that have been enumerated in the previous chapter, and to show that each of them may be understood in a Collective as well as in a Distributive sense; but it is expedient to show by examples that the Collective quantity is just as susceptible of inference and argument as the Distributive; a fact of which Traditional Logic does not seem to be aware.

If the whole library fetched £3000, then no one book in the library can have fetched as much as this; then neither a few, nor

very many, nor a half, nor a third of the books, nor the rest of the books after some were sold, nor certain of them, nor this nor that selected set of volumes, can have fetched more, nor even as much as £3000. If £50 was given for most of the books, and £1000 for all of them, then they were very unequal in value. If they were all of about the same value, and £50 was enough to give for two thirds of them, it was too much to give for the remainder. All these arguments are beyond the competence of Traditional Logic.

CHAPTER VIII

THE INDIVIDUAL. THE SINGULAR QUANTITY

REFERENCE to the scheme of Quantity on p. 81 will show that individuals may be contemplated in two ways. They may be contemplated primarily as wholes, and if contemplated as composed of parts, the composition is a secondary consideration, and is used only to distinguish them, as wholes, from other wholes, differently constituted. Or they may be contemplated primarily as composed of parts, so that the contrast of part and whole, or of part and part, is the main purpose of the contemplation. In the first case, the individual is dealt with in thought as a unit, and is never divided. In the second case, it is dealt with in thought as a composite, or quasi-class, the difference between the individual, so regarded, and the class, being that, while the constituents of the class are individuals, and are therefore necessarily discrete, the constituents of the Composite individual are parts, and need not be discrete.

THE INDIVIDUAL.

The first difficulty that confronts us in this part of our task is to determine what is meant by an individual. To the uninitiated the task may seem easy enough, but biologists know that nothing is more difficult. A tree is usually regarded as an individual, as strictly distinct as an individual man. But the roots of a tree may contain buds—buds which are parts of the root, and therefore parts of the tree. These buds may grow into suckers, which are but buds more developed, and must still, therefore, be considered parts of the tree, though they grow at a distance from the tree, and to anyone who does not know of the underground connection, appear to be individuals, as distinct as the tree itself. The root may be severed between the tree and the sucker, and the sucker taken up and transplanted into the next parish or into a distant county, where it

may grow into a tree as large as its parent. Does it become by this severance a separate individual, or does it still remain a part of the tree, the two trees making up a single individual? Suppose that the connecting root, instead of being cut, withers away, and in the course of years perishes and destroys the connection, at what moment does the one individual become two? That the flowers are part of the tree, and that the tree with its flowers are, from one point of view, a single individual, few would dispute; and if this is so with the tree in flower, it is equally so with the tree in fruit. Yet each fruit may be severed without impairing the individuality of the tree, and may grow into a separate individual.

An animal may be cut in two, and each half is then an individual half, but is not an individual animal. But suppose, as happens with some simple animals, that the head part grows a tail, and the tail part grows a head, are there then two individuals, or is there only one? and if there are two, at what moment did the two halves cease to be parts of an individual, and become separate individuals?

The old problems of the sorites and the calvities provide us with similar puzzles. A heap of stones is an individual thing. If we take one stone away, the heap still remains an individual. We may go on taking away one stone after another till none is left. At what stage does the heap cease to be a heap? does the individual cease to be an individual?

Again, a human monster may consist of two heads and torsos, the latter fused together at the pelvis, and terminating in one pair of legs. Is it one individual, or two?

The solution of these problems is to be found in regarding an individual as constituted by the way in which things are contemplated by the mind. The individual, like the class, is a conceptual creation, existing in the mind alone; corresponding, indeed, with observed facts, but itself conceptual, and not 'real.' When we experience the colour blue, we intuitively think of the colour as resident in the extra-mental blue thing that we see. Not until we study the psychological aspect of vision do we discover that the colour is not in the blue thing, but in the mind alone; and that although the colour corresponds with some quality in the seen object, yet the quality in the object is not colour, but something that gives rise to the colour in our minds. Similarly, individuality

is a mental concept. It is in the mind alone; and though it corresponds with some quality in the individual thing, the quality in the thing that arouses in us the concept of individuality, is not individuality, but something else. Although the individual is a mental creation, its mental origin and existence do not prevent us from dividing individuals into kinds, any more than the purely mental existence of colour prevents us from dividing colours into kinds—red, blue, &c.

Thus regarded, individuals are susceptible of arrangement into kinds, primarily according as they are or are not divisible into parts. Some individuals, such as colour, likeness, &c., though they may be divided into kinds, cannot be divided into parts. Though we may divide colour into red, green, and blue, this is a division of colour, not into parts but into kinds. Red and green and blue are not parts of colour, but kinds of colour. Hence the first classification of individuals is into those that are indivisible into parts, and those that are divisible into parts, the former being Qualitative Units, and the latter Quantitative Units.

Every Quantitative Unit is divisible into parts, and such units are of two kinds, according as the parts coexist, or follow one another in time. The former may be called Coexistent Units, the latter Serial Units.

Coexistent Units are divisible into kinds according as the parts of which they are constituted are or are not contemplated with respect to their continuity or discontinuity.

If they are so contemplated, the parts are either continuous, in which case the individual is a Simple Unit, or they are discontinuous or discrete, in which case the individual joins the Serial Individual in the class of Compound Units.

The parts of the Compound Coexistent Unit may be alike or unlike. If they are alike, the individual is an Aggregate Unit; if they are unlike, it is a Corporate Unit.

If, however, the continuity or discontinuity of the parts of the individual is not taken into consideration, the individual is a Uniform Individual or Unit.

Thus we arrive at a complete classification of individuals, which runs as follows:—

TABLE VI.

Kinds of Individuals.

Individuals are either	
Indivisible	Qualitative Units.
Divisible into parts that are ...	Quantitative Units.
Coexistent	Coexistent Units.
and regarded as	
Continuous	Simple Units.
Discrete	Compound Units.
and alike	Aggregate Units
and unlike	Corporate Units.
and not regarded as continuous	
or discrete	Uniform Units.
Successive	Serial Units.

When an individual is divisible into parts that are coexistent and continuous, it is a Simple Unit, or Simple Individual, and it matters not whether the parts are like or unlike. A man, a ship, a country, a machine, a road, a table, a house—each of these is a material unit whose parts are unlike, and each is a simple individual. A piece of gold, a pint of water, a cubic foot of oxygen, are simple individuals or units whose parts are alike. The parts of a piece of wood may or may not be considered to be alike; it depends on the purpose in view; but in any case, it is a simple individual or unit.

When an individual is made up of parts that are discrete, the parts may be alike or unlike. If the parts are alike, it is an Aggregate unit individual, such as a crowd of men, a ream of paper, a fleet of ships, a street of houses, a bushel of corn, a layer of dust, a pair of boots. The Aggregate individual is always, in books on Logic, confused with the Corporate Individual, and with the Collective Class; and usually all are confused with the Uniform Individual, though this last is sometimes distinguished as the Substantial term. These things are all quite discriminable and distinct. There is some excuse for confusing the Aggregate with the Corporate Individual, for the same group of things may constitute either the one or the other, according to the manner in which we contemplate them; but the distinction between the Uniform Individual and the Collective Class is much more easily

made, and the confusion between them is therefore the less excusable.

The parts of the Aggregate Individual are alike, and it is this alikeness that enables us to unify them into an Individual. They need not be closely alike. It is enough if they have such a likeness that we can unify them. A mob is still an aggregate individual, if we choose so to contemplate it, though it consists of men, women, and children. A fleet is still an aggregate individual, if we choose so to contemplate it, even though it consists of many different kinds and sizes of ships. A street of houses is still an aggregate individual, even though it consists of residential houses, shops, banks, warehouses, and so forth. The parts of the Collective class also may be closely alike or may be different *inter se*, but they must have enough likeness to one another to enable us to group them together in a class. The very same collection of individuals may be an aggregate individual or a collective class, according as we contemplate it; but this does not constitute the aggregate individual and the collective class the same thing, for, as already explained, both the individual and the class are purely conceptual; and if we contemplate a thing or a number of things in any particular way, we cannot simultaneously contemplate them in a different way. We may successively contemplate a collection of men first as a mob, which is an aggregate individual, and still remains an individual though half its members disperse; or we may contemplate it as a collective class, capable of overcoming the police opposed to it, and now destroyed, as that collective class, if half its members disperse; but we cannot contemplate it simultaneously as both an individual and a collective class.

When the parts of a Compound Individual are not only discrete, but so dissimilar that we cannot, by their likeness alone, unify them into an individual, or if the unification is not in fact effected by their likeness, then the individual is not an aggregate, but a Corporate individual. But if the parts of an individual cannot be unified by their similarity to one another, how are they to be unified? What is the basis of the unification? It is to be found in their devotion to a common purpose. A regiment, an army, a college, a university, a hive of bees, a venetian blind, a railway, a table laid for dinner, a furnished house, are all Corporate Individuals. They are all signified by the indefinite article. They

are all spoken of and thought of as individuals; and the parts of each are unified by their devotion to a common purpose. An army consists, not only of men of different ranks, but of horses, guns, wagons, ammunition, pontoons, and stores, all discrete, and all unlike, but all unified into a single individual army by devotion to the common purpose of fighting. A venetian blind consists of slats, tapes, and cords, all discrete and all unlike; but all devoted to the same purpose of shading the window. A hive of bees consists not only of the bees, but of the cavity in which they are contained, of the comb, the honey, the eggs, the grubs, and the propolis, all different, and most discrete, but all unified by devotion to the common purpose of continuing the race of bees. A railway consists of the permanent way, the stations, the bridges and tunnels, the staff, the directorate, the shareholders, the capital, and so forth; all unified by devotion to the common purpose of transport.

The same individual may, in many cases, be Aggregate or Corporate, according to the way in which it is regarded. Regarded as a collection of ships, all alike in their character as ships, a navy is an Aggregate Individual. Regarded as a collection of different kinds of ships—battleships, cruisers, torpedo boats, repairing ships, and so forth, all devoted to the common purpose of fighting at sea—a navy is a Corporate Individual. Regarded as composed of sixty ships, the same navy is a Collective Class; and regarded as composed of none but English ships, it is a Distributive Class. Regarded as marching together disorderly through the streets of Paris, a number of men and women constitute a mob—an Aggregate Individual. Regarded as intent on taking the Bastile, they constitute a Corporate Individual. Regarded as numerous enough to take the Bastile, they constitute a Collective Class; and regarded as every one wearing the tricoloured cockade, they constitute a Distributive Class. The mode of contemplation determines the constitution of the concept.

When a number of things are so contemplated that we disregard their continuity or discreteness, and look solely to the qualities in which they are alike, or rather, to their alikeness in certain qualities, without paying regard to whether they are continuous or not, then we constitute those things a Uniform Individual. When, for instance, we contemplate successively specimens of water, gold, air, or other alike material units, and consider the alikeness between the several specimens of each, without regarding

whether or not the specimens are continuous or discontinuous, then we form concepts of water, gold, air, and so forth, as Uniform Individuals.

The Uniform Individual, in as far as it is recognised at all by Traditional Logic, is confused with the Class.

Lastly, the parts of an individual may not be coexistent. They may follow one another in succession, constituting together a Serial Individual, or Series. It would need no insistence or argument to show that we may regard a series as a single individual, were it not that Traditional Logic is altogether ignorant of it. We constantly think and speak, however, of a revolution, a journey, an election, which are series of events; of a melody, which is a series of sounds; of a disease, which is a series of bodily changes; of a process of manufacture, which is a series of manipulations; of a lecture, which is a series of spoken words; of a din, which is a series of noises; of the growth of a tree, which is a series of changes; of the flight of a bird, which is a series of movements; of the evolution of man, which again is a series of changes; and we speak and think of each of these series as an individual thing, or unit. The simplest series, and the one of which we most frequently think and speak, is the numerical series. When we speak of three, or of three hundred, we mean every number up to and including three, or three hundred, as the case may be. We indicate the series by its final number, but when we speak of three hundred we do not mean the three hundredth alone, but all the previous numbers in the series also.

There are certain serial individuals that are complex, consisting of a series of parts, each part being composed of coexisting parts. Thus a shower of rain is a serial individual, composed of drops falling in succession, but the succession is so rapid that many drops are, in fact, falling at the same time; and the construction of a battleship is a serial individual, composed of a succession of processes, or rather of many successions of processes, proceeding simultaneously, and devoted to the same purpose. Some serial individuals, such as a journey, or the emptying of a measure of corn, have a definite beginning and end; while in others, such as a rebellion, or a reformation in religion, or a disease, the beginning and end are more or less arbitrary; but it is unnecessary here to pursue these nice distinctions.

The Singular Term.

The Singular Term is not the same as the Individual thing. The Individual thing is conceptual. It is a mental concept, corresponding, more or less accurately, with its external reference. The Singular Term is the name we apply to the concept, the means whereby we are able to express it, and reason about it in words. For the purpose of expression and reasoning, the same kind of Singular term may be applied indifferently to any kind of unit individual; and thus it is necessary to classify Singular terms on a plan different from that which applies to individual things. The reference of the Singular term is not to a simple or compound individual as such, but to a specified individual, a definite individual, an indefinite, or a representative individual. The scheme of Singular terms is therefore on very different lines from the scheme of individual things, and is as follows :—

TABLE VII.

Singular Terms.

	Quantity.	*Sign.*
The Singular Term refers to		
A specified individual...	The Specific Singular ...	A proper name.
A definite individual ...	The Definite Singular ...	The.
An indefinite individual	The Indefinite Singular ...	A.
A representative individual	The Representative Singular	A.

The Specific Singular term is the Proper name, and may specify an abstract unit, as blueness, or hardness; or a simple unit, as John Jones, Helvellyn, The Saucy Arethusa, Carfax; or an aggregate individual, as The House of Commons, the Cabinet, Stonehenge, The Needles; or a corporate individual, as The Devil's Own, Trinity House, Parliament, The Louvre; or a uniform individual, as gold, water, dust, soot; or a serial individual, as Measles, The Messiah, the Reformation, the Restoration, twenty.

The Proper Name specifies a certain individual as an individual, and not formally or explicitly as a member of a class. In this it

differs from the Singular Demonstrative or Selective quantity, which also specifies a certain individual, but specifies it as a certain member of a class. When a member of a class is specified as such, the mention of the class carries with it the common qualities that form the concept, and combine the individuals into a class. The class qualities need not be mentioned, but the name of the class implies their presence in every individual bearing that name. When we speak of this man or that man, it is pretty plainly intimated, though it is not stated in so many words, that we mean this or that individual having the qualities common to the class of men. But when we specify an individual by a proper name, without mentioning the class to which he belongs, do we thereby convey any qualities that he possesses? Some logicians say we do not. Proper names, they say, are not connotative, that is to say, they convey no implication of any qualities in the thing named. This seems to me a complete misunderstanding. The proper name either has a meaning, or it has none. If it has a meaning to any one who uses or hears it, it specifies a certain individual; it points out a denotation; it indicates a certain thing; and if that thing is known to us, it is known by its qualities. If it is not known to us, either the proper name connotes to us some qualities, or it is to us not a proper name, but a meaningless word. A name must be the name of something, or it is not a name. To call a name a meaningless mark, or an arbitrary and unmeaning sign, is a misnomer. A mark or a sign does not, in this connection, mean an ink mark on paper, or a written sign, or even a public-house sign. A mark is a mark of something; a sign is a sign of something; or the one is not a mark, nor is the other a sign. And a thing is known by its qualities, and by its qualities alone. Any name, or mark, or sign, of any thing, must convey the qualities of that thing, or it is neither name, mark, nor sign. I say that Ponos is Kala-azar, and if you know the qualities of Ponos and Kala-azar, these are to you proper names; but if you do not happen to know any of the qualities of Ponos or Kala-azar, and cannot therefore relegate them to a class, then these words are to you not names, but meaningless sounds or characters. When any one speaks to me of John Jones, the name conveys to me, not only all the common qualities of men, but also the additional common qualities of Welshmen. If you tell me that the John Jones of which you

speak is the name, not of a man, but of a goat, or a leek, or a rarebit, you do not thereby abolish the connotation, you merely change it. If you tell me that it is not the name of a man, but is the name of something else, you refuse to say what, then you do not abolish the connotation, you merely reduce it to the connotation of individual thing. If you empty the name of even this connotation, then it is no longer a name at all; it is *flatus vocis*.

The Definite Singular term is indicated by the definite article. It is true that certain proper names have the definite article attached to them, as the Dreadnought, the Cabinet, the Reformation; but in these cases the proper name is the residue of a Definite Singular name, that has become proper by the omission of the name of the class to which the definite individual belongs. The Dreadnought is the ship Dreadnought; the Cabinet is the Cabinet Council; the Reformation is the Reformation of religion in the sixteenth century. The fact that the definite Singular term can become a proper name by the omission of the class name seems to me to show conclusively that there is no such wide difference between them as some logicians contend.

The definite article marks its subject as expressed in denotation —less strictly in denotation than the proper name marks its subject, but more strictly in denotation than the Definite Selective marks its subject. As there can be no denotation without connotation, each of these terms is connotative in some degree; but the degree is degree in explicitness, not degree in amplitude. 'Big Ben' specifies a certain individual clock, and part of the connotation of the term is the situation of the clock at Westminster. 'The Westminster clock' denotes the same individual as is denoted by Big Ben; but 'the Westminster clock' denotes the individual less explicitly, because there may be more than one clock at Westminster, and connotes more explicitly the situation at Westminster, and the horological properties of the individual it refers to or denotes. Since, however, the individual denoted by the two terms is the same individual, it must have the same connotation, however it is denoted. The difference between the two terms is that the one connotes all the qualities implicitly, while the other connotes some of them explicitly.

The next kind of Singular term is the Indefinite Singular, which is characterised by the indefinite article. The Indefinite Singular term refers to one unspecified indefinite member of a

class; as a man, a quality, a mob, a college, a disease; but this is not the only term that thus refers to one member of a class. The Alternative Distributive term, characterised by the adjective 'any,' also refers to an unspecified and indefinite member of a class, but 'a man' does not mean the same as 'any man.' 'A man called while you were out' cannot be replaced by 'Any man called while you were out.' What, then, is the difference between the Indefinite Singular and the Alternative Distributive? The difference is this; the Indefinite Individual, *e.g.*, 'a man,' is an unchosen member of a class, determined, beyond alternative, by circumstances. The Alternative Distributive, *e.g.*, 'any man,' is one member chosen out of the rest—any other of which might have been alternatively chosen—and therefore not determined by circumstances. In other words, the Indefinite Individual is determined by circumstances, the Alternative Distributive is determined by the choice of the proposer.

The Indefinite Individual is characterised by the indefinite article; but this is not the only individual characterised by the indefinite article. The indefinite article characterises also the Representative Individual. When we say 'a man is a biped mammal' or 'a man is a responsible being,' the term 'a man' has not the same meaning as it has in 'a man called while you were out.' In the last case 'a man' means a determinate individual man, whose identity cannot be altered; but when we say 'a man is a responsible being' we are using 'a man' very much in the sense of 'any man.' We mean not a determinate individual, but a representative individual. We take a man—any man—as the representative of men in general, and whatever is predicated of a representative man is predicated of men generally.

Yet the Representative Individual, 'a man,' has precisely the same form as the Indefinite Individual, 'a man.' How then are we to know when the term is being used in the one sense, and when it is being used in the other? Very simply and very easily. Whenever the indefinite article characterises a term in an attributive or a defining proposition, the term marks a Representative individual; in every other case, it marks an Indefinite individual. 'A man is a responsible being,' 'A regiment is made up of soldiers,' 'A mob is liable to panic,' 'An attack of plague is very dangerous,' 'Responsibility is part of the nature of a man,' 'Privates and officers go to the composition of a regiment,' 'Panic may at any

time attack a mob'—in all these cases, the term characterised by the indefinite article is a Representative individual, and in every case the proposition is attributive or defining. But when we say 'A man called while you were out,' 'A regiment marched forty miles in a day,' 'A mob sacked the Tuileries,' 'The bale fell on a man,' 'The artillery destroyed a regiment,' 'Walworth confronted a mob,' we are using substantive propositions; and in these propositions every term characterised by the indefinite article is an Indefinite individual.

Mediæval Logic did not recognise or admit the Singular term, and thereby tacitly declared that there can be no reasoning about individual things, and even that no statement can be made about an individual thing, a declaration that is evidently self-contradictory. The mere inconsistency of a logical doctrine with common sense or plain fact has never deterred logicians from maintaining it; but one would have supposed that a self-contradictory doctrine would have given them some hesitation or uneasiness. Logic began by assuming that the only mode of reasoning is by the inclusion of things in classes, and the exclusion of things from classes. If it had been content with this limitation, its reasonings would have been few enough, and of little enough value; but Logic was not content with this limitation. Logicians have always been possessed by a passion to exclude from the realm of Logic as much as they possibly could; and in view of the imperfection and limitation of their method, the desire was possibly wise. Not only do they assume and declare that there can be no reasoning about anything that is not certain, as if one of the main aims of reasoning were not to render that certain which is uncertain; not only do they declare that there can be no reasoning except about classes and parts of classes, which is contrary to universal experience; but they positively assert that there is no part of a class but the indefinite part, or, at least, that no definite part of a class can be reasoned of. Confronted with the existence of individuals, which are neither classes nor indefinite parts of a class, Logic was nonplussed, and took the simple course of ignoring their existence. Logic in fact forestalled the methods of Christian Science. When it came upon an inconvenient fact, that it knew not how to account for or to deal with, Logic adopted the simple course of ignoring that fact, and pretending that it did not exist. Of recent years, Logic has, indeed, admitted

Singular terms into its system, but when they were admitted, Logic knew not what to do with them, nor where to place them. On its own showing, there are, and in reasoning there can be, no quantities but two—the class and the indefinite part of the class, —and to which of these two is the individual to be allocated? It would seem that an individual cannot be a class, for the very nature of a class is to consist of more than one individual; and though an individual may be, and in fact always is, a part of some class or other, yet it is not an indefinite part. It is an extremely definite and restricted part. Confronted with this difficulty, different logicians have solved it in different ways. Some call the individual a third variety of term, which of course it is, distinct from both the class and the indefinite part of a class; but this distinction holds good so long only as terms are being considered. When they come to propositions, these very logicians forget all about the individual term, and declare that propositions must be particular or universal, and can be nothing else. Other logicians declare, consistently, that the singular proposition must be either particular or universal, and after some hesitation they usually plump for his universality, for, they say, when it is affirmed that Taffy is a Welshman, the affirmation refers to the whole of Taffy, and not to an indefinite part of him. Whatever Taffy's moral deficiencies may be, he has at least the satisfaction of knowing that, in the eye of Logic, he is not an individual nor an indefinite part of a class, but a whole class all to himself.

Either the Subject-term, the Object-term, or both, may be singular, and may be any kind of individual, expressed in any kind of singular term; and arguments may be conducted as well about predication concerning individuals as about any other subjects. If Angus McNab is a presbyterian, he is not a Roman Catholic. If Pillicock sits on Pillicock's hill, he does not stand in Pillicock's valley. If the King is in his counting-house, we know where to find him; and if the maid is in the garden, she is not at the back door flirting with the baker. If St. Paul's was designed by Wren, then Wren designed St. Paul's, and Inigo Jones did not. If the King was in the counting-house, counting out his money, he was not in the parlour eating bread and honey; nor was he compromising his royal rank by flirting with the maid in the garden.

If St. Paul's is the only English cathedral in the classic style,
And Wren designed St. Paul's,
Then Wren designed the only English cathedral in the classic style.

If The maid was in the garden,
And The maid was hanging out the shirt,
Then The shirt was in the garden.

That none of these arguments is a syllogism, or can, without the use of unnatural violence, be distorted into a syllogism, leaves me cold. It is enough for me that they are all completely valid, although the terms are all singular, and refer to individuals.

The Composite Individual.

The careful reader will have no difficulty in keeping in mind the distinction between the Composite Individual and the Compound Individual. The Compound individual is, indeed, regarded as composed of parts, but his parts are not separately contemplated, nor are they contemplated at all, except for the purpose of determining what kind of a unit individual he is. The parts are not distinguished from one another, nor are they contrasted or compared in any way with the whole of which they are parts. Their function is purely definitive, and when we have determined, by reference to the parts, what kind of an individual we are dealing with, we may drop them out of sight, and refer to them no more. But in dealing with the Composite individual, we never lose sight of the parts. They cannot be disregarded for a moment. It is the contemplation of the parts that renders the individual composite, and if the parts are neglected, the composite individual reverts to the unit.

As already stated, the Composite Individual is a quasi-class, in which the place of the constituent individuals of the class is taken by the constituent parts of the whole. So close is the resemblance, that logicians have not detected any difference between the composite individual and the class, and constantly give, as class arguments, arguments about parts and wholes of composite individuals. Every distributive quantity, whether Universal or Particular, that is applicable to the individuals in a class, is applicable to the parts of a whole also; and not only are parts of

a whole susceptible of distributive quantity, but they are susceptible of collective quantity also. Nor does the parallel end here, for it is no more necessary that the quantity of the parts of a whole should be designated, than for the quantity of the individuals in a class. We can think, speak, predicate, and argue as readily, as intelligibly, and as validly, of gold, and of water, and of Logic, as we can of the rich or of the poor, or of definitions.

As logicians are in fact familiar with the composite individual, though they are here for the first time presented with it as a discriminated thing, and as they frequently state arguments about it under the mistaken belief that they are arguing about classes, there is no need to insist upon the fact that it can be the subject of statement and argument. It may be useful, however, to parallel some of our instances of class arguments that are out of the reach of Traditional Logic, by others of massive quantity that are out of its reach.

If part only of the machine is rusty, part at least remains bright, and the whole of it is not rusty. If every part is greasy, you cannot touch any part of it without soiling your hands. If a man cannot lift the whole of it, it does not follow that he cannot lift it in parts (this last argument employs the Particular Collective Massive quantity). If a great part at least of the embankment was washed away, the damage must have been extensive. If a small part only was damaged, it should not cost much to repair it. If nearly all the beer was drunk, there was not much left; but if a very little only was gone, the greater part remained. If he gave away most of his property, and he had very little to begin with, he left himself very poor. If he omitted the last part of his sermon, and the peroration was the best part of the sermon, he omitted the best part. If part of it only was written, and that not the best part, he must have preached the best part extempore. If more water flows out of the tank than flows into it, the tank will in time become empty; and if more flows in than flows out, the tank will in time overflow. If there is not enough wine to go round, and you want every one to have some, you had better get some more. If there has been too much rain to do the plants good, and they have not been sheltered, they will suffer in health. None of these arguments can be compassed by the methods of Traditional Logic, for each contains a quantity that Traditional Logic does not admit; and

though Traditional Logic could, no doubt, violate its own principles and construct quasi-syllogisms that would appear to prove the conclusions, the arguments so constructed would in no case represent the actual course of thought by which the conclusions were in practice reached. Anyone who is not blinded by familiarity with Traditional Logic will see that these conclusions are reached intuitively from the premisses given, and that a circuitous route through a syllogism or quasi-syllogism does not represent the mental process actually employed. Nothing is easier than to fake a syllogism that purports to show the process of an argument. We have only to garble the premiss so as to bring it into 'logical form,' then to pretend that the argument is an enthymeme, and to invent a premiss to suit the purpose, and we have the argument expressed in a syllogism. The facts that such a mode of argument is utterly artificial and unreal; that it is utterly foreign to the course of thought actually pursued in reaching the conclusion; and that no one outside of Bedlam or a book on Logic would ever argue in such a way; do not deter logicians from this deplorable practice.

CHAPTER IX

INTENSIVE QUANTITY

In the foregoing chapters, the varieties of quantity that can be attached to Quantitative terms have been enumerated and examined, and the meanings of their signs discriminated and identified. It now remains to examine the quantities of Qualitative terms, and although Qualitative terms are susceptible of two kinds of quantity,—the Intensive and the Comprehensive,—as against the one Extensive quantity of Quantitative terms, the reader will be relieved to know that the Intensive and the Comprehensive quantities together are far less numerous than the Extensive.

Intensive quantity is quantity of degree, and is applicable both to abstracts and to attributes. The degrees of both kinds of qualities are the same, but the signs of intensity that are applicable to the one are not applicable to the other; so that there are two parallel ranges of signs, the one range applicable to Abstract qualities, the other to Attributes. Unlike the signs of Extensive quantities, those of Intensive quantity are not always the same for the same quantity. Corresponding quantities, even of qualities belonging to the same series, that is, to the Abstract or to the Attributive series, are not always indicated by the same sign. A thing may be of small or great size, but it cannot be of small or great whiteness or definition. It may be bitter cold, but it cannot be bitter hot or bitter long. A thing may be intensely heavy, but not intensely light, nor do we speak of intense weight. It may be light or dark green, but not light or dark savoury. Nevertheless, though the signs are not the same, the degrees correspond, and we may always find a sign that will correspond in degree with that of the sign applied to another quality.

There are many qualities that are not themselves susceptible of degree. They may be present or absent, but if present, can be present in their fulness only, and not in graduated degrees. A thing is either perfect or imperfect; there are no degrees of perfection. It may be full or it may be empty, but there are no degrees of emptiness or fulness, properly speaking. It may be

rigid, or straight, or circular, but there are no degrees of rigidity or straightness or circularity. If it falls short of any of these qualities by the shadow of a shade, the quality is, in truth, altogether absent.

But though there cannot be degrees of such qualities themselves, there can be all degrees of approximation to them. A thing cannot be partly perfect, or rather perfect, or considerably perfect, or very perfect; but it can be nearly perfect or far from perfect. It cannot be intensely full, or most full, or very full, or straight, or circular; but it can be very nearly, or far from, or approximately, or not nearly, full, or straight, or circular.

The different varieties of Quality will be further examined in the chapter on Negation, to which the reader is referred.

These preliminaries being settled, we may set forth the several classes of Intensive quantity, in both the Abstract and the Attributive series, as follows:—

TABLE VIII.

Intensive Quantities.

		Specimen Signs.	
Reference of Term.	*Quantity.*	*Abstract.*	*Attributive.*
The intensive term refers to the degree of a quality compared with	Degree.		
Its degree in			
Other things generally	Positive.	Moderate.	Rather.
One or more things indiscriminated as to intensity ...	Comparative.	More.	More.
More than one thing discriminated as to intensity ...	Superlative.	Greatest.	Most.
The purpose in hand	Purposive.	Enough.	—Enough.
Expectation	Emphatic.	Such.	So.

Positive Degree.

Since Intensive quantity is the same as Degree, we might anticipate that it would present the same set of degrees as have already been found to obtain in the Semi-definite Extensive

quantities; and this we find to be the case. The Medium intensity is signified in the Abstract qualitative term by 'Some' or 'Moderate,' and in the Attributive by 'Rather.' From this medium, as a central plane, intensity varies upwards towards a maximum, and downwards towards a minimum, and thus we get the set of five or more degrees that have already been enumerated. Moreover, Intensive quantities exhibit the same three forms of Mimimal, Maximal, and Exact quantity that we have found to pertain to Extensive quantities. If we keep the forms in mind, however, it will not be necessary to encumber the page by setting them forth in full, and we may take the following set as comprising

TABLE IX.

POSITIVE INTENSIVE QUANTITIES.

	Abstract.	*Attributive.*
Maximative	Intense.	Intensely.
Magnative	Considerable.	Very.
Medium	Moderate.	Rather.
Parvative...	Slight.	Slightly.
Minimative	Very slight.	Very slightly.

Statements and arguments containing the Positive Intensive quantity, and inexpressible without it, are frequent enough. They are, of course, outside of Traditional Logic, which knows not the quantity.

If the cancer is very small, it is still in an operable stage; if it is very large, operation may not be practicable. If the sentence was just, no exception can be taken to it, but if it was very unjust, it ought not to have been passed, and it would be very wrong to carry it out. If there is some slight difficulty about it, it cannot be done with complete ease, but if the difficulty is very slight, it may be neglected. If his fate is rather hard, he is not very much to be envied. If the stain on the wall is very slight, it does not very much matter. If the wall is very slightly out of plumb, it is not very insecure.

If His nose is very red,
And He drinks very hard,
Then There may be a connection between the two things.

If Little good can come of it,
And Much harm may result from it;
Then It is better left alone.

If it was a very good song, and very well sung, it must have been well worth hearing. If they both started from scratch, and one ran very fast, but the other won the match, the winner must have run very fast indeed. If the tide was very high yesterday and only rather high to-day, it was higher yesterday than to-day.

Comparative Degree.

The Comparative Intensive term refers to the intensity of a quality in one thing, compared with its intensity in another thing, or in other things regarded indiscriminately as possessing the quality in the same degree. If the other things are regarded discriminately, as possessing the quality in different degrees, the degree is not Comparative, but Superlative.

Comparative Degrees are three,—the Medium, the Excessive, and the Defective; and moreover, each of these may be Indefinite, Semi-definite, or Definite.

The Indefinite Comparative.

The sign of the Medium Indefinite Comparative is 'About as,' which suffices for the Attributive quality, but for the Abstract needs the addition of 'the same.' 'About as hard,' 'about as near,' 'about as just,' 'about as definite,' are Attributives in this quantity; but to express the Abstract, we must add 'About the same hardness,' 'about the same nearness,' 'about the same justice,' 'about the same definiteness.'

The sign of Excess in the Indefinite Comparative is, for Attributes, 'more,' or the addition of the syllable -er. More hard, harder; more near, nearer; more just, juster; more definite. In the last, and many other cases, the addition of the syllable is inelegant, and is not often employed. For the Abstract, the sign of indefinite excess is more, greater, more intense, or some equivalent. More or greater or more intense hardness; more or greater justice; more or greater nearness; more intense heat or cold.

The sign of Defect in the Indefinite Comparative is, for both Attributes and Abstract qualities, 'less.' Less near, less hard, less just; less nearness, less hardness, less justice.

The Semi-definite Comparative.—This intensive quantity, as

applied to Abstracts, exhibits the Exact form only; but as applicable to Attributes it exists in all the three forms that we have found to belong to semi-definite extensive quantity, viz :— the minimal and the maximal, as well as the exact.

The semi-definite degrees as pertaining to Abstract quality are

TABLE X.

SEMI-DEFINITE COMPARATIVE ABSTRACTS.

Maximative	Much more intense.
Magnative	More intense.
Medium	As intense.
Parvative	Less intense.
Minimative	Much less intense.

As pertaining to Attributive quality, they are

TABLE XI.

SEMI-DEFINITE COMPARATIVE ATTRIBUTES.

	Minimal.	*Maximal.*	*Exact.*
Maximative	Very much more.	Not very much more.	Very much more.
Magnative..	Much more.	Not much more.	Much more.
Medium ...	Quite as.	Only as.	As.
Parvative...	—	Not quite as.	Nearly as.
Minimative	—	Not nearly as.	Much less.

It does not need much explanation to show that these degrees of intensity have generally the meanings implied by their places in the table. If one thing is very much harder, or softer, or more definite, than another or others, a downward or minimal limit is imposed on the degree of the one, by the degree possessed by that other, plus the interval between the two degrees that is expressed by the sign of quantity 'very much more.' But no upward limit is imposed, and the very much more may be any degree more. 'Much more' hard or soft or definite fixes a lower minimal limit, but fixes no maximal limit. 'Quite as' hard or swift or definite has the force of 'at least as,' and still shows the absence of any upward limit.

All the maximal degrees fix, by their very terms, an upward limit

of intensity beyond which the degree does not extend, but fix no inferior limit. It may seem that 'not very much more' has a downward limit in the medium quantity, and must be at least as intense as that of the quality with which it is compared; but this is not necessarily so. If this is not very much harder than that, it may not be harder at all; it may not be as hard. 'Only as' hard means 'not more' hard than, and clearly fixes a maximal limit only.

'As hard as that' would seem to be not only exact, but definite, but it is not quite definite. It leaves a little margin for inaccuracy, especially in the direction of excess. 'As hard' is more definite than 'About as hard,' but it is less definite than 'Exactly as hard.'

The Definite Comparative is, in the medium degree, expressed by 'Exactly as'; in the excessive degree by a multiple; and in the defective degree by a submultiple. Twice as hard, as penetrating, as loud, as bright; or, in the Abstract quality, twice the hardness, the penetration, the loudness, the brightness. Similarly on the defective side, half as hard, half as bright; half the hardness, half the brightness. Definite comparatives, other than the medium, have their minimal, maximal, and exact forms, indicated by the additions of at least, not more than, and exactly—at least half as bright; not more than twice as hard; exactly three times as great.

Statement and argument would be very much hampered, and very imperfect, if the Comparative degrees were excluded from Logic. If it is about as hard, it is not very much harder nor very much softer. If there is much more cogency in the arguments for it than against it, it is difficult not to agree with it. If the sapphire is not quite as hard as the diamond, it will not scratch the diamond. If fifty thousand pannier loads of Devils, with their tails chopped off by their rumps, could not have made a more diabolical scream than Tristram Shandy on a certain occasion, he must have screamed very diabolically. If more haste is less speed, it is wise to act with the least possible haste when we are in a hurry. If it is more blessed to give than to receive, those who wish to be blessed had better devote themselves to giving rather than to receiving. If the sun is much hotter than the earth, and Sirius is a good deal hotter than the sun, Sirius must be very much hotter than the earth. If darkness covereth the land, and gross darkness the people, then both the land and the people are in the dark, and the darkness of the land may not be so gross as that which covers the people. If Bill Adams was a very much greater

general than Wellington, and Wellington was a greater general than Marmont, Bill Adams must have been a far greater general than Marmont. These modes of reasoning are, of course, beyond the reach of Traditional Logic.

Superlative Degree.

The Superlative term refers to the intensity of a quality of one thing compared with its intensity in two or more other things regarded discriminately. Its sign is 'most,' 'least,' or some other superlative adjective. With respect to the degrees of quality in the other things with which comparison is made, the superlative degree is always at the end of the scale. It may, however, be at either end, the maximal or the minimal; and in either case it may differ from the other examples of the quality by various degrees. It may be the most or the least by a little, or by much, or by a great deal, or a very great deal. Since the other things with which comparison of quality is made differ, *ex hypothesi*, in degree among themselves, the Superlative cannot be definite. It can be by far the largest, but it cannot be the largest by twice. It can be by very far the least definite, but it cannot be the least definite by a tenth. The Superlative is susceptible, therefore, of only two modes of quantity—the Indefinite and the Semi-definite.

If this is the hottest day in the year, it is hotter than any other day in the year; it is hotter than yesterday or the day before; no previous day in the year has been as hot as this; nor has any day been of the same temperature. If he is the greatest rascal in Christendom, he has not an exemplary character; there are others more moral than he; he is not a man to be trusted; you must go beyond Christendom to find a greater rascal. If, as Lord Salisbury said, the best man for the place is the man I like best, then it is easy to make the selection, and if the appointment is in my hands, the man I like best will get it. If this one is by far the best for my purpose, this is the one I should like to have. If this is the hottest day in the year, but yesterday was nearly as hot, this is not by much the hottest day. If he is the least to be trusted of any, and none are very worthy of trust, he must be decidedly untrustworthy. If the best time to bathe is the morning, and he bathed in the afternoon, he might have bathed at a better time. These arguments are all valid and all useful, but are all outside the scope of Traditional Logic.

Purposive Degree.

This also exists in three modes, according as the degree is suitable to the purpose in hand, unsuitable by excess, or unsuitable by defect. The suitable degree is expressed by 'Enough,' which precedes the Abstract, and follows the Attributive quality,—Enough hardness; hard enough. The unsuitable degrees are indicated in the Abstract by 'too much' and 'too little,' in the Attributive by 'too,' and 'not—enough.' Too much or too little sweetness, too sweet or not sweet enough. The Purposive Degree exists in all three forms—the minimal, maximal, and exact, but after what has been said with respect to the other quantities, it is not necessary to pursue the degree through all its forms and all its degrees of definiteness, &c. It will be enough to give a few examples of arguments that cannot be conducted without this intensive quantity, and that, therefore, cannot be conducted by Traditional Logic.

If his feet are too big for his boots, his boots are too small for his feet. If it is only just large enough, it is not too large; but if it is more than large enough, there will be some over. If the sapphire is not hard enough to scratch the diamond, the diamond may be hard enough to scratch the sapphire. If the speed is too great for the lubrication, the bearings will heat. If there is not enough depth of water to float a barge, there is not enough to float a battleship. If the air is too foul to support the flame of a candle, and it requires a purer air to support human life than to support the flame of a candle, the air is too foul to support human life. If the meat is not sufficiently salted to preserve it, it will go bad if it is kept long enough. If it has been long enough in the oven, it will be cooked through, and if it is left too long, it will be overdone; but if you take it out too soon it will be underdone.

Emphatic or Unexpected Degree.

This degree may be added to almost any of the foregoing. It is signified in the Abstract by 'Such' and in the Attributive by 'So.' Such brightness; such very great tension. So hard; so long; so sweet, so cool, so calm, so bright. It conveys that the degree of quality experienced is unexpected, that we did not anticipate that it would be so much or so little, as the case may be.

CHAPTER X

COMPREHENSIVE QUANTITY. CLASSIFICATION

VIEWED in comprehension, qualities are contemplated with respect to concretes, and have different modes of comprehension according as they are regarded with respect to those concretes only in which they inhere or from which they have been abstracted, or with respect also to concretes in which they do not inhere, and from which, therefore, they cannot be abstracted. When a quality is contemplated with respect solely to the concretes to which it belongs, it is called a Common Quality; and when it is contemplated with respect both to those concretes to which it belongs and to those to which it does not belong, it is called a Proper Quality of those to which it does belong.

From this description it appears that Comprehensive quantity appears among quantities by courtesy only. It is, in truth, a kind of quality that pertains to qualities only, and that every quality must possess.

With respect to their comprehensiveness, qualities may be regarded singly or in groups. A single quality may, as just shown, be regarded as Common or Proper. If regarded as Common, it may be regarded as common to several individuals, and in that case it may or may not be selected to form the basis of a class.

If it is so selected, the quality is a Class-quality.

If it is not so selected, the quality is a Property of the class.

Or the single quality may be regarded as common to several classes; and in that case, it may or may not be selected to form the basis of a larger class, including all the classes that exhibit the common quality.

If it is so selected, the quality is a Generic quality, and is sometimes called a Genus, though nowadays the term Genus is usually employed to characterise a class composed of smaller classes, and not to characterise the common quality that unites these smaller classes in the larger.

If it is not so selected, it is a Property of the Genus, or Generic Property.

If the single quality is regarded as proper, it may be regarded as proper to an individual, or to a class of individuals.

If the quality is proper to an individual, it may be regarded in any one of three aspects.

If it is regarded with respect to the individual primarily, the consideration of the other individuals in the class, and of the class itself, being secondary and subordinate, then the quality is a Property of the Individual.

If it is regarded with respect equally to the individual in which it is found, and to other individuals in the class to which the individual belongs, then the quality is no longer a Property of the Individual, but is an Individual Difference.

If it is regarded with respect equally to the individual to which it belongs and to the class that includes that individual, then it is an Accident of the Class.

Regarded as proper to a class, a quality may be contemplated with respect not only to the members of the class to which it belongs, but also with respect to other classes within the same genus, that do not exhibit the quality. It is then a Specific Differentia, or Specific Difference.

Regarded with respect, not only to the members of the class to which it belongs, but also with respect to the genus which includes that class, the proper quality of the class is an Accident of the Genus.

But with respect to comprehension, qualities may be regarded not only singly, but in groups; and may be grouped together in the following manner.

The group of qualities formed of the Class-quality and the Class-Properties is a Description of the Class.

The Generic quality plus the Generic properties form the Description of the Genus.

The Class-quality plus the Individual Difference form the Identification of the Individual.

The Generic quality plus the Specific Difference form the Definition of the Species.

In Tabular form, the scheme of Comprehensive Quantity is as follows.

TABLE XII.

Comprehensive Quantities.

Reference of Term.	*Quality.*
The Comprehensive Term refers to	
A single quality regarded as	
Common	
to several individuals and	
forming the basis of a class ...	Class-quality.
not forming the basis of a class ...	Property of the Class.
to several classes and	
forming the basis of a larger class	Generic Quality.
not forming the basis of a larger class	Property of the Genus.
Proper	
to an individual, contemplated	
alone	Property of the Individual.
with others in the class	Individual Difference.
with the including class	Accident of the Class.
A group of qualities, consisting of	
The Class-quality and Class-properties	Description of the Class.
The Generic quality and properties ...	Description of the Genus.
The Class-quality and Individual Difference	Identification of the Individual.
The Generic quality and Specific Difference	Definition of the Species.

From this table it appears that a Genus is a class whose component individuals are themselves classes; and that the component classes of a Genus are Species.

It will be immediately apparent that the comprehensive quantities include the Predicables of Traditional Logic, and it will be evident also that these quantities are more numerous than the Predicables. The difference is accounted for by the want of any distinction in Traditional Logic between the Individual property, the Generic, and the Class properties; by the omission from the Predicables of Descriptions, and of the Identification of the

Individual. Nevertheless, these are quantities that it is desirable to distinguish, for, though definitions are of incalculable use and value, descriptions have their place in statement and argument, and nothing that pertains generally to statement or argument ought to be excluded from Logic. In practice, we are as much and as often concerned to describe and to identify as to define.

If we look back on the long array of quantities that have been described, and turn back to the summary given in Table I., p. 70, we shall find that there is yet one more division that may be made of terms. We find that Attributive qualities cannot stand alone in a proposition except as Object terms, unless the proposition is merely Defining. If we define what we mean by hard, or just, or savoury, or white, or take these words as we find them in the dictionary and predicate of them their dictionary meanings, then, and then only, can they stand alone as Subjects in a proposition. On all other occasions of their use they must either qualify a concrete thing, as a hard fate, a just sentence, a savoury dish, a white horse, or they must be attributed to a concrete thing; as His fate was hard, His sentence was just, The dish is savoury, &c. This follows of necessity from the fact that an attribute is contemplated as inherent in its concrete. The moment it is separated from its concrete it is an abstract or it is nothing. Abstract qualities may be regarded as qualitative or quantitative, and in the latter aspect they may stand as Subjects in propositions. Patience is a virtue. Beauty is skin deep. Honesty is the best policy. Those terms, whether quantitative or qualitative, that have the capacity of standing as Subject in a proposition, are all grammatically noun substantives; and for this reason may be called Substantial terms. Those which cannot stand as Subjects are attributes, and the attributive term we are already familiar with. We may therefore supplement the table of primordial terms on p. 70 as follows.

TABLE XIII.

Table of Terms.

Terms { Quantitative { Individuals, Classes } } Substantial } Terms.
Terms { Qualitative { Abstracts, Attributes } } Attributive } Terms.

Classification.

Logic is so large a subject, and its ramifications are so numerous and complicated, that it is not easy, when we arrive, as we have now done, at the end of one ramification of the subject, to keep in mind at what point the next branch starts away from the trunk, or how far back towards the trunk we must go in order to reach the next branch that we ought to follow. If the reader will turn back to p. 67, and refer to the account of the three-fold or four-fold process of Syncrisis that is there given, he will find that the three aspects of the process are Generalisation, Classification, and Abstraction. By Generalisation we form concepts of classes; by Classification we separate classes into sub-classes, and by Abstraction we reach the concept of Quality.

Classes and sub-classes may, as we have already found, be regarded from various points of view ; but all the ways in which we have hitherto contemplated them have this in common—that they have all contemplated classes numerically. Nothing has been considered but number. We have considered classes numerically as complete or incomplete, as to their numerical proportion to other classes, and as to the cardinal number or ordinal number of the individuals they contain. The whole treatment of classes has been numerical. Qualities have been considered as to their degree or intensity, and as to their comprehensiveness ; and in the latter respect we have, it is evident, reached the frontier of classification. For classification results from contemplating classes with respect to their qualities ; and in contemplating qualities comprehensively, we have contemplated them with respect to the classes to which they belong. Classification is the converse of this. It is the contemplation of classes with respect to the qualities they manifest. This is the branch of Logic that we are now to consider.

When, by abstraction, a quality of a thing is discriminated from its remaining qualities, the remainder is at the same time discriminated from the quality abstracted. Every process of abstraction results, therefore, in the formation of two abstracts, or of abstract and remainder, each of which is the complement of the other. If two or more things are taken, and the same quality is abstracted from each, so that they are combined in a general idea or concept, two or more remainders are left, one belonging to each concrete thing. These remainders may be as different as possible, but they

are linked with the others into a class by the possession of the common quality. When we take account of the likeness of the concretes in respect of their possession of the common quality, we are generalising. When we contemplate the unlikeness of the concretes in respect of their other qualities, we are differentiating or dividing. Foam, snow and chalk are, by virtue of their common quality of whiteness, generalised into the class of white things. Within this class they are divided or differentiated from each other by virtue of their several proper qualities. Foam is a white liquid, snow is a soft white solid, chalk is a hard white solid. All are classed together as white; each is separated from the others by difference of consistence. Thus we arrive at the division from one another of the individuals in a class; but there is a further step.

Chalk, I find, is not the only hard white solid. Sugar, porcelain, marble, silver, and many other things, are alike in the two respects of being both white and hard. These, then, constitute a class of hard white things, within the class of white things, and different from other things within the class of whites. Such a class included within a class, and not constituting the whole of the including class, is termed a Species; to which the including class is the Genus. The same class that, included in another class, is a species of this other, may itself include yet other classes, and be of them a genus. The process of dividing a genus into species, dividing one or more of these species, now regarded as genera, into lower species, and these again into lower still, may be continued until we are arrested by the impossibility of finding any quality common to any of the individuals of the last species and not common to all. That species is an *infima species*, and its components are individuals only. In the other direction, more than one species may be combined by some common quality into a genus, and this genus may be found to possess qualities in common with other genera, and so to form with them species of some higher genus, and this process may be continued until all classes of concretes, or of the concretes under consideration, are included in one comprehensive class, the *summum genus*. The division of a class into sub-classes, or its constitution as a genus and its division into species, is the process ordinarily termed Classification.

Classification in this sense is a necessary condition of orderly thinking. It is, indeed, implied and involved in all thought;

though thought is not limited, as the doctrine of the syllogism implies, to the formation of classes and to nothing else. Preliminary to all thinking, there is a limitation, or classification, or definition, more or less definite, but always present, always presumed, always understood, of the things thought about. It is impossible to reason about men, or principles of law, or modes of action, or shirts, or mental processes, or anything else, without first delimiting the subject of thought from other things. Without classification, the Universe is chaos. It is this preliminary delimitation that logicians have denominated the *suppositio*, or Universe of discourse.

Formal classification and formal definition are merely extensions of this practice, and its execution with exactitude. They are the accurate delimitation of classes, and of classes within classes. As some vague and general delimitation of the subject of thought is a necessary preliminary to thinking of any kind, so the accurate delimitation of the subject of thought is a necessary preliminary to accurate thinking. Hence the great importance of classification. It requires accuracy, and is indispensable to accuracy. No intellectual exercise is so conducive to a habit of accurate thought, as the practice of defining and classifying. Let us see, then, what are the essentials of a good classification.

The first essential is to know what it is that we intend to classify. What are the things to which the classification is to apply ? What are to be the limits of the classification ? Here we are introduced to another aspect of the problem already treated of with reference to propositions. In classifying, do we classify names, or thoughts, or things ? It is not necessary to go over the whole ground again, but it is necessary to give attention to certain of its features.

In settling the subject-matter with which Logic is concerned, every one admits that it includes words. The only questions have been whether it includes thoughts and things as well. In settling the subject-matter of classification, the opposite assumption is usually made ; we speak of classifying things, and make little or no reference to the part that thoughts and names take in the process. Classification, as ordinarily understood, does not, however, apply to things—certainly not to things alone. When, indeed, a cashier takes a drawer full of money, and puts the bank notes in one heap, the gold in another, the silver in a third, and the copper in a fourth,

he does classify the things themselves ; but this is not the sense in which classification is customarily understood. When we speak of a classification of animals, we do not mean a segregation of the animals themselves into groups—putting the deer into a pen, the pigs into a sty, the birds into cages, and so on. We mean, undoubtedly, a classification of the concepts of animals, not of the animals themselves.

At the same time, our classifications are not of mere concepts, as mental states only. When we classify animals, we classify them, not as states of our minds, but as things having an existence outside of our minds. In other words, the thoughts that we utilise in the classification have an external reference. We classify our concepts of the things in conformity with the resemblances and differences that we believe to exist in the things.

This being settled, the first step in classification is to form a generalisation of the things to be classified. Are we about to classify animals ? Then we must form a general concept, including all animals, and excluding all other things. We must fix the denotation and connotation of animals as nearly as we can. We must say what we intend to understand by animals—what are the qualities this term is to connote, and what are the things to which this connotation applies. We must make clear the distinction between animals and the things most like them ; we must make clear the qualities by which things, such as zoophytes, which appear to be different from animals, are included among them. In short, the first step in classification is to form a class, or to draw a definite boundary around the things that are to be divided into classes—to mark them off from other things—to convert a vague concept into an accurate concept. This, of course, presupposes that our classification is to be a scientific or accurate classification ; for scientific, in this sense, means no more than accurate. In short, we cannot speak or think of anything without classifying it, in the sense of separating its concept from the concept of other things. But to separate a concept from other concepts is to define the thing conceived, so that, while complete and accurate definition is a result of classification, tentative definition is also a necessary preliminary to classification.

The second requisite of a classification is that it should be adapted to its purpose. Before any classification can be effected,

its purpose must be decided on. Classification is often spoken of, in books on Logic, as if there were but one ideally right mode of it,—the Natural Classification—and all other modes were wrong. This is a mistake. Classifications are made by us for our convenience; and whether a classification is right or wrong depends on whether it is or is not suitable to the purpose for which it is made. Classifications are to economise thought; to enable us to think of things separately and orderly. We classify things in order that we may the better and more clearly think about them, subdue them to our purposes, and attain the ends in which the things classified are concerned. The nature of the classification that we make; the mode of classifying; the basis or principle of classification; the *fundamentum divisionis;* must have direct regard to the purpose for which the classification is required. In as far as it serves this purpose, the classification is a good classification, however 'artificial' it may be. In as far as it does not serve this purpose, it is a bad classification, however 'natural' it may be. 'Natural' classification is classification into natural kinds, and must fall with the doctrine of Natural Kinds, now abandoned. A good classification is a classification in which those things are grouped together that are most alike for the purpose in view; and those things are separated which, for the purpose in view, are unlike. When the purpose in view is to group together those things that have the closest genealogical affinities, and therefore are usually alike in most respects, the classification is called 'Natural' or Scientific; since this is the purpose of that classification that we call 'Natural' and Scientific. But when we have some other purpose in view, the 'Natural' and 'Scientific' Classification may be a very unnatural and unscientific one. The Natural classification of plants is a good classification for the purpose of revealing the genealogical affinities of plants, but for the purpose of the cultivation of a garden it is a very unnatural classification. The gardener does not apply the rose and the apple, the lily and the onion, the potato and the winter cherry, to the same purpose; and therefore he does not classify these pairs together, and such a classification, good for the purpose of the botanist, is bad for the purpose of the gardener. The best and most natural classification of books for the purpose of the librarian, is according to subject or author; for the purpose of the bookbinder, it is according to size, price, and style of binding. The classification by the gardener, of plants into

useful and ornamental, is a good classification when he is making out his seed list, or arranging his plants in the garden; but it is a bad classification when he is sowing his seeds. He now wants quite a different classification, into hardy, half-hardy, tender, and stove plants; and his classification into useful and ornamental is useless.

When the things to be classified have been delimited, and the purpose of the classification has been settled, the next step is to find a *fundamentum divisionis*, or principle of classification, by which the things may be divided; and the nature of this principle must evidently depend on the purpose in view. Traditional Logic asserts that the division must proceed upon the presence or absence of a single quality, and that venerable tree of Porphyry, which vies in antiquity with the great baobab, is put forward as the model of the perfect system of Division—the process of Dichotomy. But dichotomy is by no means the only proper mode of division. Instead of dividing *Corpus*, in the Porphyrian method, into *Animatum* and *Inanimatum*, we may divide it into Perfectly elastic, Imperfectly elastic, and Inelastic. Instead of dividing *Animal* into *Rationale* and *Irrationale*—a very faulty division, since most animals are to some extent rational, and the limits of rationality cannot be accurately fixed—we may divide it into two-footed, four-footed, six-footed, eight-footed, and many-footed; and this division will be far sharper and better than that into *Rationale* and *Irrationale*. So we may divide *Corpus Viveus*, not into *Sensibile* and *Insensibile*, but into that which is locomotor throughout life, that which is non-locomotor throughout life, and that which is locomotor at one time of life, and non-locomotor at another.

While I must deny that the method of Porphyry is the only true or reliable method of classification, I must, on the other hand, defend it from certain criticisms that have been passed upon it. It is said that division according to the possession or absence of a quality has no value at all, for, if we know the positive qualities of the things included in the negative group, it ought to be indicated by them, and not by a *nomen indefinitum*; and, if we do not know them, the negative class is not a class at all, and we have not made even a formal division, for the absence of a quality cannot indicate anything. This criticism seems to me ill founded. The positive qualities are already enumerated in

those of the suppositio, or universe of discourse, or *summum genus*, that we are dividing; and the presence or absence of an additional quality within this genus, is a good, valid, and useful distinction. The instances in the tree of Porphyry are, indeed, not very happy, but it is easy to find instances that are; and the defect in the Porphyrian tree is the selection of qualities that are indefinite, not in the method itself. To divide insects into those which, in the imago state, have jaws, and those which have not, would be a valid and useful classification. It would, indeed, be absurd to divide the contents of the Universe into things which have jaws and things which have not. In such a division, things which have not jaws would be indeed a *nomen indefinitum;* and it would be impossible, as Lotze says, to hold together in the mind such a chaos of disparate things. The things without jaws would include triangles, beauty, sulphuric acid, and so forth. But no rational system of classification is guilty of such absurdity. The criticism applies to a division of things, into things with jaws and things without jaws, but it does not apply to a division of insects on that basis. A division of elements into those that tarnish in damp air and those that do not, would be open to criticism; but a division of metals on the same basis would, for some purposes, be perfectly sound. A division of substances into phanerogamic and aphanerogamic would be open to criticism, but a division of plants on the same basis has been found to be not without value.

What is required in a *fundamentum divisionis* is that it shall be a single attribute. Whether the division is made according to the presence or absence of this attribute, or according to its modes or degrees, does not matter in the least, as long as the attribute remains single, and the following conditions are observed.

1. The classes must be mutually exclusive.
2. They must together include all the things to be classified.
3. They must include nothing that is not in the group of things to be classified.

If these conditions are observed, and the classification is adapted to its purpose, it is a good classification. If the classification is not adapted to its purpose, or if any of these conditions is broken, it is a bad classification. The worst defect in a classification is neglect of its purpose, the next grave is the inclusion of the same thing in more than one group of the same rank; the next is failure to include something that ought to be included; and the

fourth is a defect, not so much in the classification itself, as in the definition of the group of things to be classified.

These are the principles on which Classification should proceed; but, in practice, it is often difficult to give effect to them, and they are often neglected. Non-compliance because of the difficulty of compliance is to be condoned; but non-compliance from neglect of rules is not excusable.

The preliminary process, of delimiting the genus, or group of things to be divided, is often difficult from the nature of the things. There may be no sharp differences between them and other things. In classifying Insanity, for instance, what are we to include, and what to exclude? Are we to include Hypochondriasis, Delirium, Coma, Drunkenness, Hysteria, Hallucination? Some persons would include some of these and exclude others; some would exclude all; and some would, perhaps, include all. For the purpose of classification, the classifier must first of all make up his mind whether he will include any of them, and which.

The next step is to choose a *fundamentum divisionis*, that is adapted to the purpose in view. The purpose must be clearly conceived, and the principle of division chosen accordingly. Suppose the things to be classified are the goods to be stowed in a ship's hold. The purpose of the stevedore is to stow the goods so that they may trim the ship, and be accessible when wanted. He classifies them, therefore, according to their weights and the ports for which they are destined. But the underwriter has another purpose. His purpose is to charge his premium according to value and risk. He, therefore, classifies the goods according to their value and perishability. The purpose of the captor is yet different. His purpose is to confiscate what is contraband of war. He, therefore, classifies the goods according to what is contraband, and what is not.

The worst and most frequent vice in classifying, is to proceed on more than one principle, for classes of the same rank, in the same classification. There is no objection to proceeding on more than one principle if the principles are applied successively; those groups created by the application of the first principle being subdivided by the application of a second; as when a bookseller divides his books into bound and unbound, and each of these again into folio, quarto, and octavo. There is no objection to applying different principles in different classifications, so that the

bookseller may divide his books into bound and unbound for one purpose, and into folio, quarto, octavo, &c., for another. But he may not divide them on both principles simultaneously in the same classification.

The process here described is sometimes called Division, and is distinguished from Classification, which is then said to be the reverse process of collecting things, first into small groups, these into larger, and these into larger still. Such a process may be called Classification, but it is indistinguishable from Generalisation; it is Generalisation in successive steps; and, although it is the practice in Mental Science, of which Logic is an outlying member, to call the same thing by different names, and different things by the same name; the practice is one that should not be encouraged. I have treated Classification and Division under one heading because, in my opinion, they are two names for one thing. It is desirable that the one name Classification should alone be used, for Division has already other meanings, which Classification has not.

The Categories.

Now that we have examined the several constituents of propositions in all their numbers and varieties, we are at length in a position to estimate the nature and meaning of the Aristotelian Categories, the discussion of which, in books on Logic, is so lengthy and so barren. Every logician has his own notion of what Aristotle intended to enumerate in making out his list of Categories, and I am not going to add another barren speculation to the tale; but if, instead of speculating as to what Aristotle's intention was, a speculation that has the demerit or merit that it can never be verified or disproved, we examine the Categories themselves, and estimate what they are, it appears plain enough that they constitute a list of the things that propositions may express or refer to—an imperfect list, and a crude list, it is true—but still they do enumerate some of the most important, as well as some of the most trivial matters that are expressed or referred to in propositions.

The first of the Aristotelian Categories is Substance, and the meaning, as I take it, of placing Substance among the Categories, is that the proposition refers to Substance, or says something about Substance—that Substance is, or may be, expressed or referred to in every proposition. This we have found to be the

case. Every Subject-term, as has just been shown, must be substantival or substantial, and the Object-term also may be substantial. This may not be the meaning that is usually read into the statement that substance is a Category, but it is a meaning that may very fairly be read into it, and that invests the statement with a significance that it does not otherwise possess. Whether this was what Aristotle meant by saying that Substance is a Category cannot now be known, but it is at any rate an intelligible and reasonable meaning, which is more than can be said for some of the conjectures that have been made about it.

Quantity, the second Category, is another of the things that may be, and usually is, expressed in a proposition. As we have seen, either term in a proposition may express quantity, either extensive or intensive, and thus, if we mean by a Category that which may be expressed in a proposition, Quantity is properly a Category.

Quality is understood in Logic in two senses. It is one of those equivocal words that Logic delights in. As applied to the proposition as a whole, it means the character of the proposition as affirming or denying the relation it expresses, or as containing or not containing a negative term. But terms may, as we have found, be qualitative, and may express many qualities besides those of affirmation and negation. Whether we restrict the meaning of Quality to affirmation and negation, or whether we let in all the other qualities that terms may express, Quality is, in either case, one of the things that can be expressed in a proposition, and therefore is legitimately a Category in the sense here ascribed to Category.

Relation, the fourth Category, is expressed in the Ratio of every proposition. It is the function, and the sole function of the proposition to express a relation; and the Ratio of every proposition expresses a relation, and expresses nothing else. If, therefore, we take the Categories to mean the things expressed or referred to in a proposition, then Relation is very properly a Category.

Action and Passion are, as we have seen, kinds of relation, and if Relation is a Category, Action and Passion are Categories of course. There is no need to enumerate them separately from Relation, but as they are separately enumerated in the Aristotelian Categories, logicians have the less excuse for excluding them from the logical scheme of propositions, and for declaring that the Ratio of every proposition cannot be other than the verb 'to be.'

When and Where have been shown to be qualifications of the Ratio, and their inclusion in a proposition converts the proposition into a modal, and thereby excludes it from the ambit of Traditional Logic. By including When and Where among his Categories, Aristotle signified, if I understand him aright—and if I don't it doesn't matter—that these modals at least may be legitimately included among logical propositions.

Posture and Habit may qualify a term if the term happens to be singular and personal also. Their triviality and unimportance are blemishes in the scheme of Categories, and are scarcely consistent with the enlarged and philosophical calibre of Aristotle's mind. I should hazard the conjecture that they are interpolations by some later and very inferior hand. If we include Posture and Habit among Categories, I see no warrant for excluding Complexion and Acuteness of Vision. *De minimis non curat lex.*

CHAPTER XI

NEGATIVE TERMS

HITHERTO we have treated of affirmative propositions only; but in the course of thought, it is almost as frequent to deny as to affirm the existence of a relation; and until denial and its modes have been examined, the treatment of the proposition is deficient by a full moiety.

Denial is a denial of a relation, just as affirmation is affirmation of a relation; and therefore, strictly speaking, a negative proposition is a proposition with a negative Ratio. It is usually possible, however, though it is not always possible, to introduce a negative into a term; and there are many terms, such as immortal, ignorant, unwise, disorganised, in which a negative is incorporated. Propositions in which there is a negative term have, when the negative is a Privative negative, a negative force, even though the Ratio is affirmative; but terms that are negative in form very often have a positive signification; and when such a term enters into a proposition, that proposition is in sense affirmative, if it has an affirmative Ratio, even though a term is negative. In many cases, though not in all, as logicians assert, a negative may be transferred from the Ratio to a term without altering the meaning of the proposition. Thus, for 'Angels are not mortal,' we may substitute 'No angels are mortal,' and 'Angels are immortal.'

Since negation may be effected by the use of a negative term, it is necessary to give some attention to the nature and varieties of these terms.

Negative terms may be contemplated in two ways. They may be regarded with respect to the effect of the negative on the term alone to which it is attached; or they may be contemplated with respect to other terms. We will consider first the effect produced upon a term by attaching to it a negative.

The attachment of a negative to a term may have any one of five different effects. Three of these we are already familiar with. The attachment of a negative may limit a term, either minimally, as when we add 'not less than'; or maximally, as

when we add 'not more than'; or exactly, as when we add neither more nor less than; or it may merely empty the term of all contents, putting nothing in their place, and is then a Privative Negative; or it may take out all the contents of the term and substitute other contents. In every case except the last but one, it leaves the term still positive, and the proposition into which the term enters is still affirmative, unless and until a negative is introduced into the Ratio.

The Privative Negative.—When the attachment of a negative to a term results in the emptying of the term of all its contents, without replacing them by other contents, the term so produced may be called the Privative Negative. The negative so attached may be a negative prefix, such as un-, in-, dis-, or non-; or it may be the negative word 'no' or 'not.' To say that a thing is imperfect, merely deprives that thing of perfection, without replacing the perfection by any other quality. To say that it is incomplete or unsuitable, or unintelligible, usually does no more. To affirm that a man is untravelled, or inexperienced, or uninterested, merely deprives him of having travelled, or gained experience, or exhibited interest, and ascribes to him no positive quality in place of those that are removed. If it is asserted that no man has three legs, the assertion gives us no inkling of the number of legs he possesses, nor even of whether he has any at all. All the negative term gives us is that, if he has any legs, they must be more or fewer in number than three. If I am told that there is no balm in Gilead, I am not entitled to assume that Gilead contains anything at all. I now know that it contains no balm, but whether it contains anything else or not, the proposition gives me no information and no hint whatever.

It needs a good deal of care to construct a negative qualitative term that shall be purely Privative, and shall contain no hint of a positive content. When a negative is attached to an adjective, the resulting term is generally not privative, but more or less explicitly positive. To say that Angels are immortal, affirms not only that they do not die, but that they go on living for ever. To say that a thing is immobile, asserts not only that it does not move, but that it stays where it is; and less explicitly, such terms as unjustifiable, inexpedient, dishonest, unhappy, have all a positive flavour, more or less pronounced. The qualitative term that is most easily kept free from positive signification is the past

participle. Unmarried, unfinished, undefended, undefeated, are pretty free from positive implication; and though unnerved, unhung, unlicked, are not wholly free, they are far from having the depth of positive significance that attaches to improper, imprudent and dishonest. Even the past participle, however, may convey very positive signification, as in the case of disorganised.

Quantitative terms are much more easily kept free of positive meaning. No man, no brilliancy, no litigation, no class of things, not a penny, not a friend, not a bit, are purely privative negatives; but 'no gentleman' carries a good deal of positive meaning, and so does 'not a genius.'

The limiting negatives we have already made acquaintance with in our examination of quantities. There we found that every quantity has three assignable forms, the minimal, than which it can be no less; the maximal, that it cannot exceed; and the exact, from which it cannot depart in either direction. The negatives by which these three forms are severally conveyed are 'No less than,' 'No more than' and 'Neither more nor less than.'

It is odd that though logicians reject the maximal positive quantity—Some only—they mention and examine the Maximal or Exclusive Negative, 'Not more than,' in its equivalent form 'None but'; and that though they welcome the minimal form of the Particular—Some at least,—they do not examine or mention the negative by which it is expressed—'Not less than'; and of course they have no place for the sign of the Definitive or Exact form—'Neither more nor less than.'

These forms of quantity have already been referred to, examined, and utilised; and all that now remains to be said of them is that, rightly regarded, they are negative limitations of the terms they qualify. They do not, as the Privative Negative does, empty the term of contents, but they limit its extension strictly in one or other direction, or in both; and, as has been already sufficiently explained, they are applicable to all forms of quantity, both Extensive and Intensive. 'None but the brave deserve the fair' is a maximal limitation of class; as is 'Birds are clothed in nothing but feathers.' 'Fish breathe no air that is not dissolved in water' is a maximal limitation of part of a uniform individual. 'The diamond is at least as hard as glass' is a minimal limitation of an attribute; and 'His manner amounted

to neither more nor less than piggishness' is an exact limitation of an Abstract.

The Exceptive Negative differs from the Limiting negatives just considered, in that it does not limit the term to which it is attached, but, like the Privative negative, empties it of all contents. Here the Privative Negative ceases its operations, and leaves the term empty, but here the Exceptive Negative does not cease. It goes on to fill up the vacancy with an alternative, and is therefore always positive. The most general form of the Exceptive Negative is, in the Subject-term, 'What is not,' as in 'What is not mortal is not a man'; and in the Object-term, 'Except,' as in 'He ploughed the whole field except the headlands.' It is manifest at once that Exceptive Negatives are extremely comprehensive quantities,—more so even than the 'Some' of Traditional Logic; for they include not only, as 'Some' does, all Particular quantities, but all Universal quantities also. Hence, there are as many varieties of the Exceptive negative as there are of Extensive quantities. What is not desirable may be everything, each thing, or anything that is not desirable. It includes some things, a great many, many, a few, and a very few things that are not desirable. It includes every proportion of such things, from nearly all to scarcely any; and not only some, but the first, the last, others, and the rest of them. It includes more if there be more, and fewer if fewer are possible. It includes certain things that are not desirable, as well as this and that; and it includes, moreover, only too many things that are not desirable, as well as enough and too few.

Thus our three forms of quantity are increased to four. The minimal form, signified by 'Not less than' and 'At least,' limits the quantity downwards, and secures it against defect, while leaving it quite undefined in the direction of greater number, proportion, or magnitude. The maximal form, signified by 'Not more than,' 'At most,' and 'Only,' limits the quantity upwards, or maximally, and secures it against excess, while leaving it open to defect. As 'not less than' and 'at least' may include 'perhaps all,' so 'not more than' and 'only' may imply 'perhaps none.' It is usual, if it is intended to convey this possibility, to add 'if any'; but I do not know that it is logically necessary in all cases, though it seems to be necessary in some. It is necessary with the singular quantity, as we shall find, and its

use is desirable, though perhaps not imperative, in other quantities when the meaning ' it may be none ' is intended.

The Exact form limits the quantity in both directions; and lastly, the Exceptive form applies to all that is outside of or beyond the quantity of the term. In order that the Exceptive may be applicable to a term, it is necessary that the form of that term should be exact or maximal, for a minimal term may extend to all, and if it does, there are none left for the Exceptive to apply to.

The Exact form is not often explicitly stated, but it may be assumed, and usually is assumed, in spite of the teaching of Traditional Logic, that when no indication of form is attached to a term, the quantity of that term is to be taken as exact. Logic tells us that the minimal form should always be understood, at any rate in Particular quantities, but Logic gives no authority but its own for the dictum, and we have learnt that the authority of Traditional Logic is not decisive. In fact, the universal practice, outside of books on Logic, is to take as exact every quantity whose form is not explicitly stated.

If we adhere to this practice, and bear in mind that any form of negative Subject-term may be combined in a proposition with any form of negative Object-term ; and that in any such proposition the Ratio also may be negative, we see that the choice of propositions into which the negative enters is very large. If we use No-A and No-B for the Privative negative, and not-A and not-B for the Exceptive negative, we can frame six leading types of propositions, and pursue the different shades of negation through at least three and twenty degrees.

The six leading types of proposition are as follows :—

1. The Affirmative.	A is B.	Birds are clothed in feathers.
2. The Negative.	A is not B.	Birds are not clothed in feathers.
3. The Privative.	A is no-B.	Birds are featherless.
4. The Obverse.	A is not no-B.	Birds are not featherless.
5. The Exceptive.	A is not-B.	Birds are clothed in what are not feathers.
6. The Exclusive.	A is not not-B.	Birds are clothed in nothing but feathers.

Each of these values of the Object may be combined with the Privative Subject :

7. No A is B.	No bird is clothed in feathers.
8. No A is not B.	No bird is not feathered.
9. No A is no-B.	No bird is featherless.
10. No A is not no-B.	No bird is not featherless.
11. No A is not-B.	No bird is clothed in anything but feathers.
12. No A is not not-B.	No bird is clothed in nothing but feathers.

Or the different values of the Object may be combined with the Exceptive Subject:

13. Not-A is B.	Everything but a bird is feathered.
14. Not-A is not B.	Everything but a bird is not feathered.
15. Not-A is no-B.	Everything but a bird is featherless.
16. Not-A is not no-B.	Everything but a bird is not featherless.
17. Not-A is not-B.	Everything but a bird is clothed in what are not feathers.
18. Not-A is not not-B.	Everything but a bird is clothed in nothing but feathers.

Or the negative Subject may be duplicated:

19. No not-A is B.	Birds alone are feathered.
20. No not-A is not B.	Birds alone are not feathered.
21. No not-A is no-B.	Birds alone are featherless.
22. No not-A is not no-B.	Birds alone are not featherless.
23. No not-A is not-B.	Birds alone are clothed in what are not feathers.
24. No not-A is not not-B.	Birds alone are clothed in nothing but feathers.

This list of negative propositions is long, but it is far from exhaustive. The Exceptive term has been treated as if it were one, whereas it is in fact many. Any of the quantities already discovered to reside in terms, may qualify the Exceptive term, and thus the Exceptive term may have a very large number of meanings as has already been shown.

Of this great multitude of negative propositions, Traditional Logic knows of five only,—the Simple negative, A is not B; the Privative negative, A is no-B; the Obverse, A is not no-B; what it calls the Universal negative, No-A is B; and one kind of Exceptive negative, A is everything but B. The remainder of those that have been enumerated, and the additional multitude that can be constructed, are utterly unknown to Traditional Logic. It does not even know of their existence. Even of those that are recognised, two only, E and O, the so-called Universal and Particular negatives, are allowed to enter into the logical scheme of Mediate Inference. The O proposition is one variety out of eight of the Simple negative; of the remainder Logic knows nothing. The exclusion of the remaining vast multitude of negative propositions, beyond the classical five, is owing to no inherent defect or disqualification in them. They are all good and valid forms of proposition. There is not one of them that is not in frequent use. Even the highly elaborated form No. 24, with its doubly negative Subject, its negative Ratio, and its negative Object —four negatives in all—is in use, and expresses a meaning that cannot be expressed otherwise. 'No one but Jones was appointed solely on account of his merit,' 'Barbara Allen was the only dancer dressed in nothing but a few beads.' Nor does our licence to multiply negatives end here. In the Object-term as well as in the Subject, the negative may be duplicated, and we can argue quite well from propositions on the model 'No not-A is not no not-B.' 'No animals but those with wings are not confined exclusively to the surface of the earth.' As this book is going to press I find in the day's *Times* 'by not excepting him from the list of Scottish members who had not mentioned,' &c. He was therefore not no not-A.

If it is justifiable, and in accordance with the true laws of reasoning, to argue from 'Every bird has feathers,' to 'No bird is featherless,' it would be interesting to know why it is not equally justifiable, and in accordance with those laws, to argue from 'He will accept anything but money,' to 'He will accept a pair of boots,' or from 'He has lost everything but honour,' to 'He has lost his wits.' Traditional Logic does not admit the validity of these inferences; or, if it does, it knows not how to attain them without making a long detour through a syllogism, a course that no one but a logician would ever dream of taking.

They are quite beyond its competence ; but they are so clearly and manifestly valid, that a Logic that does not provide for them confesses its own futility.

It is often asserted, not, indeed, by logicians, but in common discourse, that, in English, two negatives make an affirmative. An inspection of the examples of the double negative given on a previous page, will show that this is not always true. 'No bird is featherless' is indeed equivalent to 'Every bird has feathers'; but 'Nothing that is not a bird has feathers' does not positively imply, though it strongly suggests, that birds have feathers. We might say 'Nothing that is not a bird has five legs' and still be within the four corners of strict truth; though we should certainly be guilty of the *suggestio falsi* that birds possess five legs. It is, therefore, more accurate to say that the double negative is always consistent with the affirmative; and we may go further and generalise the statement thus:—Every proposition in which the number of negatives is even, is consistent with the affirmative, and therefore with every other proposition derived from the affirmative, in which the negatives are even in number; while every proposition in which the number of negatives is odd, is consistent with every other such proposition, derived from the same affirmative, but is incongruous with the affirmative, and with all its even negatives.

Even a single negative, introduced into an affirmative proposition, does not necessarily make a proposition inconsistent with that from which it is derived, but it always makes them incongruous. Any single negative introduced into the proposition, 'birds have feathers,' gives an inconsistent proposition. 'No birds have feathers,' 'Birds have not feathers,' 'Birds are featherless,' are all inconsistent with 'Birds have feathers'; but 'Some birds have no feathers' is not inconsistent with 'Some birds have feathers.' The two are not inconsistent, but they are incongruous. If they refer to the same Subject, they are inconsistent ; if they refer to different Subjects, they are irrelevant. In either case, they are incongruous. 'Everything but a bird is not featherless,' contains three negatives, and is incongruous with 'Birds are feathered,' from which it is derived. It is incongruous, because it refers to a different Subject ; but it is not inconsistent. If everything but a bird is not featherless, that is, is feathered, it does not follow of necessity that birds are not

feathered, though it is strongly suggested that they are not. 'Every vertebrate but a bird has a backbone' is a materially true proposition. Every such vertebrate has, in fact, a backbone; but though I have strongly suggested that birds have no backbone, I have refrained from actually making the assertion. The statements are incongruous, but they are not formally inconsistent.

In books on Logic there are two muddles about the negative term, and the two muddles are in some books muddled up together, so as to make confusion worse confounded. Taking as a text the Law of the Excluded Middle, which asserts that everything must either be or not be, logicians apply this law to the cases of the soul being square, and virtue being red, and ask whether it is really necessary that the soul should be square or not square, or, as they prefer to write it, not-square, and that virtue should be red or not-red. Most logicians assert that these alternatives are inescapable, and that we are compelled by the Law of the Excluded Middle to accept one or the other. The Law of the Excluded Middle will be discussed, together with the other Laws of Thought, in a subsequent chapter, but this is the place to discuss its application to terms.

With respect to such examples as virtue is not-square, the soul is not-red, Professor Bosanquet argues that 'bare denial, whether disguised as spurious affirmation, or taken as the mere exclusion of mere suggested predicates, amounts in the strict sense to nothing.' It is difficult to imagine a statement more contrary to truth. Does it amount to nothing to deny of a man that he is honest, of a woman that she is virtuous, of a soldier that he is brave, of a ship that she is seaworthy, or of a logician that he is logical? If bare denial amounts, as it may, to nothing, it is for the very reason, and for no other than this, that the predicate has not been suggested. Denial always refers, as will be explained directly, to pre-negative affirmation. Denial is denial of something. Of what then? Of some affirmation, made, suggested, conjectured, or possible. It is this pre-negative affirmation that gives to denial its whole content and meaning. The bare denial of a suggested predicate may always be made, and always has significance, for the very reason, on which all denial is founded, that the suggestion has been made. To deny that the soul is red, or that virtue is square, is nonsense, because the corresponding

affirmative suggestions have not been made; but if it were seriously suggested that the soul is red, or that virtue is square, I see no reason why it should not be as seriously denied. The significance of denial rests, not upon the congruity or incongruity of the terms of the relation that is denied, but on the presence or absence of pre-negative suggestion. Denial that the soul is red, or that virtue is square, is without significance, not because the terms are incongruous, but because and if the relation has not been suggested. Denial that there is anyone in the next room is equally devoid of significance if there has been no pre-negative suggestion. If one should tell me, apropos of nothing, that there is no one in the next room, the denial is as devoid of significance to me as is the denial that the soul is red; but if I have heard a crash in the next room, and have said or thought that there must be some one there, the denial is immediately invested with significance. Much—fortune, life, honour—may depend on it.

The other muddle about the negative term is again a compound muddle. To clear it up it is necessary to answer not one question, but two. It concerns first, the possibility of the Privative negative, and second, the scope and range of the Exceptive negative. When we speak of not-man and not-white, do we mean, by the former, living beings only that are not men, and by the latter, surfaces only that are not white, or do we mean everything thinkable that is not man or not white, including, as Lotze puts it, triangles, melancholy, sulphuric acid, and so forth? The controversy seems to me to be founded on the fallacy hereinafter described as the fallacy of the previous question. The problem is on a par with the problem, Why does the weight of a bowl of water not increase when a fish is put into it? In other words, it assumes the previous solution of a problem that has not, in fact, been solved. It is asking, before we have determined whether there is anything at all in the jug, whether it is half full at least; or quite full. Not-man and not-white may be exceptive negatives, it is true, but they need not be exceptive: they may be privative; and if they are, then to ask the range of their denotation is to ask how much beer there is in an empty jug: and to ask whether they are infinite negatives or indefinite negatives is to ask whether the empty jug is quite full or only partly full; or more accurately, perhaps, whether the empty jug contains

all the beer in the universe, or only an indefinitely large quantity of beer.

A negative term may, as we have seen, have a positive signification. But it need not have a positive signification, and in many cases it has none. When I am told that there is no one in the next room, do I take it to mean that the room is empty of men, women, and children, or do I take it to mean that it contains triangles, melancholy, sulphuric acid, fixed stars, All Fools' day, and all other thinkable things except men, women, and children? No one can foretell what strange notions may not be entertained by logicians, and when some of them say that this last is the meaning that they understand by the negative term 'no one,' I must suppose that they believe that this is what they ought to understand by it; but I have a shrewd suspicion that they are mistaken as to their own meaning, and I am quite certain that I do not myself read any such meaning into the term.

If silver is not gold, then, according to Traditional Logic, silver is not-gold. Silver is, therefore, according to pre-Lotzian logicians, triangles, melancholy, and the rest. A logician to whom I put this consequence demurred. Silver is not-gold means, said he, Silver is *some* not-gold. If this be so, then Logic is compelled to accept the Hamiltonian quantification of the predicate, which all logicians reject: and it is compelled, moreover, to accept 'some' in the sense of some only, which is opposed to the unanimous teaching of logicians.

'Silver is not gold,' or not-gold, may assert of silver either a privative negative or an exceptive negative. If not-gold is privative, the proposition asserts merely that silver is not gold, without in the least implying what silver is, or even whether silver exists. But if not-gold is an exceptive negative, then to assert that silver is not-gold denies, indeed, that silver is gold, but asserts that it is something. The full expression of this exceptive negative is, of course, Silver is something that is not gold. But this is not the only exceptive negative included in not-gold. I can, if I please, limit the exceptive to one of the elements that is not gold; and, further, to one of the metals; and, further still, to one of the noble metals, that is not gold. An exceptive negative, therefore, need not be a universal negative, but it may be a universal negative; and if universal, it may be a limited or an unlimited universal. 'Every term that is not quantitative is qualitative' has for its

subject a universal limited to the universe of terms. 'Everything that is not mental is material' has for its subject an unlimited universal. Lotze is therefore no more completely correct than his antagonists. The Universal Exceptive may be a limited or an unlimited universal, and if unlimited, it is an Infinite Negative. The Infinite negative is a very unusual negative, but it is not an impossible negative, and there is at least one occasion on which it is requisite and necessary.

CHAPTER XII

MODES OF DENIAL

THE foregoing discussion on the character of the negative term is a suitable introduction to the discussion of modes of denial or negation. Affirmation and denial are complementary opposites. When we deny, we deny something that has been, or might have been, affirmed. The negative always has reference to an affirmative. It implies or suggests at least a conceivable affirmative. If I say 'Birds do not possess hoofs,' I must have in my mind an antecedent assertion, or suggestion, that birds do possess hoofs; and this assertion or suggestion is the basis and occasion of the denial. Unless the affirmative suggestion had been there, there would have been no reason or meaning in the denial.

Similarly, every affirmation suggests, or is suggested by, a corresponding denial. If I say 'Birds are migrants,' I deny that birds have fixed abodes; and to elicit this denial, I must have had the denied relation to some extent explicitly before my mind. As the negative denies the affirmative, so the affirmative denies the negative. 'Steel is hard' denies that steel is not hard. 'Brutus killed Cæsar' denies that Brutus did not kill Cæsar. But the affirmative does not need the antecedent suggestion of the negative as urgently as the negative needs the antecedent suggestion of the affirmative; and, in many cases, does not need any negative suggestion at all. There would be no need, occasion, utility, or even sense, in denying that Brutus killed Cassius, unless there had been some antecedent assertion or suggestion that Brutus did kill Cassius; but the assertion that Brutus killed Cæsar can stand by itself, as a piece of news, without any antecedent suggestion that Brutus did not kill Cæsar. This relative urgency of antecedent suggestion, in the two cases, corresponds with the psychological law, that discernment of likeness always explicitly precedes discrimination of difference, but discrimination of difference does not, or does not so explicitly, precede discernment of likeness. Affirmation and denial are complementary and inseparable. Each supposes and implies the other; but affirmation usually

suggests consequent denial only, while denial suggests a previous affirmation.

The opposition of affirmation to the corresponding direct denial, is but one instance of a law of opposition of much wider and more general application, viz :—that Every proposition denies every proposition inconsistent with it; and from this law (which is a U proposition in Hamiltonian, or rather, Thomsonian, nomenclature) we may deduce, that Denial is the assertion of a proposition inconsistent with that which is denied; that the only mode of denial is by assertion of the inconsistent; and that the assertion of every proposition denies every proposition inconsistent with it. Thus, 'He has just had a good dinner,' denies and is denied by not only 'He has not just had a good dinner,' but also 'He has not dined'; 'He has just had a bad dinner'; 'He is hungry'; 'He has been long without food'; 'His stomach is empty'; 'He is starving'; and many other propositions inconsistent with the original.

Hence, in order to determine the modes in which denial may be made, we must discover in what ways a proposition may be inconsistent with another; and this, in general terms, is easily done. A proposition may be inconsistent with another proposition in its Subject, in its Object, or in its Ratio; and in either case will deny this other proposition. So far, the matter is simple: but when we enquire what terms are inconsistent, and what Ratios are inconsistent, our difficulties begin. Evidently, Terms and Ratios must be examined separately with respect to their inconsistency with other Terms and other Ratios; and we shall find it necessary to examine the inconsistency of Quantitative Terms separately from the inconsistency of Qualitative Terms.

Inconsistency of Terms.

Quantitative Terms.

The consistency or inconsistency of quantitative terms with each other is determined entirely by their form, as minimal, maximal, or exact. The minimal form of a quantity may flatly deny the maximal form of another, and yet may be wholly consistent with the minimal and exact form of that other, and *vice versâ*; so that no quantity can be denied by affirming another quantity, unless the forms of both are stated. All and None are both consistent with

certain of the forms of Some; and unless the form of this quantity is explicitly stated, there need be no inconsistency, and can be no denial. 'All' is quite consistent with 'not less than some,' or 'some at least,' and does not deny this quantity; though it does deny 'not more than some' or 'some only.' 'None' is consistent with 'not more than some,' or 'some if any,' and does not deny this quantity; but it does deny 'some at least,' and 'not less than some.' Even All and None are not necessarily inconsistent. 'All if any' is quite consistent with None, and does not deny None.

Denial of the Singular Quantity.

This quantity is peculiar, in that the signs of form, when applied to individuals, alter their significance, and do not mean quite the same as they mean when applied to classes. 'A few only' and 'Not more than a few' are maximal forms, and as such are consistent with None. But 'Gladstone alone,' and 'No one but Gladstone' are not consistent with 'No one.' They are exact in form, and mean 'Gladstone certainly, but no one else.' So, also, 'few if any' is a maximal form, and is consistent with none, but emphatically denies more than a few; but 'Gladstone if any man' is more preferential than maximal. It is consistent, indeed with no one, but it is consistent also with others besides Gladstone, and though it declares that Gladstone has a preferential position with respect to others, it does not exclude others.

Although, however, the signs of quantitative form are different for the singular quantity from the signs applicable to other quantities, the rules respecting the forms are the same, *mutatis mutandis*, however the forms are expressed.

The exact form of the Singular quantity denies None and denies Others. 'A boy alone rang the bell' denies that no one rang the bell, and denies also that more than one boy or any one but a boy rang the bell.

The minimal form of the Singular denies No one, but does not deny Others, or All. 'Gladstone addressed the meeting' denies that no one addressed the meeting, but does not deny that others, or every one present, addressed it.

The maximal form of the Singular quantity denies Others, and All, but does not deny No one. 'An infant alone, if any one, is irresponsible.'

The preferential form is antithetic to the exceptive, and the two

deny each other. 'A logician, if any one, should be consistent' does not deny 'No one should be consistent,' nor does it deny 'Others besides logicians should be consistent.' All that it denies is that 'Others besides logicians should alone be consistent.'

Denial of Collective Quantity.

The antithesis of the Distributive Universal is None, but this is not the antithesis of the Collective Universal. None is no one, and no one, though it effectually denies Every one, Any one, and Each one, does not effectually deny All taken together. All taken together does not assert or posit one, and therefore to confront 'all taken together' with 'none' is irrelevant. The true antithesis of 'all taken together' is 'not all.' 'All the ships sailing out of Liverpool are together enough to bridge the Irish Channel' is not denied by 'None of the ships sailing out of Liverpool is enough to bridge the Irish Channel.' The negative is irrelevant, and does not bear upon the affirmative assertion, either in the way of denial or of corroboration. The only way to deny the assertion by means of a negative term, is to assert 'Not all the ships sailing out of Liverpool are enough to bridge the Irish Channel.' This is a denial, and a relevant and effective denial, and in no other way can an effective denial of the Collective Universal be made, except by a negative Ratio.

The Collective Universal cannot be maximal in form. If all are taken together, they may not be more than all, but they cannot be fewer, and the true maximal is 'not more, and it may be fewer than.' An All that is minimal appears tautological, for all must be all at least, and there seems no room for a possible more, if all are accounted for. But a little consideration will show that there are plenty of occasions for more than all. If the engine can draw all the coaches and a guard's van in addition, it can draw more than all the coaches. If the auctioneer conducted in the morning one sale of 150 lots, and in the afternoon another sale of 50, then in the day he sold more than all the 150 lots of the first sale. 'All taken together' denies, therefore, 'not all' and less than all,' and is denied by them; but it does not deny 'None' or 'More than all,' nor is it denied by these quantities.

The rules for denying the Collective Particular quantities are the same as those for denying the Distributive Particular, and are given below.

Denial of Distributive Quantities.

The Distributive Universal exists, as we have found, in three varieties, Every, Each and Any.

'Every one' may be exact or inexact, and if inexact may be minimal or maximal. 'Every one at least' implies possibly more, and in the distributive as in the collective quantity, there may be more than all. 'There was transport for every one of the wounded at least' suggests that there may have been transport for some of the unwounded. 'Every officer at least was armed with a revolver' suggests that some of the men also may have been so armed. The minimal 'Every one' denies and is denied by 'None' and by every maximal particular quantity. It does not deny its own exact and maximal forms.

'Every one only' is exact. 'A medal was given to every combatant only' asserts that every combatant received a medal; denies that any non-combatant received a medal; and denies, though not very emphatically, that no one received a medal. 'Every one' applies distributively to each one, and the only distributive quantity less than one is none. Consequently, to make 'Every one' explicitly maximal, that is to say, so to express it that it may mean that quantity or less, we must express it 'Every one if any one,' or use some equivalent. 'A medal was given, if at all, to every combatant only,' fixes the form of Every one as maximal. Such a maximal is not denied by None, or No one, nor is it denied by any of the minimal particular quantities included under Some at least; nor is it denied by All or Every; but it is denied by every maximal particular included under Some only.

'Each one' is almost always exact in form. 'Each if any' is a possible form, but is not often employed, and 'Each at least' scarcely ever. Each denies and is denied by None, and by all maximal particular quantities.

'Any one' cannot be maximal. 'Any one if any' is an impossible quantity. It may, however, be minimal. Any decked boat at least (and perhaps some without a deck) can cross the North Sea. Any denies and is denied by None, No one, and all maximal particular quantities.

Denial of Particular Quantities.—What is said here with respect to the denial of Particular quantities applies to both the Collective and the Distributive. For the sake of brevity, I will confine my

examination of the modes of denial of Particular quantities to denials by other members of the same series. Those who desire to know how an Enumerative quantity can deny, or be denied by, a Proportional or an Ordinal, or any other kind of particular, can easily work the problem out for themselves in the light of what follows.

In the Particular, as in the Universal quantities, the mode of denial depends on the form of the quantity, as minimal, maximal or exact.

A *minimal particular quantity* denies, of the same series,

None.

All maximal quantities less than itself.

It does not deny,

Any maximal quantity greater than itself, even the Universal.

Any other minimal quantity, whether greater or less than itself.

Its own exact form.

For instance, 'A great many at least' denies and is denied by 'Many only,' 'A good many only,' 'A few only,' 'A very few only,' and 'None.'

It does not deny 'A very great many only,' or 'Every one.'

Nor does it deny 'A very few at least,' 'A few at least,' 'A good many at least.'

Nor does it deny 'Not more than a very great many.'

Nor does it deny 'A great many, neither more or fewer.'

A maximal particular quantity denies, of the same series,

All minimal quantities greater than itself, including the Universal.

It does not deny

Any minimal quantity less than itself, even None;

Any other maximal quantity, or

Its own exact form.

For instance, 'Not more than a half' denies 'Not less than two thirds,' 'than three fourths,' and all minimal proportions in excess of a half, up to 'all.'

It does not deny 'A fourth at least,' 'A third at least,' 'Not less than a fifth,' or any other minimal quantity less than itself, even None.

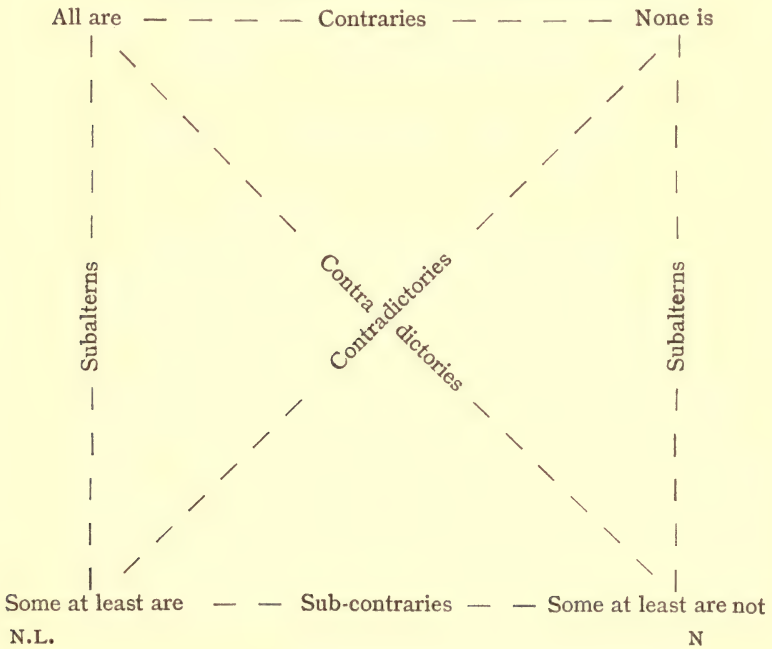
It does not deny 'Not more than a third,' 'Not more than three fourths,' nor any other maximal quantity more or less than a half.

Nor does it deny an exact half.

The exact form of any particular quantity denies, of the same series, All and None, and all other quantities except its own maximal and minimal forms.

A small number of these relations of consistency and inconsistency are expressed by logicians in the Square of Opposition. The quantities that enter into the Square of Opposition are Distributive quantities only, and of distributive quantities none but the Universal and the Indefinite Particular; and of the Universal and the Indefinite Particular none but the exact form of the Universal and the minimal form of the Particular. As a general guide to the inconsistency of quantities, the Square of Opposition is, therefore, almost worthless. Even to display the inconsistency of the only quantities it includes—the Universal and the Indefinite Particular—it must be supplemented by three other squares, one for the maximal Distributive 'Some' and one each for the maximal and minimal Collective 'Some'; and even then it will not display the inconsistency of semi-definite and definite quantities. The Traditional Square of Opposition is as follows. I discard the symbols A, E, I and O, and substitute for them their equivalents—All are, None is, Some are, Some are not.

THE TRADITIONAL SQUARE OF OPPOSITION.



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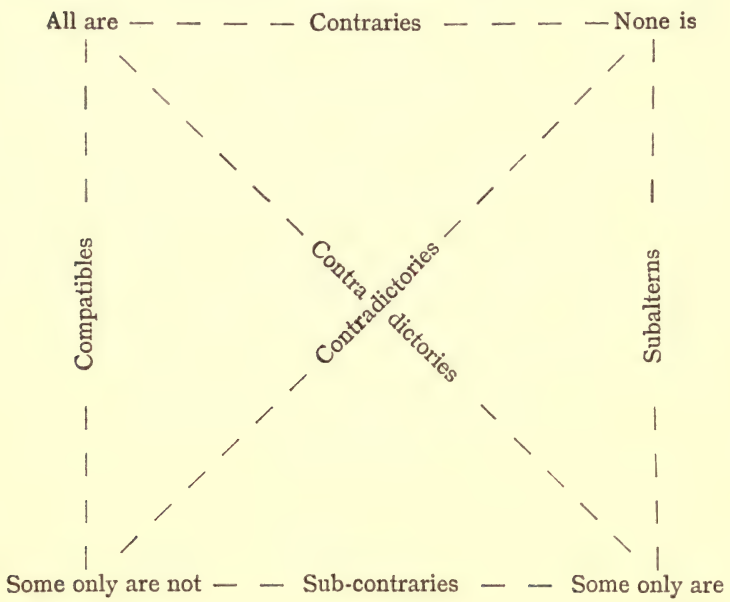
This is all very well as far as it goes, and as long as the All is distributive and the Some is Some at least; but if, the All remaining distributive, the Some is made maximal, or not more than Some, or Some only, the Square must be remodelled, and must be expressed somewhat as follows.

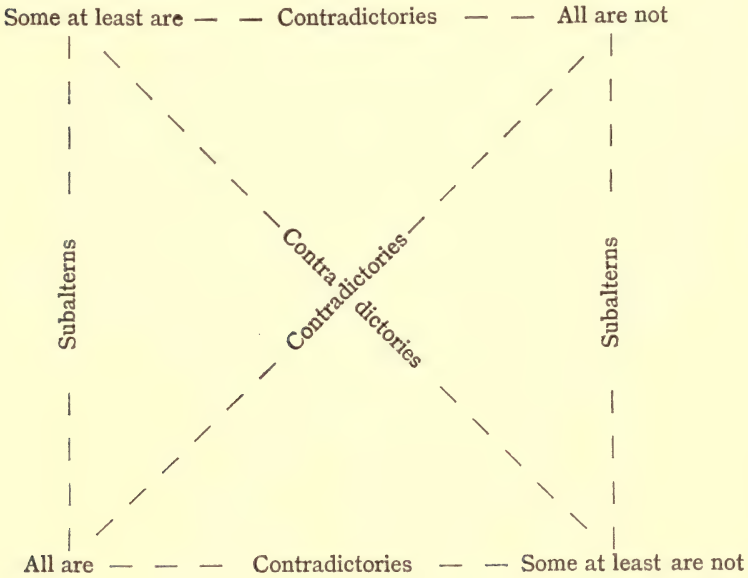
SQUARE OF OPPOSITION OF MAXIMAL DISTRIBUTIVE QUANTITIES.



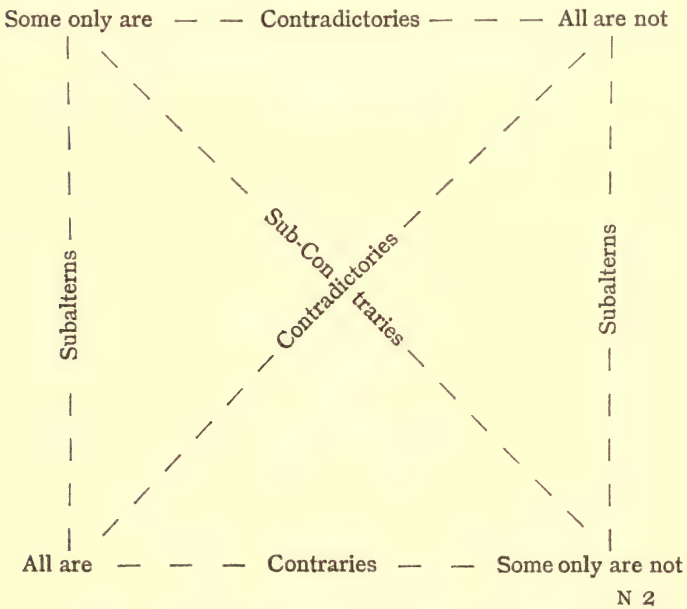
In the nomenclature of Traditional Logic, this would mean that A is compatible with O, its contradictory in the Traditional Scheme; and E is subalternans, not to O, but to I. E and O, instead of E and I, become contradictories, and A and I become contradictories instead of subalterns.

In the square on top of p. 179 it will be seen that every quantity has two contradictories, and therefore there are four pair of contradictories, no contrary, and no sub-contrary. The reason is manifest. Between 'All together are' and 'All together are not,' there is no third alternative, and these are therefore contradictory. And Some at least, is Some, it may be all, and must therefore be taken as contradictory to whatever is contradictory of all.

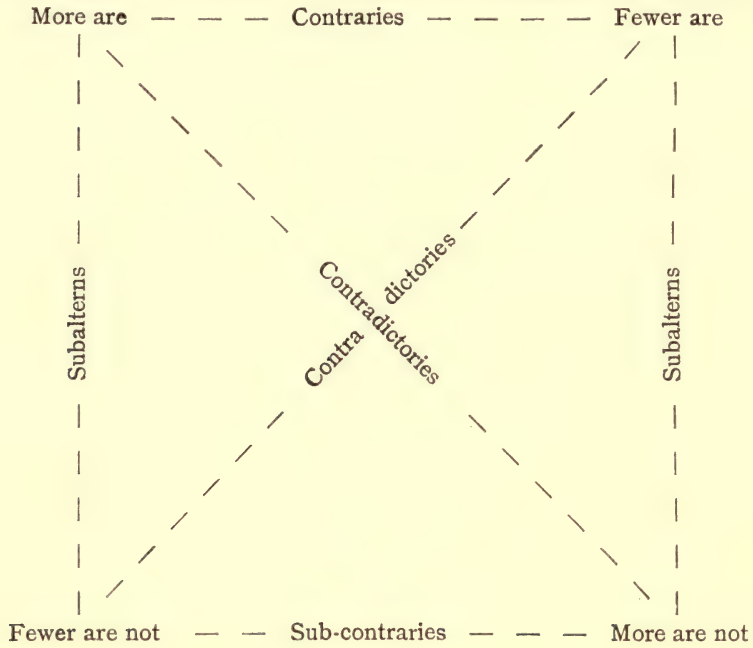
SQUARE OF OPPOSITION OF MINIMAL COLLECTIVE QUANTITIES.



THE SQUARE OF OPPOSITION OF MAXIMAL COLLECTIVE QUANTITIES.

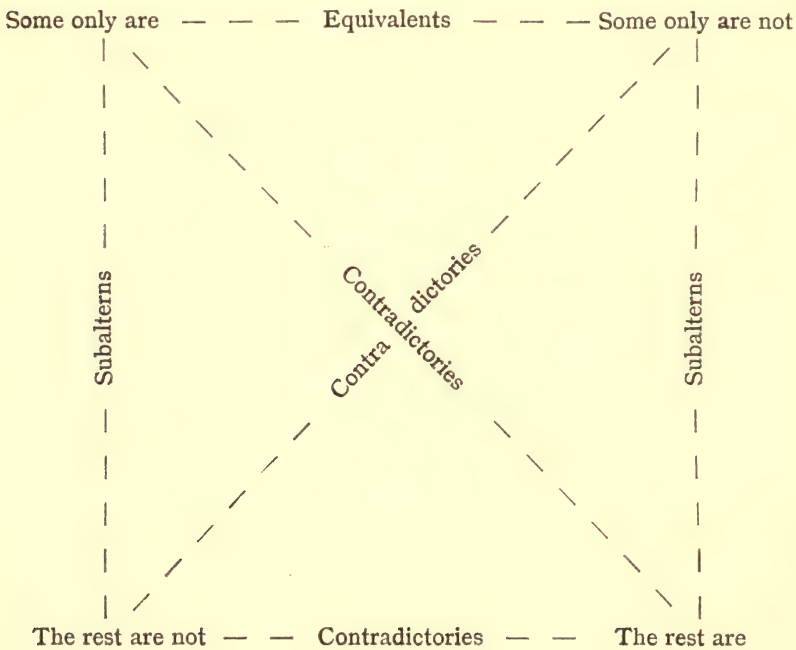


THE SQUARE OF OPPOSITION OF INDEFINITE COMPARATIVE QUANTITIES.



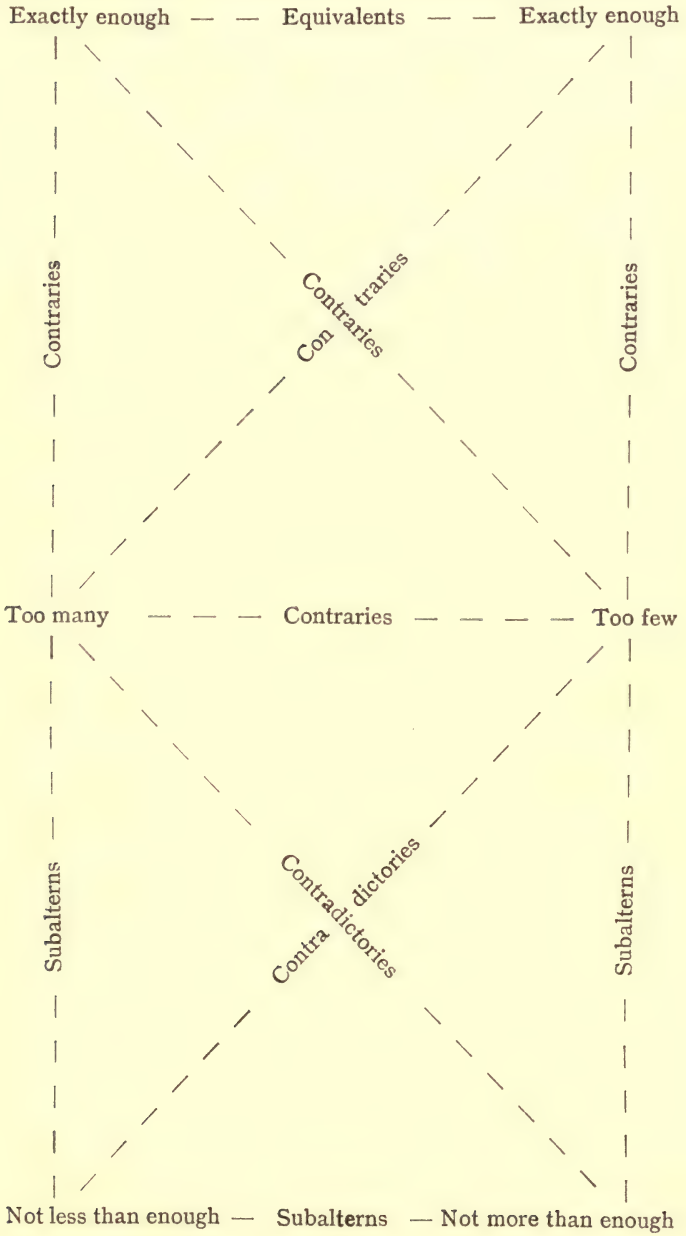
The complement of the Residual quantity is necessarily exact. 'Some at least, it may be all' may leave no residue; hence there can be but one Square for the Residual quantity.

THE SQUARE OF OPPOSITION OF THE UNIVERSAL RESIDUAL QUANTITY.



Purposive quantities require two Squares of Opposition, the one to provide for exactly enough, the other to provide for the maximal and minimal suitable quantity.

THE SQUARES OF OPPOSITION OF PURPOSIVE QUANTITIES.



Qualitative Terms.

With respect to possibilities and modes of denial, qualitative terms are divisible into five classes.

1. There are qualities which, starting from zero, proceed in one direction only, and in that direction increase in intensity without assignable limit. Such qualities, of which red, loud, wonderful, horrible, are instances, can have no Contrary or Opposite, and are deniable by the privative negative only. If we wish to deny that a thing is red, or loud, or wonderful, or horrible, there is no means at our disposal except that of saying that it is not red, not loud, not wonderful, or not horrible, as the case may be; or of asserting of the thing some quality inconsistent with that which we desire to deny. Although, however, the quality *in toto* cannot be denied except in these two ways: any given degree of intensity, whether maximal, minimal, or exact, may be denied by the assertion of some inconsistent degree; and the degrees that are inconsistent may be ascertained from the examination of inconsistent quantities just concluded, degree being substituted for quantity. Quantities of this class I call Singly Unlimited.

2. The next class of qualities consists of those which, starting from a zero point, depart from this point in opposite directions, and proceed in both directions without limit. Thus 'hard' starts from a zero point, and proceeds through degrees of increasing hardness without limit, there being no limiting point at which we can say of a thing that it is completely hard, or deny that a greater degree of hardness is conceivable. From the same zero point starts, in the opposite direction, a range of degrees of softness, which is similarly without assignable limit.

Such qualities, which I call Doubly Unlimited, are deniable, not only in the same ways as the Singly Unlimited, but also by the assertion of any degree of the opposing series. Very hard is denied, not only by not very hard, but also by soft, rather soft, very soft, and so on; and similarly, any degree of softness is denied by the assertion of any degree of hardness. Every degree of each series is negative with respect to every degree of the other series, and such negatives are called Contrary. Contrasted with each other, the degrees at opposite ends of the two scales are called Opposites.

3. A third class of qualities consists of those which, starting

from a zero point, proceed by successive degrees along a scale, but instead of proceeding without limit, as in the cases of the previous classes, arrive at length at a limit of completeness beyond which they cannot proceed. More correctly, we may contemplate the series as beginning at completeness, and from this point departing without limit. Such qualities are perfection, truth, purity, safety, definiteness, and so forth. If a thing is perfect, pure, or true, it admits of no degrees of perfection, purity or truth. It either has the quality or has it not, and no degrees of the possessed quality are conceivable. But though the quality admits of no degrees of intensity, it admits of unlimited degrees of approximation to, or departure from completeness. A thing cannot have degrees of perfection, but it may have illimitable degrees of imperfection. Purity and definiteness must be complete or incomplete. If complete, they admit of no degrees of intensity; but if incomplete, they may be incomplete through all degrees without limit. A thing cannot be completely unjust, or completely imperfect or unsafe, but it may be very or extremely unjust, imperfect, or unsafe.

Complete qualities, like other qualities, may be denied by the privative negative. It is a sufficient denial of perfection, or justice, or safety, to say that a thing is not perfect, or not just, or unsafe; but in addition to this mode of denial, completeness of any quality that is susceptible of completeness may be denied by asserting any degree of incompleteness. Complementarily, assertion of completeness denies incompleteness in all its degrees; and any degree of incompleteness denies every other degree with which it is inconsistent, according to the scheme of inconsistent quantities.

4. The fourth class of qualities consists of those which are limited abruptly at both ends of a scale, the scale being a scale, not of intensity, but of degrees of approximation or departure. In the previous class, an abrupt limit of completeness closes the scale at one end, and from this end we may depart, without limit to our excursion. In the class now under consideration, the scale is closed by completion at both ends, and the extent of our departure from completeness at one end is limited by the attainment of a complementary and opposite completeness at the other. Fulness is a complete quality. There can be degrees of approximation to fulness, and degrees of departure

from it; but there can be no degrees of intensity of fulness. When we depart from fulness, however, we cannot depart from it to an indefinite extent, as we can depart from justice and perfection. A point is reached at length at which we are brought up with a round turn, and find that we can proceed no further, for we are confronted with emptiness, which is itself a complete quality. We have now reached a blank wall, and must turn back; and the farther we recede from emptiness, the nearer do we approach to fulness, until we are again brought up with a round turn at a complete quality.

Qualities thus limited by completion at both ends of the scale of departure or approximation, are deniable in more ways than are those which are but singly limited. Fulness is deniable, not only by the privative negative, not full, and by all degrees of departure from fulness—nearly full only, not more than half full, and so on—but also by all degrees of approximation to emptiness, —partly empty, half empty, nearly empty—and also by complete emptiness, a mode of denial that cannot be used in the case of just, or perfect, or any other singly limited quality. Other pairs of complete opposites are transparent and opaque, legible and illegible, awake and asleep, wide open and shut.

5. Lastly, there are qualities that admit of no degrees at all, either of intensity or of approximation, but that are simply present or absent, such as metallic, moving, fallen, favourite, previous. Such cases may be viewed as doubly complete qualities, like those of the last class, in which the scale of intermediate degrees of approximation has been removed, and the ends brought together and coalesced into one. Such qualities can be denied only by the privative negative, or by the assertion of a quality which is equivalent to the privative negative. Metallic cannot be denied except by non-metallic; but moving may be denied both by not-moving and by at rest; but at rest means no more and no less than not moving. Such terms can have no Contraries, but Contradictories only.

Traditional Logic admits into its scheme quantitative terms only, two quantities only of quantitative terms, and two ways only of denying the quantitative terms that it admits. Though it recognises that there are contrary and opposite qualitative terms, it does not mention denial of quality in its scheme of

negation. According to Traditional Logic, there are but two ways of denying the proposition 'All soldiers wear red coats.' It may be denied by the Contradictory, Some soldiers do not wear red coats, and by the Contrary, No soldiers wear red coats. To these denials Traditional Logic is limited, and when they are made, its resources are exhausted. But in the actual practice of daily life, the assertion that all soldiers wear red coats may be denied in a score of different ways. It can be denied by All soldiers wear coats that are not red, and by Some soldiers do the like. It may be denied also by any assertion that is inconsistent with it. It can be denied by Some, or all soldiers wear black, blue, green, or yellow coats. It can be denied by Soldiers do not wear coats. It can be denied by Soldiers wear no coats at all. It can be denied by Soldiers wear smocks or blouses instead of coats. It can be denied by Soldiers are always in their shirt-sleeves.

The merits claimed by Traditional Logic for the modes of denial by the Contrary and the Contradictory, are that Contradictories exhaust between them the universe of discourse, and therefore of Contradictories one must be true and the other false; while Contraries do not exhaust the universe of discourse, and therefore both may be false. Either All soldiers wear red coats, or Some do not; and there is no third alternative. It is the absence of any third alternative that is said to exhaust the universe of discourse. It means that between the two alternatives every case is provided for. But between the Contraries, All soldiers wear red coats, and No soldiers wear red coats, there is a third alternative—that some do and some do not. Hence Contraries are said not to exhaust the universe of discourse; and it is plain that both may be false. There is, no doubt, a certain utility in making this distinction, though whether it is worth all the fuss that logicians make about it, is another matter.

Contradiction, the opposition between All are—some are not, and between None are—some are, is called by logicians the most perfect form and the most important form of logical opposition. Why it should be considered perfect, whether there can be degrees of perfection, and what the meaning is of perfect, as applied to logical opposition, are matters on which logicians do not enlighten us; but from the logical 'square of opposition' we may gather this—that denial may have more than one degree of comprehensiveness.

'No A is B' is a more comprehensive denial of 'All A's are B,' than is 'Some A's are not B.' 'Some A's are B' does not so comprehensively deny 'No A's are B,' as 'All A's are B' denies it. So far, Traditional Logic is justified; but from the square of opposition we cannot gather the much wider generalisation that denial may have many degrees of comprehensiveness, and that in some cases the number of degrees may become infinite.

According to the Logic of Tradition, there are two ways and two ways only of denying a proposition. We may deny by affirming the Contradictory, or by affirming the Contrary. But of pure denial of quantity there are many degrees, which may, indeed, all be grouped as either Contraries or Contradictories, but which are more conveniently regarded as of three kinds; according as they deny exactly what is asserted, or a portion only of what is asserted, or more than what is asserted.

If the assertion is 'Every man in the regiment has all his teeth sound,' the proposition is invalidated if I can show that one man has one tooth slightly decayed. This is a denial of the least possible comprehensiveness, and is a disproof or contradictory of the assertion. If, however, I affirm that Every man in the regiment has not all his teeth sound, or that Not every man in the regiment has all his teeth sound, I deny exactly, in form, what is asserted, neither more nor less; but my denial is, in fact, vague, and may cover every degree of comprehensiveness. But I may go much further than this. I can assert that not a man in the whole army has a sound tooth in his head. This is knock-down denial. It denies all that was asserted, and a great deal more. It strips the assertor stark naked of every rag of affirmation, and leaves him nothing wherewith to cover his shame. The first denial is a Contradictory; but so far from being 'the most perfect,' or the most important mode of denial, it is manifest that it is little more than a quibble; and if this were all the evidence that could be adduced in contradiction, the dentist who made the original assertion would escape without even a reprimand. The second mode of denial also must be regarded as a Contradictory; but though a perfectly valid denial, it is in a form that Traditional Logic knows not as a Contradictory. The third denial might be called a Contrary, but it is much more comprehensive than the Contrary known to Logic. I dare say logicians, if they admitted it into their scheme, would call it a super-Contrary; but at any

rate it is a far more effective and conclusive denial than either of the Contradictories. Prove it, and the dentist who certified to the soundness of the teeth of the regiment would not escape with a reprimand: he would be cashiered.

Inconsistency of Ratios.

Inconsistency of Ratios is not susceptible of such systematic treatment as is inconsistency of terms. A Ratio may always be denied by the insertion of a negative, and usually it may be denied in other ways also, and with various degrees of comprehensiveness. Most Ratios have a complementary opposite, which is affirmative in form, but denies and is denied by its opposite. 'He hit it' is deniable by 'He did not hit it,' but it is also denied by, and denies, 'He missed it.' In this case, the affirmative is denied by other affirmative Ratios, such as 'He went wide of the mark,' 'He very nearly hit it,' and by negative Ratios, other than the direct denial, such as 'He did not reach it,' 'He did not go near it.' In other cases, the negative Ratio is the sole mode of denial, though other Ratios may be incongruous, without being inconsistent. 'Brutus killed Cæsar' is not deniable except by 'Brutus did not kill Cæsar.' 'Brutus saved Cæsar's life' is incongruous with 'Brutus killed Cæsar,' but the two are not inconsistent, for they may refer to different occasions. Of course, in denying by means of an inconsistent Ratio, care must be taken that the Ratio is actually inconsistent, and is not merely incongruous. 'He said he would do it' is not necessarily denied by 'He said he would not do it'; nor by 'He declared he would not do it'; nor even by 'He emphatically stated what he'd be before he would do it'. All these he may have said, and yet he may have previously undertaken to do it. Even Peter denied his Master. If the assertion refers to one particular occasion of his utterance, then these are effective denials; but if not, then the only effective denial is 'He did not say he would do it'.

BOOK II

EMPIRICAL REASONING

CHAPTER XIII

EMPIRICAL REASONING

THE Art of Reasoning has already been defined as that of attaining, or constructing, or establishing, new propositions, from propositions already in possession. It is the process by which the mind, working on its own contents, rearranges them, and brings them into new forms. It gives new lamps for old ones. The form the new knowledge takes is the proposition. The material out of which the new judgement is constructed consists of propositions, or of those consolidated relations, that, as we shall presently see, result from propositionising. But though propositions are constructed in this way, it is clear that this process does not take us back to the ultimate origin of propositions. We are confronted with the problem of the owl and the egg. If every owl comes from an egg, and every owl's egg comes from an owl, which was first, an owl or an egg? If every proposition comes from a previous proposition, and this from another, what was the origin of the first proposition of all? Every proposition, however, does not come from a previous proposition. Some propositions only are thus derived. The remainder come directly, and all propositions are derived directly or indirectly, from experience. Experience is the ultimate source of all thoughts.

Some little controversy has arisen as to the meaning of experience; and by some, empiricism is taken to mean the mere succession of impressions made on the senses, as if they were received passively. This of course is not the case. The mind is active in receiving impressions; and by experience, I mean that active commerce between the self and its circumstances, by which the mind not merely is impressed, but perceives. The unit of knowledge is not a Sensation, but a Percept.

The radical vice of the Logic of the Schools was its failure to appeal to experience; and its failure to appreciate that all knowledge is founded on experience, and drawn from experience. To the Schoolmen, Logic meant, not the three modes of reasoning specified in the Introduction to this volume, but solely the second

of these modes—Deduction. Their efforts were concerned solely with explicating the implications of propositions; with deducing results from postulated principles; with speculating on the consequences that followed from suppositions. In this there would have been no harm if they had not mistaken postulates for facts, and suppositions for truths. Instead of going to experience for their principia or universals, they spun them out of their own bowels. Some of their cobwebs have long been swept away, but as we have already found, and shall find again in the next Book, many still await the broom and dustpan of the reformer.

It was the recognition of this defect in Scholastic Logic that led to the institution of Inductive Logic, as a separate branch of the subject. The radical difference between Deductive Logic and Inductive Logic, is that the one appeals to experience, and the other does not. The mistake of the Schoolmen was that they applied Deduction, which is the Logic of Consistency only, to the discovery of Truth. The mistake of the Inductive School, and of present-day logicians, is that, though they recognise that the direct appeal to experience cannot be made by any of the processes of Deduction, they confuse the indirect appeal to experience with the deductive process of syllogising; and fancy that Mediate Induction is the same as Mediate Inference; whereas the two, despite a superficial and deceptive similarity, are profoundly different. Moreover, though the Inductive School broke in one direction through the narrow and artificial limitations of Scholastic Logic, yet it falls short in two ways of the revolution that was necessary to bring this Logic into accordance with the practice of reasoners. In the first place, it leaves the whole structure of Deduction, limited, defective, and erroneous as it is, practically unchanged. In the second place, it confines its appeal to experience practically to the discovery of causation alone, and ignores the multitude of other relations that exist in the real world, and that it is interesting and important for us to discover.

The function of Induction is to solve problems; and the problems that confront us, and demand solution by appeal to experience, are by no means limited to causation. Causation is a very important relation, no doubt; but it is far from being the only relation that we desire to discover, and that we must discover if we are to adjust ourselves favourably to our circumstances. As a guide to conduct, it is necessary that we should solve innumerable

other problems—discover innumerable other relations. Is it raining? Will it be fine to-morrow? Who was it that called when I was out? Where did I put my hat? Did Babylon ever exist? Do any ruins of it remain? Do birds of a feather flock together; and if so, at what times, in what circumstances, in what numbers, in what places? Is the fleet efficient? Is it in home or foreign waters? How is it distributed? Have all the ships their full complements of men, of guns, of stores? Is ponos kala-azar? If not, what are the differences between them? Which is the best way to get to Bath, to Jericho, to Coventry? Is he rich or poor, stupid or clever, honest or dishonest? All these and many more are problems that it may be interesting and important to discover; none of them is a problem in causation.

Modern Logic, recognising the narrowness of Traditional Logic, and its severance from experience, seeks to bring Logic into touch with experience by declaring that all judgement refers to Reality. The effort seems to me as naïve and crude as the efforts of the Inductive School are partial and restricted. Reasoning cannot be based on experience by merely saying that it refers to reality. The statement is flatly opposed to fact. Modern Logic, in making the assertion, neglects that very appeal to experience on which every material statement ought to rest. If space were of four dimensions, I could tie a knot in a string without letting go the ends. Supposing I were you, and supposing you were me, and supposing we both were somebody else, our identities would be confused. If all the earth were apple pie, and all the seas were ink, and all the trees were bread and cheese, why then, many inferences could be drawn from these propositions; but to say that in stating the propositions, in forming the judgements, in drawing the conclusions, I am making any reference to reality, in any recognisable or admissible sense of the word reality, seems to me the merest moonshine.

That there are 'real' propositions, in the sense of propositions that refer to reality, and affirm the existence in the real world of a relation between real things, as well as propositions whose relations and whose terms are merely postulated for the purpose of the argument, I not only admit, but also contend. Both have their appropriate places in Logic, the one as the unit of the Logic of Experience, the other as the unit of the Logic of Consistency. Either being wanting, Logic is deficient by a moiety; but no

good purpose can be served by confusing them with one another, or by pretending that a postulated proposition necessarily refers to reality, when its very nature is to be indifferent to reality.

Far from agreeing that every proposition refers to reality, I consider it of the greatest importance to recognise the distinction between the postulated proposition and the real proposition; and the corresponding distinctions between the Logic of mere Consistency, and the Logic of Experience; between the *argumentum ex postulato* and the *argumentum in materiâ*; between the explication of what is implied in a proposition, and the investigation of fact. This distinction was drawn by Mill, but his distinction was not as complete and thoroughgoing as I would make it. He recognised that a new method was necessary to complement the Logic of Consistency; but the new method that he and his successors have adopted, is widely different from the method of solving problems that is here propounded. Mill's Logic of Induction is practically a method of determining causation experimentally. Supposing that the method can be applied, *mutatis mutandis*, to the solution of other problems than those of causation, still, it sets forth one only of the two methods by which problems are, in practice, solved. It sets forth the modes of appealing directly to experience. The indirect appeal to experience, which I call Mediate Induction, was known to him, but has never been described as it is described here. That there is an indirect as well as a direct appeal to experience, is, indeed, common knowledge; but this indirect appeal is confused by Mill and the Inductive School, as well as by Modern Logic, with the syllogism, to which it has a superficial and misleading resemblance. What I believe to be its true nature, together with the resemblances and differences between it and the syllogism, will be set forth in the next chapter.

In the Logic of Consistency, the proposition is the grist that is put into the inferential mill; and the sole function of inference is to grind it up, and present it in a new form. Until it is furnished with a proposition, and a complete proposition, inference cannot begin. But in most of the reasonings of actual life, the material presented to the reasoning process is not a complete, but an incomplete proposition; and the main task of reasoning, the sole task of Empirical reasoning, is the completion of the incomplete propositions that are continually confronting us. In short, the

task of Inference is the extraction of the implications of propositions; the task of Empirical Reasoning is the solving of problems. The aim of Inference is the maintenance of Consistency; the aim of Empirical Reasoning is the discovery of Truth.

Well, Doctor, have you discovered the cause of my child's illness?—Why, yes, I have found that it was caused by the foulness of your drains; and I should advise you to put them in order.

What would it cost, Mr. Builder, to relay my drains from the house to the sewer?—I reckon it would cost about £160, but I will send you a detailed estimate.

What is the prospect, Mr. Solicitor, of recovering from my landlord the cost of relaying the drains?—There is no prospect at all. Your landlord is not liable, and you must pay the cost yourself.

For the moment, we will not enquire how these conclusions are severally reached. All we are to notice now is that these three questions are problems; and the three answers are their respective solutions. It is quite clear that in each case the solution is more than the mere extraction of what is implied in a proposition, and therefore is reached by a process radically different from any of the processes of Inference described in the next Book. By no process of explicating the implications of any proposition in my possession can I discover the cause of my child's illness, the cost of relaying my drains, or the liability of my landlord to pay this cost. In order to solve these problems, I must go outside the proposition, for in fact, I have no complete proposition at my service; I have a problem only, and first of all, I must ascertain the nature of a problem.

A problem is an incomplete proposition. It is a proposition in which one of the three elements is wanting; and is temporarily replaced by a dummy; and the problem is solved by supplying the missing element. What is the cause of the child's illness? In this case the problem is, The cause of the illness is *x*: find *x*. What will be the cost of relaying the drains? The problem is, *X* will be the cost of relaying the drains: find *X*. Can the landlord be made to pay the expense? In this case the problem is, The landlord *x* (*can*, or *cannot be made to pay*) the expense: find *x*.

In the first problem, the Object-term is missing; in the second, it is the Subject-term that is missing; and in the third, the

element that is missing is the Ratio. Thus, any element in a proposition may be missing, and its absence converts the proposition into a problem. In any case, the solution of the problem lies in the supply of the missing element.

It will be seen by the examples given, that the scope of a problem varies much. The problems of the doctor and the builder were set at large. No hint was given to them of what the solution might be. The nature of the missing element was not suggested. The solicitor's problem was more restricted. He was not to search the universe for the missing element; it was suggested to him. All he was to do was to decide between two alternatives. And in practice we find that problems may present themselves with any degree of definiteness. Who killed Cock Robin? is an indefinite problem. Was it or was it not Sparrow that killed Cock Robin? is an alternative problem of much more restricted scope. Is there any relation between drunkenness and insanity? Is there a causal relation between drunkenness and insanity? The latter is a much more restricted problem than the former; but if an affirmative solution is found for the latter, it still leaves us in doubt whether the drunkenness causes the insanity, or the insanity causes the drunkenness, or whether both are not concurrent effects or causes of some third condition. Does or does not drunkenness cause insanity? narrows the issue to these definite alternatives.

The indefiniteness of a problem may reside in the scantiness of our experience; and in such a case, the vagueness with which it is expressed is proper and unavoidable. Or it may lie in the mode of stating the problem, and then it is avoidable and improper. Did Sparrow kill Cock Robin? sets three distinct and separate problems, and it is impossible to tell, from the form of the statement, which of the three is intended. It may mean, was it Sparrow that killed Cock Robin? It may mean, was it Cock Robin that was killed by Sparrow? Or it may mean, was killing what Sparrow did to Cock Robin? It is impossible to tell, from the way in which the problem is stated, whether it is the Subject, the Ratio, or the Object that is to be supplied. Hence, the best way to state a problem is to substitute x for the missing element.

From this statement of the nature of the problem, the distinction between Inference and Empirical Reasoning comes clearly into view. Inference needs, as its first and indispensable requisite, a

complete proposition. *Ex nihilo nihil fit.* From an incomplete proposition no implication can be extracted. 'Give me a premiss,' says the Deductive logician, 'and I will tell you what it implies. Give me an argument, and I will put it into convincing form. If there are certain flaws in it, I can point them out. But these are the limits of my powers. Incomplete propositions are of no use to me; I can do nothing with them. As to problems, I know nothing of them; they are not in my province. I can do nothing with them until they are solved. When you have solved your problem, bring it to me, and I will tell you whether it stands certain tests that I consider important; but until you have solved your problem, you must excuse me; my functions cannot begin.' Confronted with the innumerable problems of practical life, may we not fairly apply to the exponent of Traditional Logic the question put by Dr. Johnson to Lord Chesterfield: Is not a *logician* one who looks with unconcern upon a man struggling for life in the water, and, when he has reached ground, encumbers him with help?

There are two ways, and two ways only, in which a problem can be solved. If I want to know whether this jug will break if it is dropped on the stones, I can drop it on the stones, and see what happens. If I want to know whether there is anyone in the next room, I can go there and look. If I want to know whether my ship is arrived, I can go down to the docks and see. If I want to know whether the piano is in tune, I can strike the notes and listen. If I want to know whether the meat is tainted, I can find out by smelling it. In short, one mode of solving problems is by direct appeal to experience. This is the mode inculcated by John Hunter's maxim, 'Don't think: try.' This is the mode that alone is indicated in the discovery of causation by the Inductive School of logicians.

But the direct appeal to experience is often expensive; often tedious; often dangerous; often altogether impracticable; and then the second mode must be used. If I test the fragility of my jug by dropping it on the stones, and it turns out to be fragile, I have lost my jug. If I want to know whether this foreshore will ultimately form the summit of a mountain, or whether this mountain will ultimately be eroded and carried down in debris to the sea, it would be tedious to sit down and watch. If I want to know whether the bite of this cobra is fatal, I prefer some other method

than that of letting him bite me, and waiting to discover whether I live or die. And if I want to know whether the moon is inhabited, it is quite impracticable to go there and look.

Nevertheless, there are means at my command, there is a mode of appealing to experience, by which all these problems can be solved with as assured a certainty as by the direct appeal. Without breaking my jug, I can ascertain with certainty that it is fragile; without having seen this mountain upheaved from the sea, I can be quite sure that its summit once was a sea-bottom; without being bitten by the cobra, I can make quite certain that its bite would be fatal; without going to the moon, I can be as sure that it has no human inhabitants as if I had explored every foot of its surface. In these cases I make no direct appeal to experience, but I can appeal to experience indirectly, and thus solve my problems with complete certitude.

When the direct appeal to experience takes the materials of experience as they are, and merely notes them, without making any alteration in them, the appeal is called Observation. But it often happens that the real world affords no experience that applies precisely to the problem, and then we must create a quasi-artificial experience *ad hoc*. Such quasi-artificial experience is called Experiment. If I want to know whether there is anyone in the next room, I can go and look; and the experience furnishes me with a solution of the problem, without any artificial manipulation of the materials by me. But if I want to know whether the jug will break if it falls on the stones, the only way of appealing direct to experience is to create an artificial experience, *ad hoc*, by letting it fall on the stones—unless, indeed, I wait until it has fallen on the stones by accident. In the case of the jug, we may be sure that such an accident will happen sooner or later, and therefore, if we are not in a hurry, we may be content to wait until the accident happens, and then we shall know; but in many cases, the precise experience we need is not likely to happen accidentally; and then we must have recourse to experiment.

The direct appeal to experience has been shown to be often inconvenient, often dangerous, often impracticable. These defects are great and important; but it has yet another defect, perhaps more important still. The knowledge that we obtain from direct appeal to experience is limited to what now exists or what now happens. From it we can obtain no knowledge of the past or

the future. We cannot transport ourselves back into the past, or forward into the future, and observe directly what existed or happened, what will exist or will happen. Neither by observation alone, nor by experiment alone, nor by any combination of observation and experiment alone, can either the past or the future be ascertained. Yet the majority of the problems that confront us in life belong to the past or the future. What *was* the cause of my child's illness? What *will be* the cost of laying new drains? These are types of the common problems of life. To conclude, from any observation or experiment now made, what must have been in the past, or what will be in the future, is an exercise, not of the direct, but of the indirect appeal to experience. All that the direct appeal can give us is what now exists, or what now happens; in short, what is presented to perception.

The direct appeal to experience is valid in proportion to the faithfulness with which the experience fulfils the conditions of the problem. If the problem is whether this jug will break if it is dropped on a stone floor, the problem cannot be solved by observation or experiment alone, except by dropping this very jug upon a floor of stone. If I drop another jug upon a stone floor, and argue from the result what the fate of this jug would be under similar experience; or if I drop this jug on a feather bed, or into water, or on a wooden floor or an iron plate, and argue from the result what would happen if I dropped it on a stone floor, I am employing not the direct, but the indirect appeal. The direct appeal requires an experience of the very relation between the very terms that I am seeking to establish. Any departure from these conditions imports an element of indirectness into the appeal.

It is true that neither observation nor experiment is often applied, in this sense, to the direct solution of the problem in hand. Both, and especially experiment, are usually made to afford a basis for the indirect appeal; and this teaches us two things—first, the intimate association, in practice, of the direct and the indirect appeal; and second, the immense importance of the indirect appeal to experience, by which the great majority of problems are solved.

The indirect appeal to experience, as I conceive its nature, has not hitherto been described, or even recognised, by logicians, either of the Traditional, the Inductive, or the Modern School.

No doubt all of them, and especially the two last, do recognise that there are such things as problems, though they do not define a problem, or show in what it consists, or even explicitly allude to problems; and no doubt logicians of each school do propose methods for the solution of certain problems; but they do not recognise what seems to me to be the true nature of the indirect appeal to experience, or that it is the general mode of solving problems—the only mode by which the great majority of problems can be solved.

The direct appeal to experience—Immediate Induction, as we may call it—is not a mode of reasoning, as reasoning is understood in Logic. Observation and experiment are processes in which reasoning is in rudiment; and the validity of observation and experiment depends on the minimisation of reasoning—on the elimination of reasoning, as far as reasoning can be eliminated. The more complete the elimination of reasoning, the more valid and trustworthy is the observation or the experiment. In other words, direct appeal to experience gives results that are trustworthy in proportion as the appeal is direct, and as the indirect appeal is eliminated. The total exclusion of the indirect appeal is impracticable: all that we can do is to reduce it to a minimum. This is what Mill had in his mind when he said that what we observe is usually a compound result, of which one tenth may be observation, and the remaining nine tenths inference. 'I affirm . . . that I saw my brother . . . I only saw a coloured surface . . . and . . . I concluded that I saw my brother.' In other words, perception is the interpretation of sensory impressions; and in proportion as interpretation enters into perception, in the same proportion enters the liability to error. Interpretation of sensations, and their combination and elaboration into percepts, pertain to Psychology, and are out of place in Logic; but this is one of the points at which the two sciences come into contact.

CHAPTER XIV

THE INDIRECT APPEAL TO EXPERIENCE

Mediate Induction.

The direct appeal to experience we have found to be limited in practicability, and restricted in usefulness. By far the greater number of the problems that confront us must be solved, if they are to be solved at all, by the indirect appeal. What, then, is the nature of this appeal? It seeks to solve this problem by appealing to our experience of similar problems. It seeks in experience a similar problem that has been solved; and applies the solution of that problem to the solution of this. The problem is a proposition in which there are two given elements and a missing element, or quæsitum. In the indirect appeal to experience, we search experience for a proposition similar in the given elements; and we adopt into our problem the third element of that proposition as our quæsitum.

The similar proposition that is discovered in experience, we will call the premiss. Then the first step in Mediate Induction is to find a premiss. At once we see the radical difference between this process and Inference, or Deduction. Deduction cannot stir a step unless a complete premiss is given. The whole process of Inference is founded and based on a given premiss—on a postulate. Mediate Induction knows nothing of postulates. To Mediate Induction no premiss is given. Its function is, first of all, to find a premiss; and it is in the finding of an appropriate premiss that the skill and acumen of the investigator are first and most displayed. He searches experience; and from experience he selects whatever relation it contains that most resembles, in its homologous elements, the given elements of the problem.

The doctor is asked what was the cause of Johnny Jones' illness? He puts it to himself—'The problem is, Johnny Jones' illness is caused by x. I am to find x. I must search experience for a similar case—for a case as like as possible. I must find a

case in which a similar illness was traced to a cause, and I may be sure that, if the illnesses are really similar in material respects, and if the true cause of the one illness was discovered, the cause of the other will be the same, or will be similar in material respects.' He searches experience, and he finds what he wants. He remembers Jenny Brown's illness, which was, in material respects, similar to Johnny's; he remembers that Jenny Brown's illness was traced without doubt to foul drains, to suppurating gums, to faulty diet, or what not; and he concludes, with assured certainty, that Johnny's illness was due to the same cause, or to one that is similar in material respects. What his warrant is for so concluding, we shall consider presently. For the moment, it is enough to show what the course of the reasoning is.

This, then, is the nature of the indirect appeal to experience that I call Induction, or Mediate Induction. When a problem is presented to us that does not admit of solution by direct appeal to experience, we appeal to experience indirectly, by comparing the problem with some previous experience that is similar in material respects. We cannot reproduce Johnny's illness. If we could, it would not be the same illness, but another one. We cannot set the cause in motion to produce the illness, for *ex hypothesi*, the cause is unknown. Direct appeal to experience cannot be made. We therefore appeal to experience indirectly, through the medium of some similar problem, the solution of which is known. We search experience for a premiss—for a proposition known to be true in fact, and as like as possible to the problem. We compare the problem with this premiss; and, if they are like in the two given elements of the problem, we conclude that they are like in the third element also. Thus we supply the missing element in the problem, by adopting into it the homologous element of the premiss. The reasoning may be represented thus; the mark || being the sign of assimilation.

Jenny Brown's illness	was caused by	foul drains
||	||	||
Johnny Jones' illness	was caused by	(*x*) *foul drains.*

That this is the actual process of reasoning in the case

supposed, no one who follows it, and traces the operations of his own mind, can, I think, have any doubt. At least, it compares in this respect on equal terms with the syllogism; for I have never heard any reason for the assertion, that the syllogism is the common form of all reasoning, except that it is so. Modern Logic, as represented by Mr. Bosanquet, enumerates more than twenty modes of reasoning—ten of judgement, dealing with Simple propositions; and thirteen of Inference, dealing with Compound propositions. I find it difficult to appreciate the niceties of distinction that separate these forms from one another; nor do I find any one of them that is not either Inference as understood in the next Book, or Mediate Induction as here explained.

Comparing Induction, as here described, with syllogising, we find the following differences between them :—

1. The syllogism has three terms, and no more than three. The fallacy of four terms is the cardinal fallacy of the syllogism, and *ipso facto* falsifies any syllogism in which it occurs. The Induction contains four terms, and cannot be constructed with less than four.

2. The syllogism consists of three, and no more than three propositions, all of which must be complete. The Induction consists of two propositions, one of which is incomplete when it enters into the Induction, and is completed by the process of reasoning. Since, however, the assimilation marks can be expressed in words, it is possible to express the Induction in three propositions; but it may be expressed in two, which the syllogism can not.

3. The syllogism contains two premisses; and no syllogism can be constructed with more or less than two. The Induction need contain but one premiss; but Inductions can be constructed with two or with three premisses, as will hereafter be shown.

4. The foundation of the syllogism is the Universal proposition. Without a Universal, there must be an undistributed middle, with all its dire consequences. The Induction is founded on an appeal to experience. It needs a Universal, it is true; but its Universal is very different from that of Traditional Logic. The Universal of Traditional Logic is a postulated universal, and need not be true in fact. It may be wildly impossible. The Universal of Mediate Induction is founded on experience. It must, therefore, be consistent with experience; and every Induction must contain an appeal to experience.

5. The syllogism must have a middle term, common to both premisses. The Induction has no middle term. Those inductions that have but one premiss, cannot have a middle term.

6. According to Traditional Logic, one premiss at least of the syllogism must be affirmative. The single premiss of an induction may be affirmative or negative.

The differences between Mediate Inference and Mediate Induction are, therefore, profound and far-reaching. In all the respects enumerated above, they differ; but the main difference, the important difference, the difference from which it results that Induction is in daily and hourly use, while Inference is employed on occasion only, is that Inference applies to postulates, and takes no account of Truth or of experience; while Induction rests on experience alone. Whether the postulates of Inference are materially true or not, has nothing to do with the course of the argument, and is of no concern to it. For the purpose of Inference, nothing is too impossible, too absurd, too preposterous, to serve as a postulate. We can argue from the postulate that matter is imponderable, that two straight lines can enclose a space, that virtue is red and the soul is square; and our inferences will be sound if the argument is properly conducted. But Induction knows nothing of postulates. To Induction, the material truth of its premiss is vital. Induction admits those premisses only that are consistent with experience,—that are, or are believed to be, true in fact. A premiss which is at variance with experience, or which has no basis in experience, has no place in Induction. In short, Inference is the maintenance of consistency only; Induction is the discovery of truth—of fact. An Inference may be perfectly valid, in the sense of consisting with its postulate, and may stand every test of consistency that can be applied to it, and yet may be of such a crazy character that we should never dream of founding our conduct on it. If a canary bird cannot live on any diet except one of wild elephants, then I cannot expect to keep a canary bird alive in a cage unless I provide a diet of wild elephants for it. The Inference is plain, rigorous, unescapable. But in spite of the unexceptionable validity of this inference, I should never dream of sending to Africa for a consignment of wild elephants to feed my canary upon. If I want to solve the problem, What the proper diet for a canary is, I must either appeal directly to experience, by trying

one diet after another till I find the one that suits; or I must appeal to my experience, or that of others, in similar cases. There is no other alternative. In experience, and in experience alone, is the solution of problems to be found. The conclusion of an Inference is in the premiss that is supplied. The solution of a problem is not in the problem. It must be sought from an extraneous source; and that source is experience. Inference is formal proof: Induction is material proof. Inference finds what is consistent with its postulate, and is indifferent to the truth of the postulate: Induction sets out to discover what is true; and the truth of its premiss is vital.

If every man is mortal, and Socrates is a man; then Socrates is mortal. The Inference is irrefragable; and, if the premisses are true in fact, the conclusion is true in fact. But Deduction does not allow me to assume the truth of my premisses. It is this incompetence on the part of Deduction to guarantee the truth of its premisses, that led to the interminable discussions on the nature of Universals, which dominated the Schools for centuries, and which have been revived by Modern Logic. If I want to discover whether Socrates is, in fact, mortal, Inference will not assist me. I must have recourse to Induction. To discover a fact, it is manifestly useless to postulate a premiss, which, *ex vi termini*, may be true or not. To attain material truth, we must start from material truth. To discover fact, we must have fact to go upon.

'Oh, but,' says the logician, 'I have fact to go upon. It is a fact that all men are mortal, and you cannot gainsay it.' To this there are four good and sufficient answers. In the first place, it is not a fact. In the second place, if it were a fact, that has nothing to do with the inference. In the third place, if you assume it to be a fact, you have already begged your conclusion. In the fourth place, if it be a fact, you know it to be so, not from your postulate, which may not assert it except tentatively, and as a postulate, but from experience; and there is no appeal to experience in your postulate. If you assume it to be a fact, you assume what is not in the postulate, and you violate a Canon of that very inferential process that you purport to employ.

It is not a fact, in the proper sense of fact, that all men are mortal. A fact is a thing done; and all men are not mortal in the sense that their mortality is proved by their death having

occurred. A fact is an event that has happened, and the event of the death of all men has not yet happened, or there would be no discussion about it. In literal truth, therefore, it is not a 'fact' that all men are mortal.

In the second place, whether all men are in fact mortal or not has nothing to do with the process of inference. If all men are mortal and Socrates is a man, he is mortal, no doubt. That is true, and so is it true that if all men are immortal, and Socrates is a man, he is immortal. Both inferences are perfectly valid, but both cannot be founded on fact, and whether either of them is or is not founded on fact, and if so which, makes not the slightest difference to the validity of the inferences.

In the third place, if we believe that all men are mortal, in the sense that all men now living will die, it is perfectly clear that there must be some ground in experience for the belief. It is clear that the knowledge that Socrates will die depends, not on the postulated proposition that all men are mortal, but on empirical grounds.

In the fourth place, if it is assumed that All men are mortal, this postulate is assumed for the purpose of some argument, and any conclusion derived from it will be as true as the assumption and will have no other authorisation. It is a conventional assumption, on a par with the assumptions about centaurs and jabberwocks, and of neither more nor less validity, as an assumption, than these are. If the assumption goes further, and is assumed to be true in fact, the limits of Deduction are *ipso facto* exceeded, and we are in another province of reasoning. Now it is necessary that we should state the grounds of the assumption, and once the grounds of an assumption are stated, it ceases to be an assumption.

'Socrates is mortal' is an answer to three main questions. 'Is it Socrates who is mortal? Is it mortality that is an attribute of Socrates? Is or is not Socrates mortal?' Commonly, the last question is taken to be that to which 'Socrates is mortal' is the answer. But this is not explicit enough. It does not express the doubt, if any doubt exists, in the mind of the questioner. What he wants to know, if he wants to know anything on the subject, is whether Socrates will die. If Socrates is already dead, the solution is known. There is then no problem. It is only if he is alive that we can possibly want to know whether he is mortal.

Will Socrates die? That is the problem. Formally stated, it is Socrates *x* (*will* or *will not*) die: find *x*. To solve this problem, how do we proceed? I say that we proceed to find a premiss in experience. We search experience for the relation most resembling the relation stated in the problem. We ask what our experience is of the mortality of beings most like to Socrates. We compare Socrates with other men in the material respect of mortality, and we find, in experience, that, in this respect, men are divisible into two classes—those whose mortality is proved, and those whose mortality is not proved—those who are dead, and those who are alive. Socrates belongs to the latter class. We have precisely as much, and no more, warrant for concluding that Socrates will die, as for concluding that every and any other man now living will die. Our task is, not to bring Socrates into the class of those who are dead, which would result in proceedings against us at the Old Bailey; but to find out how far Socrates, and other living men, can be assimilated, in the material respect of mortality, to those who have demonstrated their mortality by dying. How is this to be done? What have we to go upon? What influences our minds in concluding that Socrates will die? Clearly it is not that All men are mortal, for this is assuming what we have to prove, an assumption quite legitimate, and even necessary, in the Logic of Inference, but preposterous, in the literal sense, in material reasoning. The question is What enables us to assimilate, in respect of mortality, the great multitude of living men with the greater multitude of men who have died? Mill says it is our knowledge of the Uniformity of Nature. Well, for one thing, Nature is not uniform, as Mill admits; but if it be, and if it is from this that we get our assurance that Socrates and other living men will die, whence do we get this knowledge of the Uniformity of Nature? On this, logicians are silent. I say that we get our assurance that Socrates and the rest of us will die from no such vague and inaccurate assumption. If we did, our assurance would be as vague and as inaccurate as the assumption itself, since nothing can be had out of a premiss that is not in it. Our assurance that Socrates and the rest of living mankind will die, is neither vague, except as to time and manner, nor inaccurate. It is precise, and it is true. Whence do we obtain it? I say that we obtain it from experience,—from the uniform experience of mankind for innumerable generations, and in innumerable millions of instances, that

no man has permanently escaped death. Given time, no man has failed to exhibit mortality. In other words, *the relation between man and mortality is constant in experience.* That, and that alone, is our warrant for the conclusion that Socrates will die.

But can the relation between man and mortality be said to be constant in experience, if there are multitudes of men who have not proved their mortality? Yes, for every man who has died has lived for a certain time before dying, and the men now living resemble in all material respects the men who have died—among other material respects, they resemble those who have died, in that a certain period of living precedes their death. The relation, in men, between living and eventually dying, is constant in the experience of the whole of mankind, without a single permanent exception. It is this constancy in experience that enables, and more than enables, that compels us to conclude, that the relation will continue to be constant in experience. The living men are temporary exceptions to this constancy in experience, but we are unable to regard them as permanent exceptions, because the relation that we have found constant is the *eventual* sequence of death upon life. There have always been multitudes of temporary exceptions: there has never been a permanent exception; and this undeviating constancy in experience allows, and compels, us to conclude that there never will be a permanent exception, and that Socrates and the rest of us will ultimately die.

Is this conclusion warranted? Are we justified in concluding that since, in the experience of mankind, a thing always has been, therefore it always will be? This problem does not belong to Logic. It pertains to Epistemology, and need not be considered here. Those who wish to pursue the subject on these lines will find it treated in my book on Psychology. As far as Logic is concerned, it is enough that constancy in experience does in fact form the ground—the sole ground—of Material, as distinguished from Formal reasoning. Of course, this doctrine is open to the objection that it lays down, as the criterion of certainty, that very *inductio per enumerationem simplicem, ubi non reperitur instantia contradictoria,* which Bacon put as the weakest form of Induction. In this I do not agree with Bacon. I hold that every one of the truths that we hold as most certain, rests upon the accumulation of instances without exception. Is anything more certain than that all matter gravitates? And on what does this certainty rest,

except the accumulation of instances without exception? Is anything more certain than that resistance is never found apart from extension? The certainty rests on the same ground. Why are we certain that the sun will rise to-morrow? Have we any better ground for our belief than the accumulation of instances without exception? How do we know that mutilation and injury of the healthy body will certainly be accompanied by pain? Is it not from the same unvarying experience? So far from the *inductio per enumerationem simplicem* being untrustworthy, it is the ground of every one of our most certain convictions. Of course, Bacon's aim was to deprecate the reception of simple enumeration as sufficient proof, without searching for contrary instances, and such an aim is wholly laudable; but his maxim has been widely held to mean that simple enumeration cannot under any circumstances give a valid induction, and this opinion, I hold, is wrong.

The Deduction by which we prove the consistency of the conclusion, that Socrates is mortal, with the postulates that All men are mortal and Socrates is a man, is stated in the form of a syllogism, thus:—

If All men are mortal;
And Socrates is a man;
Then Socrates is mortal.

The Induction by which we prove that Socrates will, in fact, die, is as different in form as it is in conclusion. It is this:—

Men — have, constantly in experience, been found — mortal
‖ ‖ ‖
Socrates — (*x*) *will be found* — mortal.

Or, in formal propositions, we may state the argument thus:—
Since men have, constantly in experience, been found mortal;
and
Since Socrates resembles, in respects material to the argument, men who have died;
Therefore, Socrates will die.

In this argument will be found certain characters that are common to all Mediate Inductions, and that form the conditions of validity of all such Inductions.

1. The Ratio of the premiss predicates a relation that is constant in experience.
2. One of the given elements in the Problem (in this case the Subject) is assimilated to its homologue in the Premiss.
3. The other given element in the Problem (in this case the Object) is identical with its homologue in the Premiss.
4. The quæsitum is obtained by adopting into the Problem the remaining element (in this case the Ratio) of the Premiss, with which the quæsitum is homologous.
5. The difference, as well as the likeness, of the assimilated elements of the Problem and Premiss, is reflected in the conclusion. Socrates differs from the men who have proved their mortality by dying, in the fact that he is alive. Hence the quæsitum '*will be found*' is not the same as its homologue 'have been found' in the Premiss; but reflects the difference between Socrates and dead men.

If these statements are severally changed from assertions to mandates, they become Canons of Induction; and may be stated thus:—

1. The First Canon of Induction is that *the premiss must predicate a relation that is constant in experience, or is subsumable under one that is constant in experience.*

Constancy in experience, of the relation expressed in the premiss, is the very *sine quâ non* of assured Induction; for note the effect of its absence. If Cassius is found murdered, why cannot I conclude that, since Brutus murdered Cæsar, therefore it was Brutus who murdered Cassius also? In all respects but the one in question, the argument is valid.

Brutus	murdered	Cæsar
||	||	||
(*X*) *Brutus*	murdered	Cassius.

Here are all the conditions, save the one in question, of valid Induction. One given element in the problem—the Ratio—is identical with its homologue in the premiss. The other given element in the problem—the Object—is similar in all material respects to its homologue in the premiss. Cassius, like Cæsar, is dead. Like Cæsar he died of violence on the Ides of March;

like Cæsar, he was stabbed at the foot of Pompey's statue. In all respects material to the argument, he resembles Cæsar. Why, then, is it unjustifiable to conclude that Brutus killed him? for Brutus unquestionably killed Cæsar. Because, and only because, the relation between Brutus and murdered men is not constant in experience. There are, in experience, many exceptions. Many men have been murdered by persons other than Brutus, and hence it is that the conclusion cannot be drawn. If no one in the history of the world had ever been murdered except by Brutus, and if Brutus had been known to murder many people besides Cæsar, the suggestion would be very strong indeed that Cassius was killed by Brutus, and the onus would lie on Brutus of proving that he did not kill Cassius; but as matters stand—experience being what it is—if the fact that Brutus killed Cæsar is the only evidence in support of his having murdered Cassius, the magistrate would have no alternative but to dismiss the charge.

But does not this prove too much? How is the Canon, that the relation expressed in the premiss must be constant in experience, consistent with the argument about the cause of Johnny's illness? In this instance, a conclusion which we feel to be valid, is drawn from a premiss stating a single instance only; and how can it be said that any single instance is constant in experience, any more than the single instance of Brutus killing Cæsar?

The difference is that the causation of the illness was not inferred from that premiss alone. Lurking in the background of the mind is another premiss, which is not explicitly mentioned in the argument, but which is in the argument, and is essential to the argument. It is there, ready to come forward and assert itself if, and when, called upon. It would be impossible to argue from one case of causation to another, unless it were assumed that, in experience, causation is constant: that the same cause always produces the same effect, and the same effect is always due to the same cause. This relation between cause and effect is, in fact, constant in experience, and hence material reasonings based on it are valid, if valid in other respects.

Then Induction, like syllogising, does, after all, require two premisses? Not necessarily. If the individual relation, expressed in the premiss, is not itself constant in experience, it

must be subsumed under a more comprehensive relation that is constant; but if the constancy in experience inheres in the very relation of the premiss itself, then this premiss alone is sufficient to warrant the conclusion. Since the mortality of men is constant in experience, I can safely conclude, from this premiss alone, that Socrates, or any other man, or any number of men, are mortal; but, when the constancy in experience is not expressed in the premiss, but is assumed, something further in the nature of a premiss is evidently required. Let us take another case.

I see a snake, the like of which I have seen but once before in my life, and that was yesterday, when a similar snake bit my dog, which died in ten minutes. That snake I killed; and on seeing this one, which is precisely similar in appearance, I conclude at once that it is venomous. What is the process of reasoning, and what is its warrant?

The problem is 'This snake *x* (*is* or *is not*) venomous'; and the induction is

That snake	was	venomous
‖	‖	‖
This snake	(*x*) *is*	venomous.

The conclusion is irrefragable; and if I were to disregard it, I should pay with my life for my indiscretion. There is no Universal, in the sense attached to that word by Traditional Logic, in the reasoning. I cannot afford to wait until I have collected all the individuals that exist of that species, including the one now under observation; procured each of them to bite an animal; and observed whether the bitten animals live or die. This is the only way known to Traditional Logic of obtaining a Universal, and, without a Universal, Traditional Logic is powerless. When I had completed the laborious task, then, and not till then, should I be in a position to argue

All snakes of this species are venomous;
This is a snake of this species;
∴ This snake is venomous.

And this conclusion could not be reached until I had actually determined by experiment, in the case of this very snake, that it is venomous. The Universal would, therefore, be not only impracticable, but utterly superfluous, and redundant, and

unnecessary. In practice I do not employ any method so absurd. I employ Induction, and I say, 'This snake resembles precisely that which I found yesterday to be venomous; therefore this snake also is venomous.'

This argument is in almost the same form as the argument that, since Brutus killed Cæsar, therefore he killed Cassius also; the only difference being the unimportant difference that, in the case of the snake, the quæsitum is the ratio; while, in the other, it is the subject. Yet the one is felt to be irrefragably valid, and the other to be utterly unwarranted. What is it that makes this difference?

Mill tells us that it is the uniformity of Nature. We can argue from the venomousness of one snake to the venomousness of the other, because in this case Nature is uniform. We cannot argue from the killing of Cæsar by Brutus to the killing of Cassius by Brutus, because in this case Nature is not uniform. The shapes of flowers of one species are uniform, but those of different species are not uniform; and the shapes of clouds are never uniform. The sequence of night upon day, and of summer on winter, is uniform; but the sequence of rain upon wind, or of wind upon sunshine, is not uniform. Logicians admit, in the words of Mill, that 'The course of Nature is not only uniform, it is infinitely various.' But in certain respects, surely, Nature is uniform. One of the favourite instances given in the text books of Logic, of the Uniformity of Nature, is the permanence and intransmutability of the elements. Alas! it is now discovered that certain of the elements are transmutable!

To rest the validity of reasoning on the Uniformity of Nature, and in the same breath to admit that Nature is not uniform, is a proceeding the like of which is scarcely to be found outside a book on Logic. It is true, however, that Nature is uniform in certain respects, and that in those respects it is safe to rest our arguments on the uniformity; but until we have some criterion that enables us to determine in what respect Nature is uniform and in what it is not, the uniformity, where it exists, is of no value. Is there such a criterion? If there be, logicians are not agreed about it. Some, indeed, offer as a criterion the Laws of Thought. Others regard the Uniformity of Nature as based on induction from uninterrupted experience; and these I believe are right; though why they should rest the validity of argument on an imaginary and non-existent

Uniformity of Nature, which they infer from uninterrupted experience, rather than on the uninterrupted experience itself, I do not understand.

The true reason that we can argue from 'That snake was venomous,' to 'This snake, which is exactly like that, is venomous'; while we cannot argue from 'Brutus killed Cæsar' to 'Brutus killed Cassius,' seems to me to be this: Behind the first argument lurks the supplementary premiss, not that 'Nature is uniform,' but that 'In experience, the relation between the appearance of snakes, and their venomousness, is constant'; or 'The experience that snakes that are alike in appearance are alike in structure and qualities, is constant.' The inference that, since that snake was venomous, this snake, which exactly resembles that, is venomous, does not rest solely on the likeness between the snakes. It rests upon a constancy in experience. Constancy of what? A single instance is not constancy, in any proper sense; and a single instance is all we have, so far, to go upon. The second, the underlying, the silent premiss, which validates the reasoning, is that the relation between the first snake and its venomousness belongs to a class, or is subsumable under a relation, that is constant in experience. It is not merely that the relation between the appearance of snakes and their venomousness is constant in experience. I could, and should, draw the same inference if I had never seen or heard of any snake except the one that bit my dog yesterday, and this one. The underlying premiss is far wider and more comprehensive than this. It is that the appearance of all animals is an index to their other properties—nay, it is wider, much wider, still. The appearance, not only of all animals, but of all organic beings; not only of all organic beings, but of all bodies whatever, is an index to their properties. The experience, not only of ourselves, but of the whole human race, is constant, that the more closely things resemble one another in some properties, the more closely, on the whole, do they resemble one another in other properties. The conclusion, that the second snake was venomous, was felt at once to be irrefragable. It was not merely arrived at without difficulty, but was thrust and forced upon me. We now see why it was so readily accepted—why it was inescapable. It rested on a generalisation—on a constancy in experience—of boundless extent.

In every Induction, the relation expressed in the premiss must be itself constant in experience, as in the case of the mortality of man; or it must be subsumable under a relation that is constant in experience, as in the case of the venomousness of the snake. It may, indeed, be plausibly argued that every premised relation must, or may, be subsumable under one more comprehensive. Even the argument from the mortality of man does not rest upon the constancy of that relation alone. The relation may be subsumed under a wider relation—that, not only of man, but of all animals, of which man is but one, to mortality. Nor does the subsumption end here. We have at the back of our minds, unavowed, latent, tacit, but ready in reserve to be called into action if necessary, the still wider relations, still constant in experience, that all organic beings, animal and vegetable, are mortal; and that all material things are subject to decay and dissolution.

In this sense, the contention of Traditional Logic is true, that all reasoning—all Empirical reasoning—rests upon a Universal. Constancy in experience is the Unknown God that the logicians of the Schools ignorantly worshipped. I cannot but think that it was some dim, undefined, vague, approximate appreciation of this necessity that led to the interminable discussions on the nature of Universals. As long as the Logic of Postulation was not distinguished from the Logic of Material Argument, it was impossible to arrive at the true nature of Universals, for the Universal of the one is profoundly different from the Universal of the other. The postulated Universal can never validate an argument *in materiâ*, any more than the true nature of centaurs or jabberwocks can be ascertained by appeal to experience. It was the non-recognition of the distinction between the discrete departments of Logic that made all discussion on Universals barren, and led to endless arguments in circles. The Universal of the Logic of Postulation is a term having a certain quantity, in a relation postulated for the purpose of argument; and all that is vital to the argument is that the quantity of the corresponding term in the conclusion is not greater than is warranted by the premisses. The Universal of the Logic of Induction is not a term at all. It is a relation—a relation that is constant in experience—and it is vital to the argument that this relation should be constant. Discussion rages round the meaning of the 'All men' in 'All men are mortal,'

when the question actually at issue is the meaning, not of the term, but of the copula. It is not what is meant by 'All men,' but what is meant by All men *are* mortal. In the Logic of Postulation this means 'For the purpose of this argument, all men are credited with the attribute of mortality, whether they possess it or not.' In Material Logic it means 'In experience, the relation between men and mortality has been found constant.' The difference in meaning is as profound as the difference in the purposes of the arguments, and it is the attempt to make the one meaning serve the purpose of the other that has sterilised the secular discussions on the nature of Universals.

What logicians mean, or should mean, by Uniformity of Nature, is constancy in experience, that is to say, the accumulation of instances without exception. How many instances are required before we can regard an experience as constant, what the effect is on the mind of meeting with exceptions, and of the ratio between instances and exceptions—these are problems in Epistemology, and are out of place in Logic. An examination of them will be found in my book on Psychology. All that need be said here is that what is called by logicians the Uniformity of Nature, means constancy in experience; that, in every material argument, the relation in the premiss must be constant in experience, or must be subsumable under one that is constant in experience.

The second Canon of Induction is that *One element in the problem must be assimilated to its homologous element in the premiss.*

This canon is of the utmost importance in material reasoning. The finding of a premiss has been said to be the first step in Induction; and the assimilation of an element in the problem, to an element in some relation that is constant in experience, is the first step in finding a premiss. The proposition in which this similar element exists, then becomes the premiss.

In the Induction by which the cause of Johnny's illness was ascertained, his illness was assimilated to Jenny's illness. That was the first step in the argument. A premiss was to be found, containing an element similar to an element in the problem. The problem contains but two elements, the third being wanting, and its supply being the solution of the problem. A premiss must be found, such that one of its elements is assimilable to one of the given elements of the problem. It is not necessary, for the solution

of the problem, that the assimilated elements should be precisely or exactly similar. Precisely or exactly similar things are not to be found in Nature. It is enough if they are similar in material respects—in respects material to the argument. The two illnesses, for instance, need not have presented symptoms precisely similar in kind and degree at every stage, and on every corresponding day of the illness. It is enough if they are so similar in material respects as to give us confidence that they are due to similar causes. In the Induction by which it is discovered that Socrates will die, Socrates is assimilated in all material respects to men who have died. It is not necessary that he should have the same colour of eyes and hair, that he should have the same stature, or speak the same language. These are not respects material to the argument. It is enough that he is similar in those respects which are material to mortality; in origin, in organisation, in mode of maintenance,—in what is vaguely termed Nature. When I assimilated the snake to the one which bit my dog the day before, I did not stop to measure it, or to find out if it were exactly the same size, or had the same number of rattles as the snake I had found venomous. It was enough that it was similar in shape, colours, and markings. These were all that were material to the argument. If it is asked how we are to know what is material to the argument and what is not, the only answer is by a scrutiny of the problem. What is the nature of the problem? The problems run Is this snake venomous or not? Will Socrates die? What is the cause of the child's illness? In deciding that the length of the snake, and the number of rattles on its tail, are not material to the argument, I am influenced by my knowledge of the nature of snakes. Logicians would say that I reject these factors because I recognise that they are not essential to venomousness. I prefer to discard the phraseology and implications of Traditional Logic, which has never made clear, which has never come to any permanent agreement as to what is meant by 'essential.' The phraseology and implications that belong to Traditional Logic, which is practically coincident with the Logic of Postulation, are out of place in Material Logic. Whether the qualities that I discard from consideration are or are not essential, is beside the mark. The reason I discard them from consideration is that, in experience, they are not material to the argument. In this as in all else, Material

reasoning rests on experience. It is empirical from beginning to end. For the same reason, in assimilating Socrates to other men, in respects material to the argument about his mortality, I do not take into consideration the colour of his eyes and hair, his stature, or the language he speaks: and I discard these matters from consideration, not because they are not essential to the nature of Socrates—for aught I know they may be as essential as the possession of a stomach or a mind. The reason I discard them from consideration is that, in experience, I have not found men of one colour of hair or eyes, or of one stature or language, more or less subject to mortality than other men; and therefore, for the purpose of the argument about mortality, they are not material.

Let us take a new argument. I have a glass flower, and I wish to know if it is fragile. According to this second Canon, I must assimilate it to some thing or things that it resembles in respects material to the argument. The only respect material to the argument is the substance of which it is made, and I assimilate it, therefore, to other glass things, and thus obtain the induction

Glass things	are, constantly in experience,	fragile
This glass flower	(*x*) *is*	fragile.

This assimilation, of one of the given elements of the problem with the homologous element in the discovered premiss, I call the Datum. It is at once apparent that the Datum of the induction corresponds with the minor premiss in the syllogism, and has by logicians been mistaken for it. If, instead of searching in experience for a knowledge of the fragility or toughness of things similar to the flower, I assume as a postulate, 'Glass things are brittle,' then upon this principium I can found a syllogism:—

All glass things are fragile;
This flower is a glass thing;
∴ This flower is fragile.

In this syllogism the minor premiss—'This flower is glass'—has a deceptive similarity to the Datum—'This flower is like other glass things in respects material to the argument of fragility.' In fact, however, the two are, or may be, widely different. The minor premiss says 'This flower *is* glass,' and we know that in

Traditional Logic, the Copula means 'is included in' or has 'the attribute of.' This is very different from 'is like for the purpose of the argument.' In this particular argument it does not matter, though we are freely at liberty to take as our postulate 'glass things are unbreakable'; but in many arguments it is vital. If dogs are paralysed by curare, I can argue, with complete validity, that, since men are like dogs for the purpose of the argument, therefore men can be paralysed by curare; but this is not the same as saying that since men are dogs, they can be paralysed by curare. This is the form in which the argument must be put if it is to be stated syllogistically. Of course, for the purpose of Inference, we can postulate what we please, and there is no barrier in the conditions of Inference to prevent us from postulating that men are dogs. But the present argument is an argument *in materiâ*. What we want to know is not whether, in the world of postulation, if dogs can be paralysed by curare, and if men are dogs, certain conclusions can be drawn, but whether in the real world, real curare will really paralyse real men; and this we cannot do by founding our argument on a premiss so inconsistent with experience as that men are dogs. To attain a real conclusion, the argument must be founded, not on a postulate, but on experience; and in place of a minor premiss, postulating that A is B, we must have the datum, drawn from experience, that A is like B in respects material to the argument.

The Datum requires its terms to be assimilated in respects material to the argument. It knows nothing and cares nothing about classes or attribution. All that is required in the Datum, is that the homologous elements in the problem and premiss, that form its terms, should be alike in material respects. However much they differ in other respects, the argument will still hold good; but with the qualification stated in the fifth Canon of Induction.

The third Canon of Induction, or argument about Realities, is that *The second given element in the problem must be identical with its homologous element in the premiss*. In other words, the problem and the premiss must have an element in common.

We have seen that a problem is a proposition in which one element is missing. Two elements, therefore, remain, as given. Of these, one is assimilated to an homologous element in the premiss; and the premiss is founded on this assimilation. The

third Canon states that the other given element in the problem must be identical with its homologue in the premiss.

This Canon has some resemblance to the condition that the syllogism must have a middle term; but the common element of the problem and the premiss in Induction is not comparable with the middle term of a syllogism. For one thing, the common element of the Induction need not be a term at all. It may be the Ratio, as in the argument about the child's illness:—

That illness	was caused by	foul drains
This illness	was caused by	(*x*) *foul drains.*

In this case, since the Object-term of the problem is the quæsitum, either the Subject or the Ratio, which alone are given, must be identical with its homologue in the premiss. The Subjects are not identical, they are assimilated; consequently the remaining elements, the Ratios, must be identical; and we see that they are so. If we substitute, for the Ratio of the premiss, one which is not identical with the ratio of the problem, no conclusion can be drawn. If, for 'That illness was caused by foul drains,' we substitute 'That illness was preceded, or followed, or accompanied, or not caused by foul drains,' we can no longer argue that this illness was caused by foul drains. If men are, constantly in experience, mortal, and Socrates resembles other men in respects material to the argument, then we can safely conclude that Socrates is in fact mortal; but we cannot on this ground conclude that he is reasonable, or polite, or wealthy. If it is a constant experience that heat causes metals to expand, we may safely conclude that heat will cause the mercury in a thermometer to expand, since mercury resembles other metals in respects material to the argument; but we may not, on the ground of this premiss, argue that cold will cause the mercury in a thermometer to contract. For aught the premiss tells us, a thing once expanded by heat may remain permanently expanded, and fail to contract on the application of cold, just as the temper of steel, once drawn by heat, remains permanently absent.

4 and 5. *The quæsitum is obtained by adopting into the problem the remaining element of the premiss;* and *The difference, as well as the likeness, of the assimilated elements of the datum, is reflected in the conclusion.*

That illness	was caused by	foul drains
This illness	was caused by	(*x*) *foul drains.*

In this argument, the problem is This illness is caused by *x*: find *x*. We find our quæsitum by first searching experience for a premiss. We look for a similar illness of which the cause is known; and we adopt into our problem the term of the premiss homologous with the quæsitum of the problem. This operation has already been sufficiently illustrated. What is important now to notice is that the homologous term of the premiss is not necessarily adopted into the problem holus-bolus, just as it stands in the premiss. This cannot be done unless the likeness expressed in the datum is complete. If the likeness of that element in the datum which is furnished by the problem, to the other element which is furnished by the premiss, is incomplete, then whatever difference exists between them, must be reflected by a modification of the element of the premiss, which is adopted into the problem to furnish the quæsitum.

If the illness of which I wish to know the cause, is plague, I search experience for the disease, most like plague, whose cause is known. My search discovers cholera, which resembles plague in the material respects of being an acute specific disease, of occurring in widespread epidemics, and of originating in the East; but is unlike plague in the majority of its symptoms. Since cholera has considerable likeness to plague in some material respects, I may safely conclude that it resembles plague generally in its cause; but since cholera and plague differ widely in other material respects, I must conclude that it differs in some respects in its cause. Cholera is, I know, due to a micro-organism; and I may therefore conclude that plague is due to a micro-organism; but the symptoms of plague are so different from the symptoms of cholera, that I must conclude that the micro-organism of plague is different from the micro-organism of cholera. The two conclusions are drawn at the same time, in the same act of reasoning, and the one is as valid as the other.

In the case just supposed, the difference between the terms of the datum are qualitative, and the likeness and difference in the conclusion also are qualitative; but should the terms of the datum be compared quantitatively, as well as qualitatively, then the likeness and difference in the conclusion will not only be

quantitative, but will have exactly the same quantitative ratio as the terms of the datum. In this case, the ratio of the quæsitum, to its homologous term in the premiss, is the ratio of the datum.

When the builder is asked for a rough estimate of the cost of laying the drains, he searches experience for a similar job; and he finds one which is similar in all material respects, except that the drain was twice as long. He concludes, therefore, that it cost twice as much. The Induction may be expressed thus:—

That drain	cost	£100
This drain (half as long)	costs	(*x*) *half as much.*

As far as the terms of the datum—this drain and that drain—are alike, the quæsitum can be assimilated to its homologous term —£100—in the premiss; and we may conclude that since that drain cost a considerable sum, this drain will cost a considerable sum. As far as the terms of the datum are different, this difference must be reflected in a difference of the quæsitum from its homologous term in the premiss. As the difference in the datum is a quantitative difference, the difference in the conclusion must be a quantitative difference, and must have the same ratio as the datum. Since one drain is half as long as the other, the difference in the cost will reflect this difference, and the new drain will cost half as much as the old. Since the ratio of the datum is 1 : 2, the ratio of the conclusion will be 1 : 2.

But it happens that the length is not the only difference between the terms of the datum. When that drain was laid, materials were a fourth dearer, labour was 10 per cent. cheaper, than it is now. These differences also will be reflected in the conclusion; and reflected in the same ratios. On account of the first difference, the new drain will be cheaper in the ratio of 3 : 4; on account of the second difference, it will be dearer in the ratio of 10 : 9; and, generally, whatever ratio exists between the terms of the datum, will be reflected in the ratio between the quæsitum, and its homologue in the premiss.

It is clear, from this example, that Induction is applicable, not only to qualitative reasonings, which alone are within the compass of the syllogism, but also to quantitative reasonings. It has already been shown that some of the reasonings of mathematics—those which have equality, and the ratios of greater and less, for

their subject—which are altogether outside the range of Traditional Logic, are included in the scheme of reasoning here propounded, and are accounted for and explained. We now see the basis of proportional reasoning. It is clear that mathematical reasoning is outside the scope of the syllogism, for mathematical reasoning is not concerned with attribution of qualities, nor with inclusion in classes and exclusion from them. But, undoubtedly, mathematical reasoning is reasoning; and no scheme of Logic, from which mathematical reasoning is excluded, is complete. Logic purports to give an account of reasoning in general, and to omit any form of reasoning from its purview is to confess its own inadequacy and imperfection.

6. Another Canon must be added to those already enumerated before the conditions of Induction are complete. The sixth Canon is this:—A problem must not be stated more definitely than the facts allow; or *Nothing must be assumed in the problem that is not warranted by experience.*

Who killed Cock Robin? This problem assumes the solution of a number of preliminary problems; and unless and until these problems are solved—unless experience of their solution is obtained, it is improper and *ultra vires* to set the consequent problem. Who killed Cock Robin? is an illegitimate problem, unless Cock Robin was killed. It assumes that he was killed. It assumes the solution of other problems also. Did he die of violence or of disease? Is he dead? Was there ever any such person? All these problems must be solved, and the solutions must be consistent with experience, before we can legitimately frame the problem Who killed him? The problem that Charles II. is said to have set to the Royal Society, is illegitimate in this respect. Why does a bowl of water weigh no more after a fish is put into it, than it did before? This problem assumes that the bowl does weigh no more under these circumstances, an assumption which is inconsistent with experience, and renders the problem illegitimate. Are the rectilinear markings on the surface of the planet Mars the product of the intelligent activity of its inhabitants? This problem assumes that there are such markings on the planet, and, if they do not exist, is illegitimate. Why has he not returned? assumes that he has not returned, and if he has returned, is illegitimate. What is the cause of the

child's illness? assumes that the child has, in fact, been ill. What will be the cost of laying new drains? assumes that new drains can be laid. Can my landlord be made to pay the cost? assumes that I have a landlord, as well as that the drain can be laid, and that it will cost something. Is Socrates mortal? is an illegitimate problem if Socrates does not exist.

We are now in a position to state in full the nature and conditions of Assured Induction.

1. Induction is the solving of problems by indirect appeal to experience.
2. A problem is a proposition of which one element—the quæsitum—is unknown.
3. The solution of a problem is the discovery of the quæsitum.
4. A problem is solved by comparing it with a premiss.
5. The premiss is a proposition expressing a relation that is constant in experience, or that can be subsumed under one that is constant in experience.
6. The premiss must be such that, of the two given elements in the problem, one is similar in material respects to its homologous element in the premiss, and the other is identical with its homologous element in the premiss.
7. The likeness of the assimilated elements of problem and premiss is called the Datum.
8. The third element in the premiss is adopted into the problem as the quæsitum, subject to such difference as is required by the difference between the terms of the datum.

CHAPTER XV

IMPERFECT INDUCTION

INDUCTION may be imperfect in two ways. It may be so conducted as to violate one or more of its canons, and so be fallacious; or it may be conducted in accordance with its canons as far as we are able to observe them, but may be imperfect from lack of matter. Induction is reasoning *in materiâ*. It is the solving of problems by appeal to experience; and it may be that experience does not afford us the knowledge necessary to furnish a full solution. In this case, the reasoning will be imperfect, but not on that account is it without value. Conclusions of great importance can still be drawn, but they will not be assured conclusions. They will be tentative, hypothetical, or conjectural conclusions. Moreover, reasonings of this kind have a great importance in showing us in what respects our knowledge is defective, and in indicating the directions in which extensions of knowledge are needed; whether such extensions are practicable or no; under what conditions they are practicable; and how to set about them. Fallacious inductions will be considered in the chapter on Fallacies; Imperfect Induction, in the second sense, falls to be considered here.

The first step in induction is to discover a premiss; and the premiss is found by means of a datum; that is, by assimilating one of the elements of the problem to the homologous element in some relation that has been found constant in experience. This process, without being fallacious, may be imperfect in four ways.

1. No datum may be obtainable.
2. The datum, if obtained, may yield no premiss.

In either of these cases, we are at a standstill, and argument cannot proceed.

3. What datum can be obtained may not be sufficiently alike in its terms to justify an assured conclusion.
4. The premiss, if obtained, may not be constant in experience.

In either of these cases, a conclusion may be reached, but will be hypothetical or conjectural.

1. No datum may be obtainable. We may not be able to find any experience sufficiently like the problem to enable us to construct a datum. Let the problem be What is the connection between mind and matter? or formally stated, Mind *x (is connected in such a way with)* matter : find *x*. In order to solve the problem, we must find a datum; that is, we must assimilate one of the given elements in the problem to something of which we have experience, and which is like the given element in respects material to the argument. But there is nothing in experience to which we can assimilate either of the elements of the problem. We know of nothing that is not mind, to which mind can be assimilated; of nothing that is not matter, which matter is like in respects material to the argument. Experience furnishes no material for a datum; and the argument cannot proceed. According to one theory, indeed, the atoms of matter are assimilable to vortices in the ether; but then we have no experience of the ether, so that does not help us. According to another theory, matter is composed of ions of electricity; but when ions of electricity are imaged in this connection, as components of matter, they are imaged as very small particles of matter; and the assimilation does not help us, because it is not so much an assimilation, as an identification. But one given element of the problem must, as we have seen, be identified with its homologue in the premiss. May we not then use this value of matter for the identified term? If we do, we are no better off, for we are still without a datum. There is nothing in experience to which the other given element —mind—in the problem, can be assimilated, and until a datum is found, reasoning cannot begin. The problem is insoluble for lack of a datum—for lack of the experience in which a datum can be sought.

What is the nature of the absolute? Formally stated, the problem is, the nature of the absolute is *x:* find *x*. In order to solve this problem, we must construct a datum, in which the nature of the absolute is assimilated to something of which we have had experience. But there is in experience no such thing. Experience contains nothing, except the relative, to which we can compare the absolute; and the relative is not assimilable to the absolute, since they are contradictories. But, it may be said, this proves too much, for it prohibits us equally from ascertaining the nature of the relative; since there is nothing in experience to

which the relative can be compared except the absolute. This is not so, however. Relativity is a generalisation from innumerable *experiences* of relatives. The absolute is an abstract obtained from innumerable *operations* of abstraction, none of which has ever been complete. We cannot abstract qualities in experience; we can conduct the operation mentally only; and experience affords us no instance of it. We have experience of relatives—of one thing being above or below another; before or after another; and in other kinds of relations to others; but we have no experience of colour without surface, or of hardness without substance. Consequently, we can find the nature of the relative, but we cannot find the nature of the absolute. In such cases as these, a datum cannot be found; and when no datum can be found in experience, reasoning cannot proceed. Reasoning *in materiâ* is arrested by want of a datum, just as reasoning *ex postulato* is arrested by want of a postulate.

2. The second way in which Induction may be imperfect, without being fallacious, is when it fails at the second stage. A datum may be obtainable in experience; but when obtained, it yields no premiss. In this case also, argument is arrested.

Doctors, in the last generation, desired to know the cause of traumatic fever. A datum was easily obtainable. Traumatic fever is closely similar, in material respects, to specific fevers, and its resemblance to specific fevers furnished an unimpeachable datum; but, as the cause of specific fevers was unknown, the datum afforded no premiss, and the reasoning could not proceed.

What elements preponderate in the composition of the satellites of Jupiter? The satellites of Jupiter are composed mainly of x: find x. A datum is readily obtainable. The satellites of Jupiter are assimilable—perhaps not in all material respects, but they are assimilable—to our own moon; but, as we do not know the composition of the moon, the datum fails to yield a premiss, and the argument cannot be pursued.

Why do the Andes run North and South, while the Himalayas run East and West? There are plenty of data available. The Rockies, the Apennines, the Aral mountains, run North and South. The Pyrenees, the Alps, the Caucasus, run East and West. But since, in none of these cases do we know what determined the

direction of the mountain chain, these data fail to afford us any premiss, and argument is arrested.

3. The datum, even if it yields a premiss, may not be sufficiently alike in its terms to yield a satisfactory or definite conclusion. In this case, argument is not arrested. It still proceeds, and a conclusion is attained; but we have already seen that when a conclusion is attained by induction, it reflects, not only the likeness, but the difference between the terms of the datum. If these likenesses and differences are definite, clear, and sharp cut, the conclusion is correspondingly definite; but if the likeness between the terms of the datum is but approximate and vague, the conclusion also is but approximate and vague. Such a conclusion, so obtained, is termed an hypothesis.

What is the cause of specific fever? We have already seen that a valid datum—valid in the sense of its terms being closely similar in material respects—can be obtained from the likeness of specific fevers to traumatic fever; but this datum was useless, because the cause of traumatic fever was equally unknown. There was, however, another datum available and employed, a datum far less satisfactory, in that its terms could be but vaguely assimilated, but more useful in that it did yield a premiss, and therefore some sort of a conclusion could be obtained from it.

Among the features common to most cases of specific fever, it is observed that they do not, as a rule, originate *de novo*. Small pox, scarlet fever, measles, typhus, whooping cough, croup, plague, chicken pox, and so forth, are well known to be 'catching.' Those who come into contact or association with persons affected by these diseases, are apt to be themselves attacked soon after; and the more closely the cases are observed, the more seldom is it found that such previous contact or association can be excluded. Thus, by a process of generalisation, we reach the conclusion that these diseases are communicable—that something conveying the disease passes from one person to another. At once the mind searches for a datum—searches experience for a similar case,—but no datum is yet obtainable, and we remain baffled.

Next it is to be noticed that when a person has been in contact with an affected person, and so has caught one of these fevers, the disease does not declare itself immediately upon the infection; but only after an interval, usually an interval of

several days, does the disease become apparent. Again the mind seeks in experience for a similar case, and tries to establish a datum; and this time, it is more successful. There are, in experience, other cases in which a period of quiescence follows a contact; and then the period of quiescence is followed by widespread activity. When seed is sown in the ground, nothing appears to happen for a time; but after an interval, the surface is covered with sprouting vegetation. When carrion lies exposed in summer, nothing appears to happen for a time; but after an interval, the carrion is found to be swarming with maggots. These cases are widely unlike the case of fever, it is true; but still, they have a certain similarity. They are not sufficiently like to fever to warrant a positive conclusion; but they are sufficiently like to warrant a tentative conclusion, or as it is usually called, to suggest an hypothesis. The hypothesis, or tentative conclusion, they suggest is that specific fevers may be due to something of the nature of seeds or eggs, passed from the body of the person suffering from the disease, to the bodies of those who come in contact with him. The cases are sufficiently alike to suggest this, and so to suggest, for the period of quiescence before the fever shows itself, the title of 'the stage of incubation.' It is as if something were being hatched.

For many generations, this hypothesis was itself incubated; but nothing hatched out, and it seemed as if the egg were addled; but it contained a germ of life, and in due time broke the shell.

The discovery of a datum whose terms are but vaguely and loosely assimilable gives us a premiss of some sort—a premiss from which we can reach no assured conclusion, but from which we can reach the tentative conclusion that we call an hypothesis; and this is the nature of hypothesis. Let us pursue the illustration of the specific fevers a little further.

When instruments and methods of research had reached a sufficient degree of advancement, search was made for the eggs or seeds which were conjectured, on other grounds than that it is a specific fever, to be the cause of tuberculosis; and, after long and patient search, they were found, in the shape of a micro-organism. The steps, by which it was shown that the organisms found are indeed the cause of tuberculosis, need not concern us. It is enough that they were found and proved to be the cause; and now this discovery furnished a new datum for the old problem.

Specific fevers and tuberculosis are widely unlike, it is true. Specific fevers are, for the most part, acute illnesses of short duration: tuberculosis is a chronic disease of long duration. Specific fevers are mostly evidenced by a rash on the skin: in tuberculosis there is none. Specific fevers are, for the most part, communicable: tuberculosis was not recognised to be communicable. Specific fevers have an incubation stage: tuberculosis was not known to have an incubation stage. Yet, in spite of these differences, there are important similarities. Specific fevers are fevers—they are accompanied by a raised temperature; so is tuberculosis. Specific fevers are wasting diseases; so is tuberculosis. The fact, however, that most influenced observers in adopting, as a datum, what likeness there is between specific fevers and tuberculosis, was that specific fevers had, as we have seen, long been suspected to be due to infection by some minute organism, and tuberculosis was now found to be due to such an organism. The suspicion was an hypothesis, based on the vague assimilation already stated. That hypothesis was now verified, in a case sufficiently similar to warrant a conclusion that is more than an hypothesis. Tuberculosis had not struck many observers as being closely like specific fevers; but at any rate it is a disease; it is a febrile disease, and a wasting disease; and these important similarities were enough to furnish a reliable datum. It was, therefore, argued that, since a micro-organism had been found in tuberculosis, which is in some material respects like specific fevers, micro-organisms would be found in these diseases also. Micro-organisms were, therefore, searched for in specific fevers, and they were found. Now the datum that had so long before been dropped, because it led to no premiss, was revived. Traumatic fever is, in material respects, similar to specific fever; hence we may argue that, since specific fevers are due to micro-organisms, traumatic fevers are due to micro-organisms. Search was made for the micro-organisms of traumatic fevers, and they were found; but if they had not been found, we should still have been justified in concluding their existence. The similarity, in material respects, of the terms of the datum, warrants us in attaching certainty to the conclusion or conclusions; for, in every case of Induction, the conclusion is double. Since scarlet fever is like, in material respects, to other fevers which are known to be due to micro-organisms, we are justified in concluding, nay,

we are compelled to conclude, that scarlet fever also is due to a micro-organism. And, since scarlet fever exhibits symptoms different from the symptoms of those other fevers, we are justified in concluding, and compelled to conclude, that it is due to a micro-organism different from theirs.

Some diseases, which are like specific fevers in the material respect of being due to micro-organisms, arise apparently spontaneously, without the affected person having been in contact or in association with anyone who has the disease; and affected persons may live for long among those who are not affected, without communicating the disease to them. The problem presents itself: How is such a disease communicated? We search experience for a datum. Taking ague as the type of such a disease, we look for another disease having the same incidence, and we find in yellow fever a disease of much the same incidence. This gives us a datum; but as the way in which yellow fever is communicated is unknown, the datum yields us no premiss, and argument cannot proceed. However, cattle bitten by the tsetse fly suffer thereafter from a disease which has the characters of a specific fever. Cattle are not closely like men, it is true, but for the purpose of the argument, they are fairly assimilable to men in the material respect of suffering from disease. The disease in cattle is not like ague, but, for the purpose of the argument, it is similar in the material respect of being communicable. Here, then, we get a datum and a premiss, affording, not indeed a positive conclusion, but a tentative conclusion—an hypothesis. From this datum and this premiss we may not conclude that ague is communicated to men by the tsetse fly, but we may fairly get the hypothesis: May not ague be communicated to man by the bite of some fly? Investigation being made, it is found that ague is communicated by the bites of mosquitoes. At once this gives us a datum for the disease of similar incidence, yellow fever; and we conclude that this too may be communicated by the bites of mosquitoes. This, also, is found correct, and now we get a group of hypotheses. In the material respects of biting human beings, and of fostering internal parasites of their own, and of infesting the bodies of those who suffer from certain specific fevers, fleas, bugs, lice, ticks, and certain other insects resemble mosquitoes. May not these parasites be the communicators, then, of other specific fevers? This starts

us on a whole series of investigations, and the hypotheses prove fruitful.

An hypothesis, then, is a tentative conclusion derived from an induction that is imperfect, in that the terms of its datum are not closely assimilable in material respects. As soon as the terms of the datum become closely assimilable, the conclusion ceases to be tentative and becomes assured; the hypothesis ceases to be an hypothesis, and becomes an assured belief. So long as the contagium of fevers entered into a datum, whose other term was seeds of plants or eggs of insects, no conclusion could be formed, for no premiss was obtainable. But even if a premiss had been obtainable, the likeness, in respects material to the argument, of diseases to plants and insects is so remote, that the conclusion would have been not an assured conclusion, but an hypothesis only.

The researches of Pasteur into the nature of fermentation furnished doctors with an hypothesis as to the nature of fever. Fever is like fermentation in several respects. When a relatively minute quantity of yeast is introduced into a vat of wort, a widespread change ensues; the whole of the wort after a time ferments, but the walls of the vat take no part in the change. When a relatively minute quantity of the contagium of fever is introduced into the human body (it must be relatively minute, for no one sees it pass), a widespread change ensues; and it was argued to be like fermentation in that this change was confined to the fluid part of the body—the blood—and the solid tissues took no part in it. Moreover, the nature of this change in the blood was likened to fermentation. These conclusions were, however, mere hypotheses, since the terms of the data—the human blood and the wort in the one case, and the contagium of fever and the yeast in the other—were not sufficiently alike, in material respects to warrant an assured conclusion. They have since been found erroneous.

4. The fourth occasion on which Induction may be imperfect without being fallacious, is when, a datum being found, and furnishing a premiss, and the datum being satisfactory in the close assimilation of its terms, the relation expressed by the premiss is not constant in experience.

An example of this imperfection is found in most text books on Logic, though they do not assign to it what I consider its proper

place in the scheme of reasoning. This is the discovery by Fermat that $2^{2^x} + 1$ is, for a great many values of x, a prime number, and his argument that since it is a prime number for a great many values of x, it is a prime number for all. In this case, the datum is unimpeachable. Whatever value is given to x, that case of $2^{2^x} + 1$ is, in respects material to the argument, precisely like all other cases. If, therefore, the relation of $2^{2^x} + 1$ to a prime number is constant in experience, or can be subsumed under a relation that is constant in experience, the conclusion, that for any given value of x, $2^{2^x} + 1$ is a prime number, is certain and irrefragable. But the number of cases in which the relation has been experienced—that is to say, in which the sum has been worked out for different values of x, and the result found to be a prime number—falls far short of constituting that constancy in experience which enables us to draw an assured conclusion. What constitutes constancy in experience for the purpose of Induction is, as has been said, scarcely a matter for Logic. It belongs more to Epistemology. But the few dozen cases in which the sum has been worked out for different values of x certainly do not compare with the number of cases in which, for instance, constancy has been experienced in the sequence between life and death, or in the coexistence of resistance and extension. Nor can the relation of the formula to a prime number be subsumed under a wider relation that is constant in experience. In the language of every day life, no reason can be given why it should be a prime number; and, since the relation is neither constant in experience nor subsumable under a wider relation that is constant in experience, we have no warrant for concluding that it is true for any value of x that has not actually been worked out. In fact, as is well known, there is a value of x for which the relation is not true.

In the experience of our ancestors, the relation that metals are heavier than water, was constant so far as experience went; but it was a very limited experience. The metals known to them were so few, that the constancy with which they were found to be heavier than water was not constancy for the purpose of sound Induction. Although, therefore, any new metal that might be discovered would be, for the purpose of the argument, closely assimilable to known metals, and thus a satisfactory datum would be found; and although this datum would furnish a premiss, since, in experience, metals had been found heavier than water; yet,

since the relation expressed by this premiss was not constant, in the logical sense, in experience; the conclusion, that all metals thereafter discovered would sink in water, would not have been justified; and experience has shown that it would have been false.

If a certain train has been for years running punctually to time every day, the argument, that it will run punctually to time on any given day, will have a high degree of assurance. The datum is unimpeachable in the closeness of assimilation of its terms. The running of the train on the given day is in material respects like its running in the past. The relation of its running to punctuality is constant in experience, as far as experience goes; but it is a limited experience. It does not extend to anything approaching the illimitable number of times on which, for instance, similar causes have been found to produce similar effects. Although, therefore, we may attach to the conclusion a considerable degree of assurance, we do not attach to it the same assurance that we attach to the conclusion that the sun will rise to-morrow morning.

The unassured conclusion that is reached from a datum whose terms are imperfectly assimilated, is called an Hypothesis: the unassured conclusion that is reached from a premiss that is not constant in experience, is called a Conjecture.

Among the many meanings that have been attached by logicians to the word Analogy, one includes Induction, especially the two forms of imperfect Induction last considered, which lead respectively to hypothesis and conjecture. As Mill puts it, 'Two things resemble each other in one or more respects; a certain proposition is true of the one, therefore it is true of the other.' 'Two propositions resemble each other in one or more respects.' That is an imperfect expression of the Datum. 'A certain proposition is true of the one.' That is an imperfect expression of the Premiss. 'Therefore it is true of the other.' That is an unwarranted conclusion.

Mill saw that this argument is not valid in all cases, and he proceeded to discuss what resemblances between the 'two things,' which I call the terms of the datum, justifies a conclusive argument. His first statement is very similar to mine. 'The circumstance in which the two cases resemble, may be capable of being shown to be a *material* circumstance; to be that on which all the consequences, necessary to be taken into account in the particular discussion, depend.' This is very much the same as saying that

the resemblance must be material to the argument. As to the condition that warrants a conclusion from the premiss, providing the terms of the datum have a satisfactory similarity, it is, he says, that 'it has been previously shown, by due comparison of instances, that there is an invariable conjunction between the former property or properties and the latter property.' This is what I mean by the condition, that the relation of the premiss must be constant in experience. 'But in Analogical reasoning,' he says, 'no such conjunction has been made out.' Analogical reasoning in Mill's sense is, therefore, that variety of what I call Imperfect or Unassured Induction that terminates in a conjecture.

If Mill had been content to adhere to this expression, I should have no material difference with him; but he subsequently wavered in his statement. 'The cases in which analogical evidence affords in itself any very high degree of probability, are only those in which the resemblance is very close and extensive.' In this expression he deserts that materiality which he has previously asserted to be necessary, and accepts, instead, closeness and extensiveness of resemblance. Thus it has happened that subsequent logicians have taken it that the validity of an Induction depends on the number of the resemblances between the 'two things,' or upon the ratio between the number of resemblances and the number of differences. This is manifestly unsound as a basis for argument, and other logicians have perceived this, and have contended that the likenesses between the 'two things' must be estimated, not as to their number, nor as to their ratio to the differences, but as to their fundamental or essential quality. The resemblances, they say, must be fundamental or essential; the differences superficial and unessential; then the argument will be valid. I cannot but think it a pity to import into Material Logic a word which is the peculiar property of Traditional Logic, and a word whose meaning, in this Logic, has been the subject of endless discussion, and is even now not defined. It does not seem to me to advance the matter any further, nor to afford any firmer ground for argument, to say that the resemblances between the things must be fundamental or essential, than to say they must be more numerous than the differences.

Glass and silver are 'two things that resemble each other in one or more respects'; 'A certain proposition'—that it can be drawn

into threads—'is true of the one, therefore it is true of the other.' In this case, the conclusion is warranted.

Glass and silver are two things that resemble each other in one or more respects; a certain proposition—that it can be made into table-utensils—is true of the one; therefore it is true of the other. In this case also, the conclusion is true.

Glass and silver are two things that resemble each other in one or more respects; a certain proposition—that it is a good conductor of electricity—is true of the one; therefore it is true of the other. In this case the conclusion is false.

Glass and silver are two things that resemble each other in one or more respects; a certain proposition—that it is fragile—is true of the one; therefore it is true of the other. In this case, also, the conclusion is false.

Now, whether the resemblances and differences of glass and silver are numerous or few; whether they are fundamental or superficial; whether they are essential or unessential; they remain the same whether these substances are drawn into threads, made into table-utensils, used in electrical apparatus, or otherwise treated. It is clear, therefore, that it is neither the absolute number nor the relative number, neither the fundamental nor the essential quality, of the characters in which they resemble and differ from one another, that gives validity to the argument, or deprives it of validity. What quality is it then, in these resemblances, that affects the validity of the argument? I think it is clear that the resemblance must be in material respects—in respects that are material to the argument. If they are alike, and so far as they are alike, in respects material to the argument, the argument, that what is true of the one is true of the other, is valid, provided that what is true of the one is constantly true in experience. Glass is very unlike silver in many respects; in the fundamental, and I suppose essential, respects of not being a metal; of being transparent; of being brittle; of not being an element; of being a compound manufactured product, and so forth; but for the purpose of being used for making mirrors, glass is like silver, in the material respects of taking a high polish, and reflecting, under proper circumstances, a large proportion of the incident light; and in these respects, the likeness is constant in experience. Consequently, we may safely argue that, if silver makes a good mirror, glass also will make a good mirror.

The last example is a sound Induction, leading to an assured conclusion; and Analogy is sometimes allowed by logicians to lead to assured conclusions; but this admission is rare, and, when made, seems to be made inadvertently. 'Analogy,' says one book, 'may have all degrees of value'; but more often it is said 'Analogy is a kind of probable proof, based upon imperfect similarity.' 'Analogical argument is only probable,' or some equivalent phrase. It seems, therefore, that, as far as logicians admit this form of reasoning, which they call, erroneously, as it seems to me, Analogy, they admit the imperfect form only, in which the terms of the datum are imperfectly assimilated in material respects. They do not appear to recognise the separate, valid, reasoning *in materiâ* that I call Induction. Lotze, indeed, distinctly repudiates it. 'I do not believe,' he says, 'in the existence of proof by Analogy.' If Analogy is used in the Aristotelian sense, and is restricted, as I think it ought to be, to this sense, then I agree with Lotze, that there is no proof by Analogy; but he evidently uses it in the current sense, and in this sense he is wrong.

Mr. Bosanquet erects Analogy into an important variety of reasoning, and devotes a long chapter to it; but he also regards it as leading to conclusions that are uncertain and tentative only. He regards the Analogical argument as an instance of the second figure of the syllogism with an undistributed middle. The conclusion, therefore, can never be indisputably valid. As an instance of Analogy he gives the following:—

> Cutting tools have edges and places for handles;
> These flints have edges and places for handles;
> ∴ These flints are cutting tools.

As a syllogism, which Mr. Bosanquet considers it, this argument is invalid by reason of its undistributed middle. I do not regard it as a syllogism. It seems to me an argument *in materiâ*. It purports to solve the problem Are these flints cutting tools? The problem is These flints x (*are* or *are not*) cutting tools: find x; and the Induction by which the problem is solved is

Things which have edges, etc., are, constantly in experience, cutting tools.

These flints, which have edges, etc., (x) *are* cutting tools.

This argument is, on the face of it, conclusive. If the flints really have edges and places for handles; and if such things are, constantly in experience, cutting tools; these flints are, without doubt, cutting tools. Mr. Bosanquet omits, as he is quite entitled to do, the constancy in experience. He omits it, however, not deliberately and of set purpose, but because, as it seems to me, its importance has not occurred to him; and consequently he is obliged to admit that the argument 'is at variance with its matter, and represents no inferential necessity at all.' This is true with respect to his argument; it is not true with respect to mine. The importation of the constancy in experience converts the argument from an argument *ex postulato* into an argument *in materiâ*. As an argument *ex postulato*, all that we are warranted in inferring, is that the characters of the flints are consistent with their being cutting tools; and to infer more than this would infringe the fourth Canon of Inference. But when we know, or if we know, that edges and places for handles are, constantly in experience, related to cutting tools, we are justified in inducing, and compelled to induce, that the flints are certainly related in the same way to cutting tools.

The want of constancy in experience of the premiss, is not the only way in which the Analogical Argument of logicians is imperfect as an induction. Its imperfection may be that noted under our third heading—the want of likeness in material respects of the terms of the datum—of the 'two things' which 'resemble each other in one or more respects.' Another instance of Mr. Bosanquet's will illustrate this.

A peculiar herring-bone structure is conjoined in the Pelargonia with the characters of the Geranieæ;

The flowers with such seed vessels as exist in our wild geraniums have the characters of the Geranieæ;

∴ That these flowers, *e.g.*, our wild geraniums, should have the peculiar herring-bone structure is exceedingly probable.

As thus stated, the argument is not very easy to follow; and I think it gains in clearness, as well as in force, by being stated as an induction, thus:—

Premiss. Pelargonia have, constantly in experience, a peculiar structure of petal;

Datum. Wild geraniums resemble Pelargonia in the common characters of Geranieæ ;

∴ Wild geraniums (probably) have this peculiar structure of petal.

The reason for the introduction of probability into this conclusion is the failure of the terms of the datum to resemble each other completely in material respects. We know that geraniums resemble Pelargonia in all the qualities common to Geranieæ ; but we do not know how far this resemblance is material with respect to the peculiar structure of the petals. This imperfect assimilation, in material respects, of the terms of the datum, vitiates the certainty of the conclusion, and lowers it from an assurance to the rank of an hypothesis.

From this discussion it appears that an Hypothesis is the tentative conclusion of an induction that is imperfect, in the incomplete assimilation, in material respects, of the terms of the datum ; while a Conjecture is the conclusion of an Induction in which the relation predicated in the premiss is not known to be constant in experience, and is not subsumable under a relation that is constant in experience ; and that the Analogical reasoning of logicians is not, properly speaking, Analogy at all, but is Imperfect or Unassured Induction.

Some criticisms must be anticipated at this point. It has been contended by an acute critic of these doctrines, that if I admit resemblance in material respects as necessary to Induction, the material respects are a Universal, and I am in the trap of the *petitio principii*, and all the incurable vices of the syllogism. It is further contended that if subsumption is admissible in Induction, then is the syllogism admissible, for the syllogism is subsumption.

With respect to the first contention, that resemblance in material respects is a Universal, I am not concerned either to admit or deny the impeachment. 'Universal' is used in so many senses by logicians, that one is never safe in denying anything to be a Universal. If the term 'Sir Christopher Wren,' in the proposition 'Sir Christopher Wren designed St. Paul's,' or if that proposition is, as some logicians contend, a Universal, then it is clear that it would be very unsafe to deny that material respects, or anything else, constitute a Universal; but that the acknowledgement

that I employ Universals in reasoning lands me in the trap of the *petitio principii*, and the other incurable vices of the syllogism, I do most strenuously and utterly deny. The syllogism is a definite apparatus. It is a machine of complicated construction, of which its Universal is but one part—a necessary part, no doubt—but still only the mainspring or fly wheel. If I utilise a mainspring or a fly wheel in my machine, it does not follow that this machine is a timepiece or a steam engine. It may be a bottle-jack or a gas engine. My Universal is the respects that are material to the argument, in which respects the terms of my datum must be alike. The Universal of the syllogism is the general rule, under which the minor premiss must come as an instance. The two are as different as likeness and subsumption, and cannot be more nearly assimilated. I say that for the purpose of certain arguments with respect to the storage and liberation of motion, the brains of animals resemble in material respects electric accumulators; but this is not subsuming the animal brain under the electric accumulator, or saying that the brain belongs to the class of electric accumulators.

The second argument, that if subsumption is admissible in Induction, then the syllogism, which is subsumption, is admissible, is clearly fallacious by the rules of the syllogism itself, if the argument is syllogistically stated. For the subsumption that alone is admissible into Induction is subsumption of an experienced relation under a relation that is constant in experience; but the subsumption of the syllogism is the subsumption of any relation under any relation that contains it. As a syllogism the argument is

Some forms of subsumption are admissible into Induction;
The syllogism is a form of subsumption;
∴ The syllogism is admissible into Induction.
Fallacy of undistributed middle.

Another criticism questions the statement that Induction knows nothing of postulates; for, says the critic, are not working hypotheses postulates? Certainly, they are; but Induction cannot utilise them as premisses. The only position that an hypothesis can hold in Induction is that of a tentative conclusion from a material premiss. This tentative conclusion may become a working hypothesis; that is to say, it may be postulated to be true for the purpose of argument, and conclusions may be deduced from it. Yes; deduced. That is to say, the moment it is postulated,

it is taken out of the realm of Induction and introduced into that of Deduction. I do not deny, and in a subsequent chapter I assert and proclaim, that the conclusions of one mode of reasoning may form the premisses of another; but I maintain that hypothesis has no place in Induction except as a result of the Inductive process. So, the conclusions of Deduction may be true; but they cannot be known to be true merely because they are valid deductions. To ascertain their truth we must apply them direct to experience, and see if they agree. It is true that if the postulated premiss happens to be true, and the deduction is properly carried out, the conclusion will be true; but this is an accidental result. It is no necessary or inseparable condition of Deduction that its conclusions should be true, or that its premisses should be true.

BOOK III

INFERENCE OR DEDUCTION

THE METHOD OF EXPLICATION

CHAPTER XVI

IMPLICATION AND THE LAWS OF THOUGHT

EVERY proposition implies certain others, which are necessarily granted when the postulate is granted. In other words, the relation expressed by a proposition may be expressed in several ways: it may be expressed by other propositions derived from the postulate. If All men are mortal, then No men are immortal. The second proposition is implied in the first. It is another way of stating the relation expressed by the postulate. This process, of extracting or explicating the implications of simple propositions, is called, by logicians, Immediate Inference, and the implications thus extracted are called immediate inferences.

The Mediate Inference of logicians is the extraction of implications from Compound propositions. Logicians consider that Mediate Inference is more than this, and enables us to proceed, as they call it, from the known to the unknown. In this I think they are in error; and this is one of the fundamental differences between the system of Logic here expounded and the systems of Traditional and Modern Logic. In supposing that the syllogism enables us to proceed from the known to the unknown, or to discover anything beyond what is implied in the postulate, logicians are, in my opinion, profoundly mistaken. This confusion of two fundamentally different modes of reasoning will be considered presently; for the moment it is enough to notice that the syllogism, whatever else it may be, if it be anything else, is certainly a mode of extraction of implications from Compound propositions. If All men are mortal and Socrates is a man, then, implied in this double postulate, or compound proposition, is the implication 'Socrates is mortal.' The conclusion is a mode of stating part of the sense contained in the postulate. It is one of the implications of the postulate.

There are, as we have seen, three main forms of Categorical proposition—the Simple, the Conditional, and the Compound. The process of extracting the implications of Simple propositions is called Immediate Inference. The process of extracting the implications of Compound propositions is called Mediate Inference.

No special name has been given by logicians to the process of extracting the implications of Conditional propositions; which is included under Mediate Inference.

Some of the implications of propositions are so manifest; so thinly disguised; appear so plainly in the statement of the proposition itself; grin at us so impudently through the structure of the proposition; that to call them inferences seems to invest them with fictitious importance; and to call the process of extracting them a process of inference, seems to dignify unduly a very simple affair. Hence, in the text books, the question is usually debated whether Immediate Inference is a process of inference at all. Other implications are so hidden, in such remote recesses of the postulate, that it is a real, if not a very difficult, exercise of ingenuity to explicate them; and to these the title of Inference is allowed less grudgingly; but the nature of the process is not affected by the ease or difficulty with which it is performed; and whatever title is given to such a simple transfer as from 'Men are mortal' to 'Men are not immortal' may consistently be given to the less obvious transfer from 'Men are both mortal and responsible' to 'Mortality is consistent with responsibility,' or from 'I saw him do it' to 'I was there when he did it.'

In most text books on Logic, there is much debate whether Immediate Inference effects more than a verbal change; and whether, if it effects no more than a verbal change, it is entitled to the glory of being called Inference. It is clear that it is a verbal change; and it is clear that, in such an instance as the inference from Man is mortal to Man is not immortal, it is little or nothing more than a verbal change. It would puzzle a sophist to detect a difference of meaning between these two propositions. But it is clear that between All birds are clothed in feathers, and Anything that is featherless is not a bird, there is a certain difference that is appreciable, and may on occasion be useful. The difference is not altogether a difference in meaning. The one statement is implied in the other; and the meanings cannot, therefore, be diverse. But the two propositions look at the same fact from different points of view. The attention is directed to different aspects of the same fact.

The propositions of Logic are considered by the text books in isolation from their context—apart from the discourse in which they appear—and, so considered, much of their significance is

lost. The full use and value of a proposition can be known only by its context. In the queer and obscure phraseology of Modern Logic—in its statement, repeated with such wearisome iteration and in so many ways, that judgement is the synthesis of differences in an Identity—there seems to lie a discernment that every judgement is an organised part of an organic whole; and that no one judgement can have its full value assigned to it, except by estimating its relations to the general scheme of knowledge. It would need greater temerity than I can lay claim to possess, to interpret the true meaning of the doctrines of Modern Logic concerning the judgement; but if this is the meaning, or one of the meanings of these doctrines, I respectfully signify my agreement with it. At the same time, I think that Modern Logic, impressed by the baldness and superficiality of Traditional Logic, errs in the opposite direction, and courts confusion by its constant asseveration that knowledge is a single Identity. Nevertheless, if its teaching may be interpreted as insisting on the interconnection of the various constitutents of knowledge, and thus implying that a proposition, considered apart from its context, is divested of much of its meaning, then I think Modern Logic has reason.

Whether it is best to state the judgement in the form 'All birds are clothed in feathers,' or in the form 'Anything that is featherless is not a bird,' depends on the context; that is to say, on the matter under discussion, or the purpose of the argument. If the question, or doubt, or conjecture, is whether All birds are clothed in feathers, or is What birds are clothed withal, then the proposition 'All birds are clothed in feathers' gives the most direct and appropriate answer. But if the question is whether this featherless creature is or is not a bird, then the proposition 'All birds are clothed in feathers' does not give a direct answer. But the variant or implication 'Whatever is featherless is not a bird,' does give a direct and an appropriate answer. The two propositions have precisely the same meaning, and each is implied in the other. Both express the same relation between birds and their clothing in feathers; but the same explication is not equally appropriate for every context, or for the purpose of every argument. Each explication brings into prominence some special aspect or implication of the relation, which is more appropriate than the rest for some special purpose; and, as every proposition is, in actual reasoning, stated for some purpose, regard

should be had to this purpose in stating the proposition. One of the radical defects of Traditional Logic is that it steadily ignores the purpose of its arguments. One of the merits claimed for the system of Logic here expounded, is that it keeps steadily in view the purpose of the argument. For aught that appears in the text books, Inference, as a mode of argument, might have no purpose at all. Its purpose is never alluded to. But the purpose of an inference is vital to its validity as an inference. In the course of the consideration of Inference, we shall come upon abundance of instances of inferences that are valid for one purpose and invalid for another; and to ignore the purpose of the argument is a direct incitement to fallacy, and a certain road to fallacy.

To put the matter crudely, a proposition may be regarded in the light of the questions to which it is an answer; and is modifiable, so as to answer directly each of these questions; each such modification being an implication, and being derivable by the rules of Inference. Such a simple proposition as 'Brutus killed Cæsar' answers at least twenty questions; and I dare say many more. It answers Who killed Cæsar? and the reciprocal, By whom was Cæsar killed? It answers Whom did Brutus kill? and the reciprocal, Who was killed by Brutus? It answers the specific question, Did Brutus kill Cæsar? the general question, What did Brutus do to Cæsar? the more general question, Did Brutus do anything to Cæsar? the still more general question, What took place between Brutus and Cæsar? and the yet more general question, Did anything take place between Brutus and Cæsar? These are far from all the questions to which the proposition is an answer. It answers also Who was killed? Who killed? Was any one killed? Did Brutus protect Cæsar? Did Brutus defend Cæsar from his enemies? Did any one but Brutus kill Cæsar? Was it Brutus who killed Cæsar? Was it Cæsar who was killed? Did Brutus and Cæsar ever meet? Were they living at the same time? and so forth, and so on.

All these questions are answered by the proposition 'Brutus killed Cæsar,' but all are not answered with equal efficacy, or with equal directness, by this mode of expressing the relation. To give each question a direct answer, the proposition must be so modified that, while the information it contains, that is, the

relation it expresses, is the same, the information or relation is expressed in such a manner as is suitable to the occasion, or is fitted to the purpose of the argument. This is done by explicating the appropriate implication. As far as the content of the proposition is concerned, it matters not whether we say 'It was Brutus who killed Cæsar,' or 'It was Cæsar who was killed by Brutus.' Both express the same relation, neither more nor less; but they are appropriate to very different occasions. They are germane to the purpose of very different arguments. They indicate different attitudes of the proposer's mind towards the fact expressed in the propositions. The first answers directly the question 'Who was it that killed Cæsar?' and for the purpose of this argument, the second proposition is inappropriate. It gives an answer, but it gives an indirect and inappropriate answer. To every argument, its purpose is vital; and the form or implication of the proposition must be found, that is appropriate for the purpose of the argument. This is the function, and this is the use, of Immediate Inference. It enables us to put our arguments in telling form. It shows us what is implied in a proposition; enables us to extract from a proposition all its implications; guards us against error in the process; and teaches us to keep in view, in every argument, the purpose for which the argument is undertaken.

The process of Immediate Inference is not, therefore, as it often appears in the text books, a mere useless exercise of perverted ingenuity. On the contrary, it is, on occasion, of real assistance, and even necessity. It is not a waste of time to ascertain in what ways, by what rules, the implications of propositions may be explicated; or what are the immediate inferences that can be extracted from them. Still, this is not to say that the immediate inferences of the text books are useful, or even valid.

The Laws of Thought.

Under this title, logicians state what are, in their view, the underlying conditions of valid inference. The term 'law' is very well known to be used in two senses. In one sense, it means observed uniformity, and expresses a relation that is constant and invariable in experience, and that man cannot alter. Such are the Laws of Motion, of Gravitation, of Combining Proportion, of

Evolution, of Survival of the Fittest, and so forth. In the other sense, 'law' means a rule of conduct. It means a mandate, or a prohibition, that we are told to observe, but that we are at liberty to disregard, if we choose to take the consequences of so doing. It means a course of conduct enjoined upon us, but that we may follow or not as we please.

The discrepancy among logicians, which is wide enough to prevent them from agreeing as to the nature and province of Logic, is deep enough to prevent them from agreeing as to the nature of the Laws of Thought. According to some logicians, the Laws are laws in the first sense. They are statements of observed uniformity; they are descriptions of conditions to which thought must conform; they are inviolable laws of nature; they are necessary laws, from which no departure can be made; 'As really obeyed by all minds, they are *laws* in the sense of scientific uniformities.' According to others, they are laws in the second sense. They are rules that we ought to observe, and that we must observe if our Inferences are to be valid; but that we may break, either deliberately or by inadvertence, on peril of the consequence, that the reasonings conducted in violation of them will be invalid. According to this view, they are precepts. They set up a standard that it is desirable to follow; but that we may or may not attain. 'They may be compared with the laws of Grammar as regards correct speaking and writing.'

A third opinion is that the Laws are laws in both senses. They are inviolable laws of Nature, that we are compelled by the constitution of our minds to observe, but that we can disregard and violate if we please. Some text books explicitly state that the Laws are laws in both senses; all, I think, without exception, whether or no they speak of them as laws of Nature, interpret them as behests. Whether these laws are laws of Nature that we are compelled by the constitution of our minds to observe, or whether they are behests that we ought to observe, but may disregard if we choose, I will not now argue; but I feel considerable difficulty in accepting the doctrine, inculcated by some logicians, that they are both.

The first Law of Thought—the Law of Identity—is 'Whatever is, is.' As it is difficult for the non-logical mind to understand this proposition, at any rate in the sense in which logicians understand it, they have furnished us with several alternative

expressions, such as 'Everything is identical with itself'; 'A is A'; 'Everything is what it is'; 'Every object of thought is conceived as itself'; 'A thing is what it is'; 'If B is A, it is A'; and so forth. I do not find the law anywhere stated as 'Eggs is Eggs'; but this may be only an example, not a statement, of the law. It is perhaps a corruption of 'X is X'.

The second Law of Thought—the Law of Contradiction—states that Nothing can both be and not be; and of this also there are many variants, each logician stating it better than any other. 'A is B and A is not B cannot both be true together'; 'A cannot both be B and not be B'; 'A is not non-A'; 'A cannot be both B and non-B'. I have collected a dozen other methods of expressing this Law, but it is not worth while to give them; for, taken in the ordinary sense, one is as good as another; and no one helps us more than another to arrive at the sense that logicians read into them.

The third Law of Thought—the Excluded Middle—runs 'Everything must either be or not be'; 'A is either B or not B'; and a dozen more variants of the same theme.

When a person who has not been suckled and weaned on Traditional Logic, comes upon these Laws, and finds them in the same book, and it may be in the same chapter, in which the uselessness and tautology of the 'verbal proposition' are set forth with emphatic insistence, his first impulse is to 'hold up his hands in respectful amazement.' If these are indeed the ultimate and underlying laws of all thought; if this is the grand climax of Traditional Logic; if this is the sublimation and concentrated quintessence of the result of two thousand years of investigation; then the novice is inclined to say, with the boy who learnt the alphabet, that it is scarcely worth while to go through so much in order to attain so little.

The first thing that strikes us, upon an examination of these Laws, is that, in form, they are neither mandatory nor prohibitive. They tell us nothing that we are to do, nor do they tell us anything that we are not to do. Their form is purely assertory. They assert, not what ought to be done, or what must not be done; but what is, and what is not. They are in the form, not of legislation, but of statements of fact—of generalisations. Yet most logicians interpret them as rules; and when the

exegesis of these interpretors is examined, it is found to amount to this :—

The first Law of Thought means that a term, or a proposition, is always to be used in the same sense in the same argument.

The second Law means that we ought not to contradict ourselves.

The third Law means that every proposition ought to mean something.

These are not, indeed, the very words in which the Laws are expounded; but, when the chapter in which they are explained is boiled down, this is the residue that is left. The question naturally arises in the mind of the reader, Why, if this is what the Laws are intended to mean, are they not expressed in these words? It requires some ingenuity to read these meanings into them, and a plain man would scarcely guess that they are to be so understood, until they are thus expounded to him. Why not, then, cast them in the form that expresses clearly the meaning that is intended?

Modern Logic, however, possesses a much deeper insight; and the ordinary man is amazed, and almost appalled, by the revelation of the profundity of meaning that Modern logicians find lurking unsuspectedly in the deceptively simple-looking formula 'A is A.' Thus says Modern Logic, as interpreted by Mr. Bosanquet.

'1. The Law of Identity must be taken to signify *at least* that 'it is possible to make judgments that have a meaning and are 'true.

'*a*. In the bare form "A is A," however, a form which is not 'drawn directly from Aristotle or from Plato, the law does not '*primâ facie* possess this significance, and therefore indeed not any. 'If it means that A is A and no more, or is *mere* A, then it is 'aggressively untrue, for it denies the synthesis of differences 'which alone can make a judgement. If, again, the law is taken 'as a mere symbol of the pervading unity of the Logical 'subject, and not as intended to exclude all differences from enter-'ing into it, then it is an inadequate symbol, erring by omission 'though not by exclusion. In an absolute tautology which excludes 'or omits difference, identity itself disappears and the judgment 'vanishes with it.

'Therefore, *β*. We can only assign a meaning to the law A is

'A if we take the repeated A to be not a specification of the 'identical content, but an abstract symbol of its identity. The 'law will then mean that, in spite of or in virtue of the differences 'expressed in a judgment, the content of judgment is a real 'identity, that is to say, has a pervading unity. It says that 'there is such a thing as identity in difference, or in other words, 'there is such a thing as general affirmation—synthesis of differ- 'ences referred to reality—which yet is true, that is to say, does 'not interfere with (but in fact is indispensable to) identity.

'And, γ. We are only expanding what is implied in the 'allegation of real identity if we say that the law "A is A" ulti- 'mately asserts the thoroughgoing unity of Reality. A significant 'judgment, symbolised by "A is A" lays down for itself no reser- 'vation beyond that which its own content may dictate, and 'claims therefore to be true without any reserve. Its simple 'affirmation leaves no room for any discontinuity in the real 'world, such that on one side of it the judgment may be true, and 'on the other false. If there were such a discontinuity, the 'judgment, such is the claim of the categorical affirmation—and 'all affirmation *quâ* affirmation is at least categorical—would have 'taken note of it within its content, and would in that respect 'affirm under a reservation. But once true, always true. All 'reservations necessary to truth are included in the content. 'Reality, therefore, is one throughout. Relation to time, for 'example, is not involved in the fact of affirmation, but only, if 'at all, in conditions belonging to the content affirmed which 'depend on facts in time. Affirmation as such is unconditional, 'that is to say, is not limited by conditions outside its own content, 'and so if true, is true without reserve. There is not one Reality 'of which it is true and another of which it is false. Reality is 'what it is, and if it turns out not to be what we thought, then 'we have judged amiss, *i.e.* judged falsely.'

I have omitted two footnotes which go to elucidate still further the meaning of this extraordinarily significant law, and I must express the gratitude of the ordinary man to the original formulator of the law, that he has left us no law stated in the form A B is X + Y, for humanity staggers, and imagination boggles, under the contemplation of what such a law might really mean, without showing a sign of such meaning on the surface.

The first criticism of the Laws that suggests itself, is that, though

they are called the Laws of Thought, it is manifest and unmistakeable that they make no reference whatever to Thought. They refer to Things, not to Thought. The first Law does not say Whatever is thought, is thought; it says Whatever is, is. It seems beyond question, and it has certainly never been directly questioned by any logician, that 'Whatever' means 'Whatever thing.' Some of the alternative expressions distinctly and expressly declare that the Laws refer to things, and are Laws of Things. 'A thing is identical with itself'; 'Nothing can both be and not be'; 'Everything must either be or not be.' These are not Laws of Thought. They make no reference to thought. They are statements, not about thought, but about things. Logicians, in discussing them, understand by them, sometimes statements about the nature of things; sometimes statements of the ways in which we ought to think of things; sometimes statements of the way in which we must think of things; but no meaning is long adhered to. In the practical affairs of daily life, we do, no doubt, especially those of us that are unaccustomed to accurate thought and expression, say 'This is so' when we ought to say 'This seems to me to be so'; but I do not think the most inaccurate and slipshod thinker or speaker ever uses 'This is so' for 'This is what I ought to think is so.' This extreme of inaccuracy is reserved by logicians for their own use.

If the first Law of Thought means what it says—Whatever is, is; a thing is identical with itself,—then I submit, it is not a Law of Thought at all, but a statement about things, the objects of thought. If it means 'We ought to think' or 'We are compelled to think,' that whatever is, is; or that a thing is identical with itself; then, I respectfully submit, it should be stated in whichever of these forms is intended by the jurist who states the law. If 'Nothing can both be and not be,' it is difficult to see how a thing which is not a Law of Thought can be a Law of Thought. If 'Everything must either be or not be,' a law must either be a Law of Things or not be a Law of Things. If the Laws of Thought are Laws of Things, why are they not so called? If they are Laws of Thought, why do they not refer to thought? If they are Laws of both Thought and Things, why are they not so called, and why do they not refer to both? Why are they called Laws of Thought and stated as Laws of Things?

Granting, however, any and all of the meanings that logicians

so ingeniously read into these simple statements; and granting that they are Laws of Thought and not Laws of Things; accepting in full every gloss that can be put upon them; we are still, as it seems to me, far from possessing any code of rules for drawing inferences from postulates. The meanings that Traditional Logic finds in these Laws are that we must not equivocate; must not contradict ourselves; and must not talk nonsense; and the importance of observing these behests appears from the foregoing discussion; from which it appears, also, that as with other behests, the mere inculcation of them does not secure their observance. But though the observance of these rules will preserve us from some glaring blunders; though the rules, thus interpreted, tell us some things that we may not do; they do not tell us what we may do, nor how we are to do it. It is important, no doubt, to know that 'A is A,' if we consider it sufficiently, and in a proper spirit, means all that Modern Logic discovers in it; but even this amplitude of interpretation does not help us in the task of drawing inferences from postulates, unless, indeed, we read into the Law a further meaning, including an entire code of Rules. It may be that such a code of rules is really inherent in the deceptively simple expression 'A is A,' and that the code could be extracted by a sufficiently competent intelligence; just as, according to Holmes, an archangel could, by a mere gesture, convey to another archangel a history of the Universe; but it would be unfair to demand such a feat from the average undergraduate, who, after all, is not an archangel; and, in order to assist him in the task of drawing conclusions from postulates, and of distinguishing valid from invalid inference, without the necessity of having

> His cogitative faculties immersed
> In cogibundity of cogitation,

I have ventured to formulate certain Canons of Inference, which seem to me to be required, and to secure the end in view.

CHAPTER XVII

THE CANONS OF INFERENCE

THE unit of Logic is the proposition. The unit of Empirical or Inductive Logic is the proposition derived from experience. The unit of Inference or Deductive Logic is the postulated proposition, whose nature has been explained in the first Chapter. It was explained in the Introduction, that there are three main forms of Reasoning, in the first of which we hold fast to the facts of experience, and never go beyond them. We travel on the firm ground of experience and never do, or never ought to, take a step, until we are assured of the firm ground on which we stand. In the second mode of reasoning, we put out to sea. We leave the dry land of experience behind us, and sail upon the illimitable ocean of postulation. All our postulates do, it is true, originate in some experience or other, but in the combinations and analyses we make, in the rearrangements we effect, in the transformations we bring about, we are not influenced by experience in the least. We are in the fairy realm of imagination and fancy, with which the work-a-day world of experience has no concern.

Experience teaches us the forms of men and of horses; and as long as we remain in the realm of Induction, we may make no suppositions about the forms of men and horses that are not warranted by experience. But when we sail on the sea of postulation, we may, in imagination, cut off the man at the waist, cut off the horse at the root of the neck, join the mutilated man to the mutilated horse, and so create a centaur; invest him with life, and with any other qualities we please. We may make him—still in imagination—an Archer, or a Butcher, or a Chemist, or a Drunkard. We may give him a serpent for a tail, and a cuttle fish for a head; and having created these postulates, we can argue from them as if they were real. If a centaur has the body of a horse, then a man could ride on his back. If he has the intelligence of a man, then he can reason logically, unless, indeed, his mind has been vitiated by the study of Traditional Logic.

But it is not only, nor chiefly, of concrete imaginings like centaurs, that the power of postulation enables us to reason. Its supreme value is in the power it gives us to reason of abstractions. For the purpose of argument, we may postulate lines that are straight; circles that are perfect; rigid levers; strings without weight, and perfectly flexible; machines without friction; perfectly elastic bodies; vacua; hypothetical vortices in an hypothetical ether; asymptotes; infinitesimal quantities; and a thousand things besides. It places at our disposal the whole field of mathematical physics. It allows us to speculate as to space of more or less than three dimensions; it allows us to postulate that two straight lines may enclose a space; that any two sides of a triangle are equal to, or less than, the third; that light is corpuscular or undulatory. It allows us, having granted or assumed these postulates, to trace the consequences that would flow from them if they were true. Whether they are in fact true or not, Deductive Reasoning does not inquire. It is as easy to reason deductively from postulates that are materially true, as from postulates that are materially false; and from those that are materially false, as from those that are materially true. It is easy, and it is legitimate, to argue from postulates whose truth or falsity is doubtful or unknown to us. We may postulate not only what is improbable, but what is impossible; not only what is impossible, but what is inconceivable; not only what is inconceivable, but what is nonsensical; and arguments founded on any of these postulates will be sound, valid, and incontestable, if they are conducted according to rule. There is but one limit to the power of postulation, and that will be indicated presently.

It is improbable that an earthquake will devastate to-morrow the City of London; but it is quite legitimate to argue from this postulate, and to show the widespread ruin, the dislocation of finance, of commerce, of politics, that would ensue from such a catastrophe, if it were to take place. In other words, we may postulate, for the purpose of argument, that London will be destroyed to-morrow by an earthquake; and the validity of the argument is not affected, one way or the other, by the improbability of the postulate.

It is impossible for me to jump over the house; but if I could jump over it, I should come down with a tremendous thump on the other side. The validity of the argument is not in the least

affected by your denial that I could jump over the house. I dare say I could not. I am not so active as I was, and I was never a good jumper ; but for the purpose of argument, I can postulate that I could jump over the moon ; and having assumed this postulate, I can deduce the consequences that would ensue if it were true. Whether it is true or not does not in the least affect the validity of my argument.

Not yet have we exhausted the powers of postulation. For the purpose of argument, we may postulate not only what is improbable ; not only what is impossible; but what is actually inconceivable. Grant me my postulate, and I can argue of the square root of minus one ; of a fourth dimension in space; of eternity, and infinity. Grant me my postulate, and I can show what would follow if two straight lines should enclose a space ; if any two sides of a triangle were less than the third ; if the whole were less than its part; and it is on such postulates as these that the familiar *reductiones ad absurdum* of Euclid are founded.

The power of postulation extends beyond the inconceivable. It includes even the nonsenical. If chalk is harmonious, and what is harmonious is black, then chalk is black; and the validity of the deduction is in no way diminished by the nonsensical character of the postulates. Much play is made in books on Logic by such nonsensical statements as that virtue is red and the soul is square; but if I choose to postulate that virtue is red or that the soul is square, all the king's horses and all the king's men cannot prevent me from assuming these postulates for the purpose of argument. If virtue is red, and I photograph it in the ordinary way, it will come out white in the photograph. If the soul is square, then its sides are equal, and its angles right-angles. No arguments could be more valid than these.

Not even yet are the powers of postulation exhausted. It extends beyond the nonsensical to the unintelligible. I may, if I please, postulate that Brillig is a slithy tove, and that any slithy tove can gyre and gimble ; and from these postulates I can draw the irrefragable deduction that Brillig can gyre and gimble. It is no more necessary to read a specific meaning into the terms used in a deductive argument, than it is necessary to read a specific meaning into the terms in the equation $a + b = x\,y$. We may deal with the terms as symbols only, and, as long as

our operations are conducted *secundum artem*, their conclusion will be unimpugnable. But it is evident that this unimpugnability refers to consistency only. The assumption of a postulate can never guarantee the truth of a conclusion from it; but the correct performance of deduction does guarantee that the conclusion is consistent with the postulate. This is the function, and the only function, of Deduction. Its province is not to ascertain truth, but to ensure consistency, and to explicate meanings that are in the postulate, but that may not be immediately apparent.

I have said that there is one limitation to the power of postulation; and the limitation is important. We may postulate what is improbable, what is impossible, what is inconceivable, what is nonsenical, even what is unintelligible; but we may not postulate what is self-contradictory. We may postulate that there is a whale two hundred yards long; that wax becomes harder the more it is heated; that time is eternal and space infinite; that the soul is square and virtue red; that Brillig is a slithy tove; but we may not postulate that an irresistible force can impinge on an immoveable body; that there is an unconscious mode of consciousness; that matter can be refined into immateriality; that a privative negative has a denotation; that an infinite series is terminable; or that an infinitesimal quantity is of appreciable magnitude. Self contradictories we may not postulate; but short of what is self-contradictory, we may postulate what we please.

The first Canon of Inference or Deduction, is, therefore, that *Every Inference is deduced from a postulate*; and the second is that *For the purpose of argument we may postulate what we please, saving only self-contradictories.*

It is curious that no logician but Sir William Hamilton seems to have had any inkling of this doctrine; and it is more curious that though Hamilton stumbled on it, he thought it applied to Induction. But then Hamilton, like all other logicians, considered that Induction was arrived at by means of the syllogism, and his statement of the doctrine occurs in his treatment of what he calls the Inductive Syllogism; a creature that in my opinion has no existence except in the imaginations of misguided logicians. 'The logician,' he says, 'has a right to suppose any material impossibility, any material falsity; he takes no account of what is objectively impossible or false, and has a

right to assume what premisses he pleases, provided they do not involve a contradiction in terms.' This is precisely the doctrine that I advocate with respect to Deduction; and for Deduction it seems to me indisputably true; but how Hamilton could have supposed that it is applicable to Induction, or that it is possible to derive a materially true conclusion from a premiss that is materially false, passes my comprehension, and corroborates my opinion that no doctrine is too extraordinary for a logician to entertain. If any doctrine could involve a contradiction in terms, I should have thought that this did. If, however, we separate it from Induction, and apply it to Deduction, it expresses what I believe is the exact truth.

If Hamilton's doctrine, as applied to Induction, is strange, it is not stranger than that of some of his commentators. One of these says that Hamilton's doctrine, quoted above, 'does not leave it at all clear that logic—thus regarded—has any value whatever.' If this were said of Hamilton's doctrine as applied to Inductive Logic only, I should agree with it; but it manifestly refers to the whole of logic. Is there, then, no use in the Infinitesimal Calculus, in Mathematical Physics, in Higher Mathematics generally, in the *reductio ad absurdum*? It is true that mathematical reasonings are excluded by logicians from the realm of Logic, or, if not formally excluded, are by common consent ignored; but this is only another instance of the inefficiency of Logic as hitherto understood. Mathematical reasoning is reasoning, and a science which purports to expound the nature of reasoning must include mathematical reasoning, or stand convicted of inefficiency.

Some adumbration of this doctrine seems to have been in the minds of those logicians of whom Hamilton, again, is the most conspicuous, who have applied the term 'Formal' to Logic. If it is possible, as I have just contended, to argue from postulates that are not merely impossible and inconceivable, but nonsensical and unintelligible, I do not see how it can be denied, that the latter, at any rate, are purely formal; and, since the mode of argument is the same in all, if it is formal in one, it is formal in all. That all Logic is formal, I should strenuously deny; but that Deductive Logic is formal, cannot, in my view, be contested. Those logicians who, like Thomson, confess that they do not understand the distinction between material and formal, are out of this argument; and most of those who deny that Logic is a

formal science do so, rightly as far as they go, by adducing material reasoning in contradiction. Bain alone, as far as I know, denies that Deduction is purely formal ; and the controversy is not important enough to warrant a long digression to examine his arguments. In my view, Deductive Logic is purely formal on this ground and in this sense—that it consists solely in casting the matter of the posulate into different forms. The postulate gives us the matter in one form, and the task—the sole task—of Deduction, is to convert the postulate, or part of it, into another form, and to ensure that the two forms are consistent with each other.

The doctrine here advocated casts light upon the contention of Modern Logic, that every proposition refers to Reality. 'All propositions necessarily imply the existence of their subjects in the appropriate sphere.' To this I can assent, if among the appropriate spheres is included the sphere of postulation. But when it is said that In every judgement I assert a meaning, and assert that meaning of ' Reality,' I must differ on more than one ground. In the first place, many of the ' judgements ' of Modern Logic, if they do indeed assert a meaning, do not convey any meaning to their readers ; and in the second, any reference to Reality in Deductive Logic is out of place, irrelevant, and confusing. The subject is postulated, if as real at all, as real for the purpose of the argument only. Whether it is or is not real in a more absolute and more correct sense, is a matter with which the Logic of Consistency is not concerned.

According to the Law of the Excluded Middle ; chalk is either harmonious, or is not harmonious, and no third alternative is possible ; but if, and as far as, Logic deals with Real existence, there is a third alternative—that neither is true, for both are nonsense. The Logic of Deduction, however, does not admit the third alternative. It declares that, for the purpose of argument, we may postulate what we please ; and that if chalk is harmonious, and what is harmonious is black, then chalk is black. Refuse to admit the postulates, and still the argument is not invalid. It merely does not exist. There is then no argument. All Inference proceeds upon assumption, and cannot begin until its postulates are granted ; but grant it its postulates, and it can argue of anything.

It seems manifest that we may, if we please, interpret the first

of the so-called Laws of Thought—whatever is, is—to mean whatever is postulated for the purpose of argument may form the ground of argument; and thus we may read the second Canon of Inference into the first 'Law of Thought.'

Since all Inference is based on postulation, the argument, once begun, must proceed on the basis of the postulate, and on no other assumption; and this gives us two more Canons of Deduction; the first of which is that *A postulate, once granted, must not be withdrawn nor ignored in the course of the argument.* The argument must proceed throughout on the basis of the postulate.

The argument that if centaurs existed, they would make splendid cavalry, cannot be controverted by denying that centaurs exist. The postulate may be denied, but not in the course of the argument. If it is questioned, it must be questioned before the argument begins; but having once been allowed or assumed, it must not be denied in the course of the argument. If Consols fell to 84, the cause, I say, was this or that, and you may controvert my argument by any reasoning you please, but you may not controvert it by denying that Consols did so fall. That is outside the argument. That must be settled, if it is settled at all, before the argument begins. If you question the postulate, you must do so at the outset; you may not postpone your objection until the argument has led to a conclusion distasteful to you. To deny the postulate does not invalidate the argument; it renders argument on that basis impossible. I may argue that if women have votes, they will involve the country in war, and you may seek to refute my argument by any means that commend themselves to you, even by breaking my windows, or chaining yourself to my chairs and tables; but you do not refute the argument by denying that women will have votes.

Not only may the postulate not be denied: it must not be ignored. The argument must proceed on the basis of the postulate, and on that alone. I say that if centaurs existed, they would make splendid cavalry, and you do not refute my argument by saying that the horses of the other cavalry would be frightened by them, or that they would need very large tents. Such statements do not proceed on the basis of the postulate. They ignore it. If Consols fell to 84, I say the cause was this or that; and

you do not refute my argument by saying that it was a good opportunity to pick them up cheap. That is beside the question. It ignores the postulate. I say that if women had votes, they would involve the country in war; and it is no counter argument to say that they would never vote for any war that was not just. This deserts the basis of the postulate. It is outside the argument. It ignores the postulate.

With a little ingenuity, this Canon can be read into the second Law of Thought. 'Nothing can both be and not be' may be held to mean that we must not or cannot assent to two propositions that are inconsistent with each other. If this is made as a statement of reality, it is certainly not true; for many pairs of beliefs, held in common by multitudes, are inconsistent. Multitudes who hold that the country has a surplus of population, which is bad for the country, are appalled at the declining birth-rate, and hold that this also is bad for the country. If, however, it is held to mean that we cannot assent to two propositions when we believe them to be inconsistent with each other, then this Law of Thought has a meaning, and a true meaning. To argue on the basis of a postulate, and to deny the postulate, or to ignore it, is to hold two inconsistent positions at once.

The remaining Law of Thought—the Law of the Excluded Middle—asserts that everything must either be or not be. We may, perhaps, interpret this to mean that a postulate must be either granted or refused, and that we must argue deductively on the basis of a postulate or not at all. If this seems a free rendering of the Law, I can only put forward in excuse that free renderings of the Laws of Thought are the rule in Logic, and, moreover, if these interpretations of the Laws are not admitted, I can do very well without them.

So far, the Traditional Laws of Thought, if interpreted in these senses, do express real conditions that are necessary for Inference; but they do not by any means express all the conditions that are necessary, nor can they, by any artifice, be made to express them all. There are two other Canons that are necessary if Deductions are to be valid, or if they are to be made at all; and these are of as much value and as great cogency, they are as indispensable, as those already stated. If the first of the new Canons is violated, Inference is invalid; unless the second is admitted, Inference is impossible. The first Canon is

stated by Hamilton, but no subsequent writer, except Prof. Carveth Read, has recognised its importance sufficiently to repeat it or adopt it; and the second, though it has been tacitly assumed, or no inference could ever have been made, has not, as far as I know, been formulated by any logician. The omission of both these Canons from every text book is one of the most surprising things in Logic, fertile as Logic is in surprises.

The Fourth Canon of Inference is: *Nothing may be assumed that is not in the postulate.* This is, of course, a corollary from the rule that the argument must proceed on the basis of the postulate, but it is expedient to divide this rule into two, and the fourth Canon is its second implication. According to this Canon, we may not go outside our premisses; we may not go beyond the evidence; we may advance nothing that is not in our brief. Grant me the postulate that his evidence was false, and I may rightly infer that it was calculated to mislead the jury; but I may not infer, from this postulate alone, that he committed perjury. To draw that conclusion, I must have the further postulate that he knew his evidence was false. Granted that he was found dead; but I may not conclude, from this postulate alone, that he was murdered, or that he committed suicide. Postulate that logicians have stated three Laws of Thought, but we may not conclude, from this postulate alone, that they have stated all the conditions necessary to valid inference. Postulate that drink can cause insanity, yet we may not conclude, from this postulate alone, that his insanity was due to drink. Granted that Inductive Logic must take account of the matter of which it treats; it does not follow that Deductive Logic is not a Logic of pure form.

No Canon of Inference is more important than this, for it is in the breach of this Canon that most of the recognised fallacies of Inference consist. It is the violation of this Canon that constitutes all the formal fallacies of Traditional Logic, and many other fallacies that that Logic does not recognise.

If there are degrees of importance in the Canons of Inference, then the Fifth Canon is the most important of all, for it and it alone renders inference possible; it alone allows inferences to be deduced, and all deduction is based directly upon it. It is this: *When a postulate is granted, all its implications are granted.* The other Canons state the conditions of Inference. The fifth Canon shows the mode or method of Inference. It tells us what inferences

are, and how they are effected. This Canon will presently be expanded into a series of Lemmas, which constitute the practical rules that regulate the process of Inference. What the implications of a postulate are, and how they may be deduced from it, will form the subject of the following chapters; at present we are to notice that every postulated proposition contains implications, and that, when it is assumed or postulated, all its implications are assumed or postulated along with it.

What is meant by an implication of a proposition has already been explained in the last chapter. An implication of a proposition is another way of stating the matter of the proposition, or of a part of it; and from the discussion in the present chapter it follows that every inference, like the proposition from which it is extracted, must be hypothetical. The process of inference is the extraction or explication of some implication or meaning latent in the proposition that is postulated for the purpose of the argument. We cannot begin to draw an inference until its premisses are postulated. If this doctrine is correct, and if the Canons of Inference here stated are sound and valid, then any doubt remaining of the existence of the *petitio principii*, said to be inherent in every syllogism, is laid at rest. If the conclusion contains anything that is not postulated in the premisses, the fourth Canon is violated and the argument is unsound. In another sense of *petitio principii*—for this, like every other cardinal term of Traditional Logic, is ambiguous—the whole basis of Inference is that very begging of the *principium*, or major premiss, that is in question. Unless the premisses are assumed or begged for the purpose of the argument, argument cannot proceed. State your syllogism. 'All men are mortal'—Stop there! I deny your major. There are cases to the contrary—Enoch, Elijah, Struldbrugs. Until this preliminary difficulty is settled, you cannot proceed with your argument. You are arrested at the outset, and cannot go on. But put your premiss in the form 'If all men are mortal,' and you disarm me. I am powerless now, and cannot hinder you. If all men are mortal, and Socrates is a man, then, indeed, Socrates is mortal; and however I may deplore the prospect before him, I have neither hope nor comfort to offer. But now you have begged your *principium*; and it is on this very *petitio principii* that the whole validity of your inference rests. The conclusion rests entirely on the validity of the premiss; and this premiss is postulated

or begged for the purpose of the argument. I can demand the warrant for your postulate, but I cannot do so as a Deductive logician. As a mere deducer you are safe. I am powerless to question the validity of your inference as an inference. Before I have any right to demand the grounds or justification of your *principium*, I must leave the domain of Inference, and enter another realm. The Logic of Inference can no more question its own premisses than a man can wheel himself along in a wheelbarrow, or lift himself up in a basket. As long as the Deductive logician is content to argue on an admitted assumption or postulated premiss, he sails on the calm waters of Inference; but the moment he attempts to show a conclusion that is not already begged in his *principium*, he strikes on a rock. He is now trying to sail on dry land. He may, indeed, be on firm ground, but firm ground is the last thing a ship desires to meet with. This discussion on the *petitio principii*, inherent in every syllogism, will be resumed in the chapter on the syllogism.

CHAPTER XVIII

IMMEDIATE INFERENCE

The Implications of Simple Propositions.

The implications of Simple Propositions are known in Traditional Logic as Immediate Inferences; but in this field, as in others already examined, the narrow and conventional boundaries of Traditional Logic are broken down by the New Logic here expounded, and the field is indefinitely enlarged. The two Quantities of Traditional Logic have been found to be the meagre representatives of very many that are in actual use. The two Negatives of Traditional Logic are the attenuated remnant of scores of negatives that can be constructed, and are in daily use. The Immediate Inferences of Traditional Logic are three or four—the Converse, the Obverse, the Contrapositive, and to these some add the Inverse; the implications of simple propositions, derivable by the method of Explication here expounded, are indefinitely multitudinous.

The general Canons of Inference are laid down in the last chapter; and, in accordance with them all inferences ought to be made, and all valid inferences are made; moreover, when a fallacy in Inference is perpetrated, its perpetration is due to the breach of one of these Canons; but in order to discover what inferences may be drawn from propositions, and how they are to be extracted, we need guidance more specific than these Canons afford. The whole scope of Inference, or Deduction, is indicated by the fifth Canon, which asserts that when a proposition is granted, all its implications are granted with it. Since the implications are merely other ways of stating the proposition, or part of it, this is self-evident; but this Canon does not give us any indication of what the implications are, or of the ways in which they may be extracted from the postulate. For these purposes we require further rules, or further licences; and these rules or licences are not the same for all classes of propositions; or rather, the Canons of Explication, as we may call them, that suffice for the extraction of the

implications of Simple propositions, need the addition of others to enable us to extract all the implications that are contained in Compound propositions. In this chapter, we are concerned with Simple propositions only, and the Canons for their explication may be stated, as Lemmas to the fifth Canon of Inference, as follows :—

THE CANONS OF EXPLICATION OF SIMPLE PROPOSITIONS.

Every postulated proposition implies

1. Every equivalent and included proposition.
2. Every condition necessary to the postulate.
3. The denial of every proposition inconsistent with the postulate.

1. *Every postulated proposition implies every equivalent and included proposition.*

Of these equivalent or included propositions there are three varieties; and to enable us to extract them all, we require three Minor Canons of Explication, as follows:—

A. *Every postulated proposition implies its reciprocal.*

The proposition expresses, as we have already found, a relation between two terms. The first Minor Canon of Explication declares that every relation implies a reciprocal relation;—that whatever relation the Object holds towards the Subject, is reciprocated by the Subject towards the Object. If A is the father of B, then B is reciprocally the child of A. If A is above B, then B is reciprocally below A. If A strikes and kills B, then B reciprocally is struck and killed by A. If A includes, or is included in, B, then B reciprocally is included in, or includes A. If A is an attribute of B, then B reciprocally possesses the attribute A.

Traditional Logic knows nothing of the reciprocal proposition, or of the reciprocity of terms. I know of no exponent of Logic except Prof. Carveth Read, who makes any allusion to reciprocity, or even mentions the reciprocal proposition; and Prof. Carveth Read attaches no great importance to it, and merely mentions it. In place of the reciprocal, Traditional Logic offers us the converse, which is a conventional and unnatural implication, which no one but a logician would think of extracting from a proposition; which is never, in fact, used in argument outside of books on Logic; which cannot be extracted from any proposition but those

expressed by the copula; and which cannot be extracted from many of them without wresting and distorting their true meaning. Even within this limited class of propositions, conversion can be applied to but one of the two pairs of relations that are, according to Traditional Logic, expressed by the copula. It is applicable to the relation of class inclusion and class exclusion only, and cannot be applied to attribution.

Of the four meanings which alone are admitted by Traditional Logic to be expressed by a logical proposition, it is agreed that one is usually intended. It is generally agreed, by the exponents of Traditional Logic, that the Subject is to be understood in extension, the Object in intention,—the Subject in denotation, the Object in connotation—the Subject is a thing or class of things, the Object a quality or attribute which is predicated of that thing or of the things in that class. This is the meaning that the exponents of Traditional Logic unanimously agree is to be understood by the logical proposition. Yet when, in the next chapter, they treat of the conversion of propositions, logicians ignore this signification altogether, and substitute another. The proposition which predicates a quality of a thing or of things in a class, is never converted as if it had that meaning, but always as if it predicated inclusion or exclusion of things in a class. 'All trees are tall' expresses, according to the accepted convention of Logic, 'All things in the class of trees have the quality of tallness.' It is possible, indeed, that it may have one of the other three meanings; but this is the meaning that is usually to be read into it. But when they convert the proposition, do logicians make the converse 'Tallness is an attribute of all trees?' Never. The converse they construct is invariably 'Some tall things are trees.' Why the meaning, which is said to be expressed by a proposition, is always dropped, and replaced by a different meaning when the proposition is to be converted, is not stated by the text books, whose writers do not appear to be alive to their own inconsistency; but the reason is, no doubt, that the sense of class inclusion is necessary to the propositions of the syllogism.

The converse of Traditional Logic is no easier—it is not so easy—to construct as the reciprocal. The relation the converse expresses is felt to be artificial and unnatural. It is, moreover, inaccurate. If all trees are tall, that is, if all trees have the attribute of tallness; then that tallness is an attribute of all trees, is a

natural, a complete, and an accurate converse, or reciprocal. The terms are identical; the relation is reciprocal. Everything expressed in the convertend is in the converse. There is nothing in the converse that is not in the convertend. But if we convert 'All trees are tall' into 'Some tall things are trees,' the first impression made on the unaccustomed mind is that this is a very unnatural and artificial inference. It is one that no one unacquainted with the peculiar conventions of Traditional Logic would ever think of. The convertend says nothing, and suggests nothing, about 'Some tall things.' The term is an importation. It is a violent wrenching of the meaning. It threatens, if it does not actually invade, the integrity of the fourth Canon of Inference, which forbids us to assume anything that is not in the postulate. The term is dragged in neck and heels, and is stuffed into a position for which it is palpably unfit. Moreover, the convertend says 'All trees are tall,' but the converse says nothing of all trees. Nothing in Traditional Logic is more settled, about nothing are the warnings of Traditional Logic more emphatic, than that the predicate of an affirmative proposition is undistributed. If we reconvert our converse, what do we get? 'Some tall things are trees' yields the converse 'Some trees are tall things,' so conveying the suggestion that some trees are not tall things, which is contradictory of the original postulate; and transmogrifies the original attributive predicate into a class predicate, which is contradictory of the logical doctrine that the predicate is to be understood in intention. Traditional Logic would, no doubt, deny that 'some' suggests 'not all,' and would refer to the conventional meaning 'some at least,' to which it attempts to limit the 'some' of ordinary discourse; but if Logic is to be generally applicable to the reasonings of daily life, and is not to be restricted to a few conventional forms, it must not thus arbitrarily restrict the meanings of words in common use; and if it is to be a purely technical science and art, restricted to a few artificial conventions, its claim to general usefulness must be abandoned. If we adhere, as I submit we ought in this case to adhere, to the connotative or attributive value of the predicate, which is indicated as plainly as possible by the adjective 'tall,' we get the reciprocal, 'Tallness is an attribute of all trees.' This is, in the first place, natural. It commends itself to us at once, as a manifest implication of the postulate. In the second place,

it is accurate. If the convertend expresses, as logicians tell us it does, the relation of attribute to substance, then the converse should express, as this does, the relation of substance to attribute. In the third place, it is complete and ample. Whatever the convertend says of all trees and of tallness, the reciprocal says of tallness and of all trees. If the proposition is reconverted, it reappears in the exact form of the original.

In a comprehensive and authoritative text book on Logic, the converse of 'Every old man has been a boy' is said to be 'Some who have been boys are old men.' It will be noted that, in the first place, the quantity of both terms has been altered; a proceeding that I regard as doubly inadmissible, and one that strikes us as strange from an exponent of Traditional Logic, which requires such punctilious accuracy with respect to quantity. In the second place, the converse conveys, not the same meaning as the convertend, but a very different meaning. 'Every old man has been a boy' excludes entirely the possibility that any old man could have been a girl. But 'Some who have been boys are old men' does not exclude, nay, it distinctly suggests, the possibility that others who have been girls are old men. From the convertend we can get the obverse, 'No old man has been a girl,' but from the converse we cannot obtain this negative. If the implications of the converse are not the same as those of the convertend, the meanings of converse and convertend cannot be the same; and in this case, they are plainly not the same. The true converse, or reciprocal, should express exactly what is in the convertend, neither more nor less; and the terms should remain precisely the same. It is not allowable to alter them in quantity, as Traditional Logic does, neither is it permissible to alter an abstract term into a concrete, as this Logic constantly does. The true reciprocal of 'Every old man has been a boy,' is 'A boy is what every old man has been.' In this reciprocal, the terms are identical with the terms of the postulate: the Subject is become Object, and the Object, Subject, without alteration of either; and the Ratio alone is changed into its reciprocal. These are the only alterations. The meaning of the proposition remains precisely the same. It is not extended: it is not contracted: it is not modified.

The text books do not all give the same rules for the conversion of propositions, and some of them give two rules only, which, by themselves, are manifestly insufficient, for they are both negative,

and telling us only what we must avoid, they say nothing of the way the thing is to be done. The first rule is that the quality of the proposition must not be changed; the second is that no term that is undistributed in the convertend, must be distributed in the converse. Both rules are faulty. There are propositions that cannot be converted without altering the quality; and it is not enough to prohibit an extension of distribution of a term. The term must not only remain unincreased in quantity: it must remain unaltered in any respect whatever except in case, and in one other respect. And these rules omit altogether to state that the terms are to be transposed.

Adding this condition, however, the whole scheme is radically wrong. It gives us, at best, the very imperfect form of converse that has already been examined. To many propositions it gives us no converse at all, or no reasonable or correct converse. It may give us a converse that is nonsensical. It is incapable of giving a converse of the O proposition, which, by a correct method, is as easily convertible as any other. The reciprocal relation is open to none of these objections. It gives us in every case, without difficulty, and without altering the sense, a true, accurate, intelligible reciprocal, that cannot be mistaken for anything else. Moreover, this transformation is effected by a single very simple rule:—Transpose the terms without any alteration except what necessarily follows from the transposition, and change the Ratio into its reciprocal.

There are two alterations of terms which necessarily follow from their mere transposition; and when either of these alterations is consequential on the transposition, that alteration must, of course, be made; but no other alteration of a term is permissible. If either Subject or Object is inflected, its case must be altered when it is transposed; and if the Object is an attribute, it must of course be converted into an abstract before it can stand as Subject.

There are many propositions that admit of no converse, or of no correct converse, by the Traditional plan of conversion. In no text book of Logic known to me is any attempt made to convert a proposition constituted by an intransitive verb. As far as conversion is concerned, intransitive verbs do not exist for Traditional Logic. How to convert He fell, He dances, It rains, and so forth, Traditional Logic does not tell us, and does not appear to know.

'He fell.' How is this proposition to be converted by the rules of Traditional Logic? First we must, by hook or by crook, introduce the copula. A proposition that has no copula is inconvertible. That the relation that the proposition expresses cannot be expressed by the copula, is a matter to which Traditional Logic is indifferent. If it cannot be so expressed, so much the worse for the relation. The mandate of Traditional Logic is simple:—Alter it into one that can. Never mind that in so doing you alter the sense of the proposition. Traditional Logic is not concerned with sense. Get the copula in somehow. *Rem. Si possis, recte; sed rem.*

'He fell' must therefore be altered into 'He was a person who fell,' or 'He is a person who fell.' Convert this according to logical rule, and we get 'A person who fell was he.' This is not the converse of 'He fell.' 'He fell' tells us what he experienced —what he underwent. The converse should tell us what was experienced or undergone by him. It does not. 'A person who fell was he' tells us, not what he experienced or underwent, but who a person who fell was. This is not what we want. The true converse or reciprocal of 'He fell,' which is short for 'He experienced falling,' is 'Falling was experienced by him.'

Similarly, 'He danced' cannot be converted, on the plan of Traditional Logic, until it is transformed into 'He was a person who danced'; that is to say, until a statement of historical fact is changed into a definition or description. Then it is converted into 'A person who danced was he.' But 'He danced' is not the abbreviation of 'He was a person who danced.' The abbreviation of this proposition is 'He was a dancer,' and it is of this proposition that 'A person who danced was he' is a converse. 'He danced' and 'He was a dancer' have very different meanings; and their respective converses must have very different meanings also. 'He danced' is short for 'He performed the act of dancing'; and the converse, or rather, the reciprocal, of this is 'The act of dancing was performed by him,' or colloquially, 'Dancing was what he did.'

In order to convert 'You shall have jam for tea' by the method of Traditional Logic, we must first transform it into 'You are a person who shall have jam for tea,' and the converse will then be 'A person who shall have jam for tea is you,' a proposition which logicians are welcome to keep for their own use and delectation. But if we look at the relation the proposition expresses, and find

the reciprocal of that relation, its conversion into a rational proposition becomes easy enough. The words 'for tea' are a qualification of the Ratio, and in logical order, the proposition is, 'You—shall have for tea—jam.' The literal reciprocal is 'Jam shall be had for tea by you'; but in common discourse, we do not express ourselves with this pedantic exactitude, and the colloquial reciprocal is 'Jam is what you shall have for tea.'

'Anything but water is wholesome to drink' becomes, by logical conversion, 'Something wholesome to drink is anything but water,' which is not English, and is scarcely sense. The reciprocal is 'Wholesomeness to drink is found in anything but water'; which is both good English and good sense.

The logical rule, that the quality of the proposition must not be changed in conversion, is unnecessary, and would prevent us from effecting some conversions that otherwise are possible. 'Nothing is as painful as humiliation' becomes, by the conversion of Traditional Logic, 'Something as painful as humiliation is nothing,' which is very like a contradiction in terms. The true reciprocal is, of course, 'Humiliation is more painful than anything (else).' In order to get the true reciprocal, we must violate the practice of Traditional Logic, and look behind the words, to the sense that they express; we must violate its rule, and change the quality of the proposition.

It is unanimously asserted by the text books that the O proposition—the Particular Negative—Some A is not B—is inconvertible; and so it is by their mechanical process, which looks to the words only, and takes no account of the sense. But if we go behind the words, and pay regard to the sense that the words express, it is convertible easily enough. The impossibility is like the chalk lines that hypnotisers draw upon the floor, and persuade their victims are insurmountable barriers. If 'Some men are not honest,' then it is true enough that we cannot convert this, according to logical rule, into 'Some honest beings are not men,' or, if we do, we shall make a material mistake. But this inability arises from nothing inherent in the Particular Negative, but from the application to it of a vicious method. It arises from pretending that the negative proposition must express a relation of class exclusion; which it may not, and, according to logicians themselves, it usually does not. If we take it, as they tell us it ought to be taken, as expressing non-attribution, it is convertible

easily enough. The reciprocal then is 'Honesty is a quality which some men do not possess,' or 'Honesty is not a quality of some men.'

The reciprocal is but one of those implications of Simple propositions that are called, in Traditional Logic, Immediate Inferences. We have seen that every postulated proposition implies every proposition that is equivalent to it, or is included in it. Of those that are equivalent, the reciprocal is one. There are others, however, and these are now to be considered.

B. The second Minor Canon of Explication states that *Every postulated proposition implies every proposition in which the Ratio of the postulate is replaced by a Ratio that is, for the purpose of the argument, equivalent to, included in, or implied in, the postulated Ratio.*

In other words, if a proposition can be expressed differently, by the use of a different Ratio, without enlarging the meaning of the proposition, it may be so expressed; and such expression is a legitimate Immediate Inference from the proposition. Every Inference is another way of expressing the postulate, or part of the postulate; and if the Ratio is susceptible of being expressed otherwise than it is expressed in the postulate, it may be so expressed, and the expression is a valid inference.

If Brutus murdered Cæsar, then Brutus wilfully and feloniously killed and slew Cæsar; Brutus killed Cæsar of malice aforethought; Brutus, being prompted and instigated by the devil, and not having the fear of God before his eyes, did wilfully, maliciously, and feloniously, kill and slay Cæsar, against the Peace of our Lord the King, his crown, and his dignity. These substituted Ratios are equivalent to the postulated Ratio 'murdered,' and may therefore replace this Ratio in the proposition, and the Immediate Inferences are valid.

If there is no balm in Gilead, then we may legitimately infer that balm is absent from Gilead; that balm does not exist in Gilead. If men like flattery, they are pleased by flattery; they are gratified by flattery; they welcome flattery; they would rather be flattered than not.

These Ratios are equivalent, severally, to the Ratios they replace; but an inference is legitimate when the substituted Ratio is not equivalent, if only it is included in, or implied in

the postulated Ratio. If Brutus murdered Cæsar, then Brutus killed Cæsar, for killing is included in murder; but of course the converse is not true. We cannot infer from Brutus killed Cæsar to Brutus murdered Cæsar, for murder is not, for the purpose of the argument, equivalent to, nor included, nor implied in killing.

If there is no balm in Gilead, then we may legitimately infer that balm cannot be extracted out of Gilead; and that there is no use in going to Gilead to get balm; for these are implied in the postulate, though they are not equivalent to the postulate.

These inferences are manifestly legitimate and valid. They commend themselves to the hearer, and carry their validity on the face of them. They cannot be doubted nor questioned; but they cannot be reached by any of the processes of Inference, Immediate or Mediate, of Traditional Logic. That they are not Immediate Inferences is manifest. They are neither converses, obverses, contrapositives, nor inverses, and these are the only Immediate Inferences of Traditional Logic. Neither can they be reached through the syllogism. We might, indeed, construct a quasi-syllogism that would give us the conclusion. We might say:

All the persons that a man murders, he kills;
Brutus murdered Cæsar;
∴ Brutus killed Cæsar.

Whether logicians would admit this to be a valid argument, I do not know; but it is certainly not a syllogism. The propositions are not logical propositions, and are incapable of entering into a syllogism, for they contain no copula. There are four terms, and a syllogism cannot be constructed with more than three; and there is no middle term. A nearer approach to a syllogism on the subject must be constructed somewhat in this way:—

The person who murdered Cæsar was the person who killed Cæsar,
Brutus was the person who murdered Cæsar;
∴ Brutus was the person who killed Cæsar.

This is not a syllogism; at any rate some logicians would refuse to recognise it, for the middle term is singular.

This is the nearest we can get; but even this does not give us our conclusion in its proper form. It gives us that Brutus was

the person who killed Cæsar, but it does not give us that Brutus killed Cæsar. What we want to know is not what sort of a person Brutus was, but what Brutus did to Cæsar. Waiving this objection, however, is this the course of thought that the mind goes through, in inferring, from Brutus murdered Cæsar, that Brutus killed Cæsar? I say with confidence that it is not. The transaction in the mind is the intuitive realisation that killing is, for the purpose of the argument, included in murder; and that if murder was done, killing must have been done. The mental transaction is not a syllogistic process, but the substitution of one ratio for another which is seen to include it.

If it stinks, it smells bad; if it is pouring in torrents, it is raining; if he is driving recklessly, he is driving without proper care; if he battered it to pieces, he broke it; if he jumped down from the window, he took the shortest way to the ground; if he sent the ball flying, he moved it; if he went from England to France, he crossed the sea. All these inferences are irrefragable and inescapable. They commend themselves to the reason with irresistible force. But they cannot be reached by the syllogism, or if they can, the process by which they are so attained is not the process by which they are actually attained in practice. No doubt we can get from London to Paris by going through Bombay and Yokohama, but that is not the route followed by business men who are anxious to reach their destination with the least expenditure of time and trouble.

C. The third Minor Canon of Explication applies, to the terms of the postulate, the same axiom that the second applies to the Ratio. It states that *Every postulated proposition implies every proposition formed by the substitution, for either or both terms of the postulate, of a term which is, for the purpose of the argument, equivalent to, included in, or implied in the displaced term.* In other words, *We may replace any term in a postulate by a term which is, for the purpose of the argument, equivalent to, included in, or implied in the displaced term.*

a. Either term in a postulate may be replaced by a term that is, for the purpose of the argument, equivalent to the displaced term. 'The Marquis of Salisbury was prime minister,' implies 'The owner of Hatfield was prime minister'; 'the Marquis of Salisbury was first Lord of the Treasury'; 'The owner of Hatfield was first

Lord of the Treasury.' These are, it is true, so many ways of saying the same thing; but then every Inference is another way of saying the same thing, or of saying a part of the same thing. The whole aim of Immediate Inference is to discover in how many ways a thing may be said. Some of the new ways are so little different from the postulate itself, that logicians grudge to them the title of inferences; but this is because logicians misapprehend the true nature of Inference. Other new ways of saying a thing put the matter in a form so different, and perhaps so unexpected, that to them the title of Inference is freely allowed; but in nature the process is the same, and the result is the same. Every inference is a restatement in a new form of the whole or part of the postulate.

It is scarcely necessary to give more instances of the substitution of equivalent terms, which is included under Jevons' Substitution of Similars; but it is worth while to notice that Similars are not always substitutable. Pinchbeck is very similar to gold; but there are many arguments in which pinchbeck cannot validly be substituted for gold. When we speak, in Logic, of equivalents and similars, it is important to remember that what we mean is things that are equivalent or similar for the purpose of the argument. This is a matter to which logicians have given no attention; but it is of the utmost importance, as will be shown again and again in the following pages. For the purpose of many arguments, two crown pieces are equivalent to half a sovereign; but if half a sovereign will go through a certain slot, it will not do to infer that two crown pieces will go through the same. For the purpose of this argument, two crown pieces are not equivalent to half a sovereign; nor are they equivalent for the purpose of the argument that half a sovereign weighs so many grains. For the purpose of carrying certain information through the post, a postcard is equivalent to a letter; but for the purpose of carrying the information privately, and for the purpose of the revenue derived from the carrying, the postcard is not equivalent to the letter.

The substitution of an equivalent term produces so slight a modification of the postulate, that it seems scarcely worth while to call it an inference. Nevertheless, it is an inference, and may be an inference of great importance. In a subsequent chapter we shall find that it enables us to solve, with ease and certainty, problems that have puzzled logicians for generations; and we

may note at once that it is the sole warrant for proceeding from one step in the solution of an equation to the next. When we say, because

$$(a + b)^2 = (a + b)\ (a + b), \text{ therefore}$$
$$(a + b)^2 = a^2 + 2\ a\ b + b^2,$$

what is our warrant for arguing that the second equation is equivalent to the first? On what Law of Thought, or logical principle, is the inference founded? Do we rest our assurance, that the second of these equations is equivalent to the first, on the maxim that whatever is, is? or on the maxim that nothing can both be and not be? or on the maxim that everything must either be or not be? Do we rest it on the *Dictum de omni et nullo*, and argue that the second equation must be equivalent to the first because what is predicated of everything in a class is predicated of anything in that class? The suppositions are ridiculous. Our warrant is, plainly, and manifestly, and without doubt, that any term in a proposition may be replaced by any term that is equivalent to it. Here, $a^2 + 2\ a\ b + b^2$ is equivalent to $(a + b)\ (a + b)$, and therefore may replace it in the postulate. As stated elsewhere, logicians fight shy of mathematical reasonings, and in most cases assume, and in some boldly state, that the reasonings of mathematics are conducted on a plan different from 'qualitative' reasoning. They say, for instance, that the logical argument

A—is—equal to B, and
B—is—equal to C

is conducted on a plan different from that of the mathematical argument

$$A = B$$
$$B = C.$$

It would be premature and superfluous to deny that the mode of reasoning is different in these two cases. The burden of proving that they are different lies on those who make the assertion; and we are justified in ignoring it until it is proved.

b. Either term of a proposition may be replaced by one that is, for the purpose of the argument, included in it.

If every building in the town was destroyed by the earthquake, the town hall was destroyed. If it was cheap at fifty guineas, it

was cheap at fifty pounds. If every dog has his day, many dogs have their days. If all men are mortal, some men at least are mortal; and any particular man is mortal. If the whole of the milk was contaminated or adulterated, each pint of it was contaminated or adulterated. If all fruit is wholesome food, grapes and oranges are wholesome food.

It is not permissible to replace a term by one that is merely included in it. The substituted term must not only be included in the term it replaces; it must be included for the purpose of the argument, or the inference will not be valid. If the whole town was destroyed by the earthquake, it follows that the town hall was destroyed; but it does not follow that the school children were destroyed, for, for the purpose of this argument, the school children are not included in the town. But if the whole town was depopulated by cholera, the school children are, for the purpose of this argument, included in the town, and the town-hall is not. For the purpose of the argument, 'It was cheap at a guinea,' a pound is included in a guinea; but for the purpose of the argument, 'A guinea is so called from the source of the gold from which the first guineas were made,' a pound is not included in a guinea. For the purpose of the argument, 'Milk should be sterilised before it is consumed,' contaminated milk is included in milk; but for the purpose of the argument, 'Milk is wholesome for children,' contaminated milk is not included in milk. For the purpose of the argument, 'All animals require organic food,' beetles are included in animals; but for the purpose of the argument, 'All hollow-horned animals are ruminants,' beetles are not included in animals. Of course, the statement, All hollow-horned animals are ruminants, if it is taken literally, is untrue, and ought not to be made; but in colloquial discourse, in inexact writing, and in books on Logic, hollow-horned animal usually means hollow-horned mammal; and the statement is allowed to pass. For the purpose of the argument, 'Man is mortal,' woman is included in man; but for the purpose of the argument, 'Man is the masculine sex of the human race,' woman is not included in man. 'Fruit is wholesome food,' does not include in fruit, castor oil beans or the berries of the deadly nightshade; but for the purpose of the argument, 'Fruit follows the flower,' these are included in fruit.

c. Either term of a proposition may be replaced by another term that is, for the purpose of the argument, implied in the replaced term. It

is not always easy to say whether a substitutable term is included or implied in the term it replaces, nor does it matter; for both are equally substitutable. 'He lives in Cheapside' implies 'He lives in London'; but London is not included in Cheapside for the purpose of this or of any other argument. 'There are eels in the river' implies 'There are fish in the river,' and yet fish are not included in eels for the purpose of the argument, or for any other purpose. It is easy to see, however, why these arguments are legitimate. Though fish are not included in eels, the connotation of having the qualities of fish is included in the connotation of eels; and though London is not included in Cheapside, the quality of being in London is included in the connotation of Cheapside. Hence, though in denotation, London is not included in Cheapside, nor are fish included in eels, yet in connotation the first of each of these pairs of terms is included in the second; and the inference is on that account valid. Similarly, if cancer is a fatal disease, it is a disease; if these counters are beans, they are vegetable products; if he called a taxi, he called a cab; if he ate tuberculous meat, he ate what is unwholesome.

The question arises, How are we to distinguish a term that may, for the purpose of an argument, be substituted for another, from one that may not? This is a question that Logic cannot always answer, for in many cases, it depends on the purpose of the argument, and the purpose of the argument is extra-logical. If the quantity of a term is Distributive, we may always replace the whole of a term by its part, and thus we discover the place of the *Dictum de omni et nullo* in a comprehensive scheme of reasoning. We find that, so far from its being the universal rule upon which all reasoning depends, it is a small part of a sub-rule of a Minor Canon of one of the Canons of Explication, all three of which are Lemmas to one of the five Canons of Inference.

But if the quantity of the term is Collective, the part can no longer be substituted for the whole: on the contrary, we may now substitute the whole for the part. If some of the soldiers were clad in kharki, we may not infer that all the soldiers were clad in kharki; but if some of the soldiers were sufficient to man the rampart or to defeat the enemy, then it is certain that all the soldiers were sufficient to man the rampart, or to defeat the enemy.

If I infer from 'The Marquis of Salisbury was prime minister'

to 'The Marquis of Salisbury was First Lord of the Treasury,' it is clear that this inference is not based solely upon the postulate, that the Marquis was prime minister. I must have the further postulate that the prime minister is equivalent to the First Lord of the Treasury. If every building in the town was destroyed by the earthquake, I may infer from this postulate that the town hall was destroyed; but I cannot do so until I have assumed the further postulate that the town hall was a building in the town. If from the postulate that it was cheap at fifty guineas I infer that it was cheap at fifty pounds, I make the silent assumption that fifty pounds is less than fifty guineas. It is true that in each case the silent premiss is so universally known, is so intimate a part of our mental equipment, that we do not recognise that we are making any assumption at all; but it is there, nevertheless; and strictly speaking, all these inferences are drawn, not from simple, but from compound propositions. But so to consider them would be pedantic formalism. For all practical purposes, they are inferences from a single postulate; or, to put it otherwise, and more accurately, we are entitled, when a postulate is granted to us, to add to it what knowledge of its terms is already in our possession.

Otherwise, the replaceability or non-replaceability of one term by another depends on the purpose of the argument; and the purpose of the argument is extra-logical, and is determined by other considerations. Is china clay a mineral? That depends on the purpose of the argument. For the purpose of Geology, it is; but for the purpose of a lease of minerals, the Courts of Law must be invoked to determine the question. Is marriage with a sister-in-law a valid marriage, or not? For the purpose of civil law it is. For the purpose of the *forum conscientiæ* it may or may not be, according to the conscience of the person concerned. For the purpose of administration of the Sacrament, it is a valid marriage in law; it is not a valid marriage in the opinion of some of the clergy. Is the bursting of an aneurism equivalent to an accident? For the purpose of medicine, it is not. For the purpose of the Workmen's Compensation Act, it is; for the purpose of an accident insurance policy, it may or may not be.

These are questions that Logic cannot answer on the basis of a single postulate. They depend on the purpose of the argument, and for every different purpose, different accessory postulates are

required; and though the Logic of Inference may assume what postulates it pleases, yet this assumption is rigidly limited as soon as the purpose of the argument is determined. The purpose of the argument is material. It belongs to matter, and not to form; and is outside the scope of Deductive Logic. The purpose of the argument prescribes its own postulates, and with them Deduction cannot interfere. Deductive Logic, as we have seen, has no power to question its postulates. That is the function of Empirical or Material Logic. All that Deductive Logic can do is to work upon the material it assumes, or that is presented to it. Having its postulates, Deductive Logic shows us how to mould them into different forms according to its rules; it is a guide to us on our way, and a lantern to our feet; it puts up sign-posts at dangerous crossings, saying 'Beware! here you are likely to go astray; mind your steps'; it points out, when we have reached an erroneous conclusion, exactly at what point of the journey we took the wrong turning. All this Deductive Logic can do for us; but it cannot determine the purpose of our argument. It is a route book which shows us whether we can reach our destination or not, and how we can get there; but no route book can decide what our destination is to be.

The Second Canon of Explication states that *Every postulated proposition implies everything necessary to the postulate.*

Strictly speaking, and if we adhere rigidly to pure logical form, we should require an additional postulate, setting forth the conditions necessary to our main postulate, to be formally stated. But there must be some limit to formalism, or arguments would be too voluminous to be serviceable. What is common knowledge must be assumed to be known. The postulate 'Brutus killed Cæsar' implies the necessary conditions that Brutus and Cæsar both lived; that they lived at the same time; that once at least they met; that Brutus was capable of killing, and Cæsar of being killed. All these conditions are necessary to the postulate, and all are therefore implied in it. It is absurd to say that we cannot arrive at the conclusion 'Cæsar once lived' from the postulate 'Brutus killed Cæsar,' unless we assume also the postulate that he who is killed once lived; for though Deductive Logic is the Logic of Form, it would deprive it of nearly all its usefulness to insist on such formalism as this. Some knowledge must be taken for

granted, or we should never get on. If he saw her as he ran down the hill, it is implied that he was there; that she was there; that he could see; that he looked in her direction; that he and she were there at the same time; that she could be seen from where he was running; that there was a hill; that he was higher up at first, and lower down afterwards; that the hill was not too steep to run down; and so forth, and so on.

To state these implications formally, as deductions worth making from the postulate, may seem to be trifling: they are so manifest. But they are by no means of trifling importance. They are inferences that are frequently drawn, and that are often of the utmost importance to draw. They are inferences on which fortune and life may depend; and yet neither Traditional Logic nor Modern Logic knows anything about them, or has a word to say of them. Who has not heard in a Court of Law, or on some other important occasion, some such argument as this? 'The prisoner admits that he saw the prosecutor within five minutes of the commission of the crime, therefore, within five minutes of that time, the prisoner was on the spot.' 'I have shown that there was a high wall between them, and therefore the prosecutor could not have seen the prisoner commit the crime.' 'If I prove that the man who is alleged to have been murdered died two years before the prisoner could have met him, you must acquit the prisoner of the murder.' 'Some one has been in the garden, for there are footmarks in the snow.' 'The ship must have touched at Singapore, for some of her passengers landed there.' 'The water will never run out of this gutter, for it slopes in the wrong direction.' 'If you caught fish out of that pond, there must have been fish in it.' 'It has been raining, for the ground is wet.'

Apart from the implication of the conditions necessary to the postulate, there is no cogency or validity in these arguments. Yet they are irresistibly cogent, and manifestly valid. They are unknown to Traditional Logic, to Inductive Logic, and to Modern Logic. In order to arrive at them by recognised logical methods, we must convert them into syllogisms. 'If he saw her do it, he must have been there when she did it' is an argument that commends itself to the reason as unimpugnably valid. Traditional Logic would, I suppose, call it an enthymeme, and would supply a missing major premiss somewhat in this way:—

Everyone who sees a thing done must have been there when it was done,
He saw her do it;
∴ He must have been there when she did it.

This statement of the course of the argument may pass, though I do not agree that it is the mental process by which the conclusion is reached; but the trouble is that it is not a syllogism. To get it into syllogistic form, we must put it something like this.

Every one who sees a thing done is a person who was there when it was done,
He is a person who saw a thing done;
∴ He is a person who was there when it was done.

This is a syllogism, but it does not give us the conclusion we want. We want He must have been there when she did it; and we get He is a person who was there when it was done. The difference is not great; it is perhaps not very material; but Traditional Logic is very punctilious. It demands the strictest adherence to form; and if we desire to alter 'He is a person who was there when it was done' into 'He must have been there when she did it,' we must go outside of Traditional Logic for our authority. Traditional Logic gives us no rule for the conversion of one of these forms into the other. Be it said that no authority is needed, for the two are so plainly equivalent that they commend themselves to common sense as having the same meaning, then the strict formalism of Traditional Logic is abandoned; and then the same consideration will allow us to infer directly from 'He saw her do it' to 'He was there when she did it,' without any necessity for going round through the syllogism or the enthymeme. We may, therefore, fairly posit, as the second Canon of Explication, that *Every postulate implies all the conditions that are necessary to the postulate.*

The third Canon of Explication is that *Everything inconsistent with the postulate may be denied.*

Every postulated proposition implies the denial of every proposition that is inconsistent with the postulate, or with any of its implications. We have seen that the positive implications of a

postulate are of several different classes, and the postulate denies every proposition that is inconsistent with any implication in any of these classes. We must take the classes separately, and thus get several additional Minor Canons of Explication. The first of these is

D. *Every postulated proposition implies the denial of every proposition in which the Ratio of the postulate is replaced by a Ratio that is, for the purpose of the argument, inconsistent with it.* The Ratio that is most plainly inconsistent with the postulate is its negative. 'All men are not mortal' is plainly inconsistent with 'All men are mortal,' and is denied by this postulate. We may, therefore, on the basis of this postulate, deny, in any way open to us, that all men are not mortal. Hence 'All men are mortal' implies 'All men are not immortal,' 'No men are not mortal,' 'Not all men are immortal,' 'It is not true that all men are not mortal' and other double negatives of the postulate. 'All ships sail on the sea' implies 'No ships do not sail on the sea,' 'Not all ships do not sail on the sea,' 'It is not true that ships do not sail on the sea,' and so forth. 'Brutus killed Cæsar' implies 'It is not true that Brutus did not kill Cæsar.'

The Ratio of the postulate may be replaced by a Ratio that is not the direct negative of that Ratio, but yet is inconsistent with it. This is a very important and a very frequent mode of denial; and as it is inconsistent with the postulate, the postulate denies all such negatives. If stones sink in water, then this postulate implies the denial, not only of 'Stones do not sink in water,' but of 'Stones float in water.' If Birds of a feather flock together, then we may infer the denial, not only of 'Birds of a feather do not flock together,' but of 'Birds of a feather are of solitary habit; live dispersedly; are lonely; segregate themselves.' If curses come home to roost, they do not go abroad to roost, neither do they fail to come home to roost.

E. The fifth Minor Canon of Explication permits us to deny *Every proposition in which a term of the postulate is replaced by one that is, for the purpose of the argument, inconsistent with the term it replaces.* The term that is most manifestly inconsistent with any term is its direct negative; and we may always deny a proposition in which a term of the postulate is replaced by its direct

negative, provided the direct negative is inconsistent, for the purpose of the argument, with the term it replaces. This seems, on the face of it, an unnecessary proviso. It seems that the direct negative of a term must always and for all purposes be inconsistent with that term; but it is not so. 'Men who are not clever' is, in one sense, the direct negative of 'Clever men,' yet, though clever men are mortal, it would be unsafe to deny that men who are not clever are mortal. Clever men and men who are not clever are not, for the purpose of this argument, inconsistent. The negative of 'clever men' that is, for the purpose of this argument, inconsistent with 'clever men' is 'no clever men'; and if clever men are mortal, we are safe in denying that no clever men are mortal, and that there are no clever men who are mortal.

If men are mortal, then we may deny that men are immortal; for mortality and immortality are inconsistent for the purpose of this argument. If just acts are expedient, we may deny that they are inexpedient; but we may not deny that unjust acts are expedient; for just and unjust, though generally inconsistent, are not inconsistent for the purpose of this argument. But if expedient acts are just, we may deny that they are unjust, for, for the purpose of this argument, just and unjust are inconsistent terms.

The direct negative of a term is no more the only term inconsistent with the affirmative, than the direct negative of a Ratio is the only Ratio inconsistent with its affirmative. If it is the last straw that breaks the camel's back, we are warranted in denying that it is the first straw that breaks the camel's back. If it is the first step only that costs, we may safely deny that the second step costs. If a little pot is soon hot, we may deny that a big pot is soon hot, for a big pot is inconsistent, for the purpose of this argument, with a little pot; but we may not deny, on the authority of the same postulate, that a little pot is soon cold; for, for the purpose of this argument, hot and cold are not inconsistent. If one and one are two, then we may deny that one and one are three, for two and three are inconsistent for the purpose of the argument; but if two heads are better than one, we may not, on the authority of this postulate, deny that three heads are better than one, for, for the purpose of this argument, two and three are not inconsistent. Traditional Logic is oblivious to the purpose of

its arguments; such inferences as these are, therefore, altogether beyond its purview.

When the denial of an affirmative proposition is made by a direct negative, whether in Ratio or term, the denial of this negative must be made by the insertion of a second negative. For this reason, a portion of this Minor Canon may be combined with a portion of the last, in the statement that *Every postulated proposition implies all its double negatives, in which the negatives are inconsistent with the elements they replace.* Thus, the postulate 'All men are mortal' implies

No men are immortal.
No men are not mortal.
Not all men are immortal.
Not all men are not mortal.
All men are not immortal.
There are no men who are not mortal.
There are no men who are immortal.
There are not any men who are not mortal,
&c., &c.

Of all these double negatives which are implied in the postulate, Traditional Logic knows of one only, which it calls the Obverse: of all the remainder it is ignorant. The rule given in the text books for obtaining the Obverse is 'Change the quality of the proposition, and substitute for the predicate its contradictory.' The rule is lamentably defective. It does give us, from the postulate All men are mortal, the obverse, No men are immortal; but here its powers end. It cannot furnish any of the other double negatives instanced above; it is often impracticable, for many terms have no contradictories; it is often ambiguous, for some terms have more than one contradictory; and it sometimes plays us false, and gives us an obverse that is not implied in the postulate.

The rule of Traditional Logic is often impracticable, for many terms have no contradictory, unless indeed, we understand by the contradictory the Infinite Negative; and even if we do, the contradictory may fail to give us an obverse, or may give one that is absurd or unwarrantable. If indeed, we admit no proposition but that constructed with the copula, the rule may be practicable, but such arbitrary limitation of the power of propositionising I have

already repudiated. What obverse can we construct, on this plan, of the proposition Brutus killed Cæsar? We can change the quality of the proposition readily enough. It then becomes Brutus did not kill Cæsar. But what is the contradictory of Cæsar? Is it some one who was not Cæsar? or every one, or any one who was not Cæsar? In either case, the obverse so obtained is not warranted by the postulate, is *ultra vires*, and fallacious. What is the contradictory of the predicate of All ships sail on the sea? Is it what is not the sea? Then the obverse commits us to the statement that No ships sail on what is not the sea, which is not implied in the postulate. The postulate does not permit us to deny that ships sail on rivers, lakes and canals, even if they sail on the sea also. Are we to take as the contradictory, the Infinite Negative, Everything that is not the sea? Then the obverse commits us to the statement that no ships sail on triangles, melancholy, sulphuric acid, and other things outside the suppositio. Be it said that 'Dry land' is the contradictory of the sea, I deny that it so necessarily. If it were, the postulate 'The sea is His, and He made it,' would compel us to deny 'The dry land is His, and He made it.' But for the purpose of the argument, the dry land is the contradictory of the sea? Very likely, but the rule of Traditional Logic makes no reference to the purpose of the argument. It says substitute the contradictory, as if there were one contradictory, always available, and always the same. It won't do. By the rule of Traditional Logic, no obverse can be obtained. But by the Method of Explication we can get the double negative, No ships do not sail on the sea, which is clearly implied in the postulate 'All ships sail on the sea.'

F. The sixth Minor Canon of Explication permits us to deny *Every proposition inconsistent with any implication of the postulate.* To go through all the implications of the postulate, and find all the double negatives of them all, would be an endless task; but since Traditional Logic has essayed a single instance, we may examine this instance, and test its validity. Traditional Logic recognises, as one of its Immediate Inferences, the Contrapositive, which is the Converse of the Obverse. As the converse has been shown to be faulty, and the obverse has been shown to be faulty, it is one of those arguments, *à fortiori*, which Traditional Logic admits its inability to explain, that the Contrapositive is faulty.

Whatever objections apply to the converse and the obverse, apply with force at least undiminished to the contrapositive.

According to Traditional Logic, the obverse of 'All men are mortal,' is 'No men are immortal,' and the converse of this is 'Some immortal beings are not men.' This is the contrapositive of the postulate, and is the only Immediate Inference that can be formed on this plan. In my view, not one only, but many double negatives are obtainable from this postulate, and each yields its reciprocal. In my view, the true reciprocal of 'No men are immortal' is 'Immortality is an attribute of no men.' In this reciprocal, the Subject, now become Object, is not changed from 'no men' to 'men'; the affirmative Ratio is not changed to a negative Ratio; and the Object, now become Subject, is not changed from an indesignate abstract to a quantitative concrete; four changes that I regard as unnecessary and inadmissible. An additional objection to the contrapositive is that, like the obverse from which it is derived, it is not always implied in, or even consistent with, its postulate. 'All things are thinkable' becomes, in the contrapositive of Traditional Logic, 'Some unthinkable things are not things.'

In this place we may dispose of the fourth of the Immediate Inferences of Traditional Logic, a recent discovery, which is called the Inverse, and is arrived at by a method so complicated that I will not trust myself to attempt it, but will take, from a standard text book, the following example. 'Every truthful man is trusted' —Inverse, 'Some untruthful men are not trusted.' Some logicians doubt the legitimacy of this form of Inference; and I must confess to misgivings about it; for, if it is valid, I see no reason why it is not equally valid to infer from 'Every truthful man is mortal,' to 'Some untruthful men are not mortal.' This puts on inveracity a premium, which is scarcely to be expected from the justice of Providence; and, what is more to the purpose, does not seem to me to be implied in the postulate. I cannot help suspecting, therefore, that those logicians have reason, who find, in the complicated process by which the Inverse is obtained, some term distributed which ought not to be distributed.

G. The last implication of the postulate is *The denial of every proposition that is inconsistent with a necessary condition of the postulate.* This extremely important implication of the postulate is unknown

to Traditional Logic, though it is the one most frequently utilised in practical life. Who has not heard, in a Court of Law, or on some other important occasion, some such argument as this: 'How could you have seen him do it, when you have admitted that you were not there when he did it?' 'It cannot be true that you have just come in from a long walk in the rain, for your clothes are quite dry.' 'You say you stayed at an hotel in Herm; I will prove there is no hotel on the island.' 'You fell out of a train going sixty miles an hour, yet you can show no bruise or scratch on your body, and no rent or soil on your clothing!' Apart from the conditions necessary to the postulate, there is no contradiction in these pairs of statements. In Logic they are not contradictories, nor even contraries. The only contradictories known to Traditional Logic are All are—some are not, None are—some are. What perverseness of ingenuity, what cataractous blindness, must have been combined to discover implications so far-fetched and useless as the Contrapositive and the Inverse, and to overlook so manifest and important an implication as the denial of the inconsistent condition! No prisoner has ever been prosecuted in a Court of Law without Counsel for the prosecution seeking to show that the evidence was inconsistent with innocence, which could therefore be denied. No Bill has ever been opposed in Parliament without the opponent seeking to show that the Bill was inconsistent with some condition of justice or expediency, and so inferring that the justice or expediency of the Bill could be denied. Yet the implications of consistency, and denial of inconsistency, with its necessary conditions, that are contained in every postulate, have been ignored and neglected by every logician, from the time of Aristotle to the present hour. Is it any wonder that Logic in its turn has been ignored, neglected, and derided, by practical reasoners?

The view of contradiction taken by Modern Logic is expressed by Lotze thus:—'If however there are only two specific forms of P, p^1 and p^2, and S must have a specific form of P for its predicate, then not only does the affirmation of one of them as predicate of S involve the negation of the other, but also the negation of the one involves the definite affirmation of the other; p^1 and p^2 are then opposed to one another *contradictorily*.' It is with diffidence that I attempt to interpret this dictum, but I do not think it can be so interpreted that the predicates 'saw him' and 'was not there' can

stand as the only specific forms of predicate that 'I' is capable of. Many other things can be predicated of the first person singular; and even in the present connection, 'I was blind,' 'I was looking the other way,' 'I had my eyes shut,' equally carry the negation of 'I saw him.' These are, therefore, modes of contradiction that are unknown to Modern Logic; and in fact, it never contemplates the implication of what is necessary to the postulate, nor the denial of what is inconsistent with such an implication, as a further implication of the postulate.

Yet between 'I saw him do it' and 'I was not there when he did it,' there is a manifest inconsistency, which strikes home to the conviction of every one who realises the circumstances; and either being postulated, the other may be denied on the strength of the postulate. If I was not there when he did it, I could not have seen him do it; and, if I swear to both assertions, I am liable to indictment for perjury. Yet, in uttering this manifest and palpable contradiction, I am infringing no rule of Logic, Traditional, Inductive, or Modern. But surely the clear and inescapable inference, that if one is true the other is false, is one that Logic ought to be able to reach. We see at once that they are incompatible. They are so manifestly incompatible that it might be plausibly advanced that no reason for their incompatibility need be shown. Nor need it be shown in practice; but if Logic in any case traces the processes of reasoning, and shows the grounds of judgement, surely it should do so in such a case as this. Logic provides rules showing the incompatibility of such pairs as All men are mortal—some men are immortal; No man is perfect—some men are perfect. It is not, therefore, because of the plainness of their incompatibility that such inconsistent propositions have been neglected: it is because they have been overlooked; or perhaps because they pertain to the matter and not to the form of the postulate, and Logic fetters itself to verbal forms.

Traditional Logic would perhaps say that the argument 'You cannot have broken your leg on that day, for you ran a race the day after,' is a syllogistic argument, and not an Immediate Inference. That it requires, in strictness, an additional postulate, I should be prepared to admit; but that the syllogism represents the mental process actually performed, I should deny. The syllogism by which the conclusion is supposed to be reached would be something like this:—

No person who runs a race has recently broken his leg,
You are a person who ran a race;
∴ You are not a person who had then recently broken your leg.

Is this the process the mind performs, and is this the conclusion reached? As far as I can trace the operations of my own mind, neither is so. When I hear you assert that on a certain day you broke your leg, and have it proved that on the following day you ran a race, the contradiction, or as Logic would say, the contrariety, is in my mind immediate. I do not reach it through any such Universal as 'No person who runs a race has recently broken his leg.' I do not go over in my mind, and collect together all the instances I know of persons who have run races, and then consider whether or not their legs had been recently broken. Nor do I perform the 'generic' judgement of Modern Logic, and say to myself, 'It is the nature of all persons who run races not to have had their legs recently broken.' What passes in my mind, as well as I can trace it, is the formation of an idea of a man with a broken leg trying to run, and of his leg giving way under him, and rendering running impossible. There may be persons who reach the conclusion through the generic Universal, though I should think they are exceptional; but I cannot believe there are any minds so constituted as to reach it through the distributive Universal. My own description of my own mental process must, I think, be accepted as that which obtains in my own case; and then it is conclusive that there is a case in which the reasoning is not syllogistic, but is the intuitive recognition of the inconsistency of the two propositions; and the intuitive recognition that the postulation of one implies the denial of the other.

Set out in full, the Canons of Explication of Simple propositions, which, it must be remembered, are Lemmas to the fifth Canon of Inference, are as follows:—

TABLE XIV.

The Canons of Explication, *expanded.*

Every postulated proposition implies

1. Every equivalent and included proposition; that is to say,

Minor Canons:

It implies A. Its Reciprocal.

B. Every proposition in which the Ratio of the

postulate is replaced by a Ratio that is, for the purpose of the argument, equivalent to, included in, or implied in the Ratio of the postulate.

C. Every proposition in which a term of the postulate is replaced by one that is, for the purpose of the argument, equivalent to, included in, or implied in the term it replaces.

2. Every condition necessary to the postulate.

3. The denial of every proposition inconsistent with the postulate, or with any of its implications; that is to say,

Minor Canons:

It implies D. The denial of every proposition in which the Ratio of the postulate is replaced by a Ratio that is, for the purpose of the argument, inconsistent with the Ratio of the postulate.

E. The denial of every proposition in which a term of the postulate is replaced by a term which is, for the purpose of the argument, inconsistent with the displaced term.

F. The denial of every proposition inconsistent with any implication of the postulate.

G. The denial of every proposition inconsistent with any condition of the postulate.

Of all the implications contained in this long array of classes—eight classes in all, and every class containing many implications—Traditional Logic knows of four implications only:—the Converse, the Obverse, the Contrapositive, and the Inverse. Of these, the Converse is strictly applicable to a small class only of propositions, those, namely, that express class inclusion, though it is usually applied wrongly to attributive propositions; the Obverse is not always to be had; the Contrapositive, being the Converse of the Obverse, partakes of the defects of both; and the Inverse is altogether invalid. If, therefore, these were the only implications that could be extracted from propositions, our reasonings from them would be so restricted as to be of little or no value; and would in many cases be invalid. Fortunately, however, in actual reasoning, the behests of Traditional Logic have always been disregarded. Every child in the nursery knows better than to argue from 'Treacle is sticky' to 'Some sticky thing is treacle,'

and is quite capable of forming the reciprocal 'Stickiness belongs to treacle.' Who on this earth, except a logician, ever argued from 'Brutus was a Roman' to 'Some Roman was Brutus,' or from 'Logicians bind themselves by pedantic restrictions,' to 'Some people who do not bind themselves by pedantic restrictions are not logicians'? But who is there that has not upon occasion used some such argument as these?—'If but one prehistoric man crossed the Channel, it shows that the Channel was not an impenetrable barrier to immigration from the Continent.' 'If he accepted it with enthusiasm, we may conclude that he was pleased with it.' 'If half a loaf is better than no bread, then a whole cake is better than nothing to eat.' 'If hard words break no bones, soft words will certainly break none.' 'You admit that the price of labour determines the cost of production, for you said just now that the cost of production is determined by the price of labour.' 'If you find that he took the money with the intention of converting it to his own use, you must find him guilty of stealing.' 'Some one has been meddling with my papers, for they are not as I left them.' 'He is there, for I hear his voice.' 'If there are many modes of reasoning unknown to Traditional Logic, Traditional Logic is defective.' 'You cannot say that the goose is despised, for

Of all the Poultry in the Yard
The Goose is most prefer'd;
There is so much of Nutriment,
In that weak-minded Bird.'

'If his wife was a burden on the rates, he could not have been a single man.' 'She says she has had no medical attendance for three years, and the doctor swears he attended her last summer: both cannot be speaking the truth.' 'If there was enough to go round, there is no reason why everyone should not have some.' 'If he was better after taking the medicine, it did him no harm.'

These are samples of modes of reasoning in every day use. They are useful, and they are valid, and they are commonly employed; but none of them is attainable by any method of Traditional Logic, unless, indeed, some of them may be artificially concocted into syllogisms, which would not display the true form or process of thought. Neither can I find in Modern Logic any allusion to arguments of any of these classes. The only logician

who has given any formula under which they can be subsumed is Hamilton; who states that what is true in any one form of words is true in any other form of words; but this, although it covers many of the instances given, does not tell us how to find another form of words in which a proposition may be stated. I claim it as a merit of the Method of Explication that it assigns to them a due position in the scheme of reasoning.

CHAPTER XIX

THE COMPOUND PROPOSITION AND ITS IMPLICATIONS

A COMPOUND proposition consists of two or more propositions having a common element.

The common element may be the Ratio, or it may be a term; and the common term may occupy the same position in both propositions, or may be the Subject of one, and the Object of the other.

1. The common element may be the Ratio. 'He was murdered, robbed, and flung into a ditch.' 'She made the bread, baked it, cut it up, buttered it, and gave it away.' I cannot find any reference to the implications of this form of Compound proposition in any text book; but it is a sound valid proposition; not infrequent in use; containing various implications; and capable, therefore, of forming the basis of argument.

2. The common element may be a term; and there are three or four forms of proposition having a term in common.

a. The common term may be the Subject in both propositions. A is B and C. 'Washington was good and great.' 'Electricity causes lightning and thunder.' 'He was murdered by Burke and Hare.' 'Many of the audience applauded both the actors and the actresses.' In the foregoing examples, not only the Subject, but the Ratio is common to the two constituent propositions; but this is by no means necessary. The proposition is still Compound if the Subject alone is common, the Ratios being different. 'Washington was a great man, and achieved the independence of America.' 'Electricity causes lightning and propels street cars.' 'He was drugged by Burke and stifled by Hare.' 'Many of the audience hissed the actors and applauded the actresses.'

b. The common term may be the Object in both propositions. A and C are B. 'Titanium and Uranium are metals.' 'Paul and Julius were shipwrecked.' 'Lightning and thunder are caused by electricity.' 'Cancer and phthisis are fatal diseases.' As in the previous case, the Ratio need not be common to the two propositions. 'Some of them served, others betrayed, their party.'

'Burke drugged, and Hare stifled him.' 'Cancer is, and catarrh is not, a fatal disease.' 'Dryness preserves, and moisture deteriorates, most things.'

c. The common element may be the Subject of one of the constituent propositions and the Object of the other. A is B and B is C, or A is B and C is A. 'Rain brings out slugs, and slugs bring out birds.' 'The cost of labour depends on its efficiency, and the rate of profit depends on the cost of labour.' 'Democracy tends to despotism, and despotism tends to revolution.' 'Faith excludes scepticism and scepticism excludes confidence.' Again, in this case, the Ratios may be the same or different. 'Rain brings out slugs, and slugs are eaten by birds.' 'The earth is attracted by the sun, and the moon revolves round the earth.' 'The current in the coil magnetises the core, and the core reacts on the current.' 'The master scolds the butler, and the butler boxes the page's ears.'

It is at once apparent that the forms of the Compound proposition with a common term correspond with the figures of the syllogism. A is B and C may be written

A is B
A is C; which are the premisses of the third figure, in which the middle term is the Subject of both premisses.

The Compound proposition with a common Object-term forms the premisses of the second figure. A and B are C may be written

A is C
B is C.

The Compound proposition, in which the common term is the Subject of one and the Object of the other constituent, includes the premisses of the first and fourth figures.

A is B and B is C, and B is A and C is B may be written

A is B
B is C; which are the premisses of the fourth, or

B is A
C is B, which are the premisses of the first figure.

The syllogism is, therefore, closely related to the Compound proposition, or at least, to those forms of the Compound proposition in which the common element is a term; and, in fact, the syllogism may be regarded as neither more nor less than a mode of extracting one of the implications contained in these forms of Compound proposition. The premisses of a syllogism are, in every case, a compound proposition, or may be stated in the form of a compound proposition. The conclusion of a syllogism is one of the implications of the compound proposition which forms the premisses. This implication is extracted by dealing with the syllogism according to its rules. To this mode of extracting from a compound proposition one of its implications, I offer an alternative by which they may all be extracted, which I call the Method of Explication, whose rules are a series of Lemmas to the Canons of Inference.

Three of these Lemmas, with their derivatives, have already been stated as the Canons of Explication of Simple Propositions. Since they are applicable to Compound Propositions also, they may be re-stated here, together with two new Canons, with which they must be supplemented in order to enable us to extract all the implications from Compound Propositions.

THE CANONS OF EXPLICATION OF COMPOUND PROPOSITIONS.

Every postulated proposition implies

1. Every proposition equivalent to or included in the postulate.
2. Every condition necessary to the postulate.
3. The denial of every proposition inconsistent with the postulate.

These apply equally to Compound and to Simple propositions. The Compound proposition needs for its complete explication the following additional Canons:—

4. When two terms are postulated in the same relation to a third, it is implied that they are equivalent to, resemble, or are consistent with one another with respect to that third.
5. When two terms are postulated in inconsistent relations to a third, it is implied that they differ from one another with respect to that third, and that the third marks a difference between them.

Compound propositions are, as we have seen, of four or five main forms, according as we reckon them. The first, in which the common element is the Ratio, is unknown to logicians; yet this form of proposition is in common use, and has implications of its own that are not neglectable. Traditional Logic may claim that it can take the two constituent propositions of any compound proposition that contains two constituents only, and combine them into the premisses of a syllogism; but when the common element of the propositions is the Ratio, Traditional Logic cannot do this.

If he was murdered, robbed, and flung into a ditch, Traditional Logic may take two of these propositions and posit them as the premisses of a syllogism or quasi-syllogism, thus

He was murdered;
He was robbed;
∴ Some one who was robbed was murdered.

I should doubt whether this is properly a syllogism. Traditional Logic makes no distinction between the true copula and the auxiliary; but I think the distinction is clear, and is important; and that, in this case, neither of the premisses is in true logical form. Waiving this objection, however, and the objection that the middle term is singular, it remains that this, and 'Some one who was murdered was robbed,' are the only conclusions that can be drawn from these premisses; and that Traditional Logic must take the premisses two by two, and cannot consider all at once. The Canons of Explication allow us to draw many conclusions, and need not disjoin the argument. By them we can infer that he was there; that he was not alone; that he was assaulted; that he is dead; that he did not retain all his property; was not left lying in the road; did not die a natural death, or commit suicide; that some one murdered and robbed him and disposed of his body; that he was the subject of a crime; and so forth, and so on, all proper and legitimate inferences.

If she made the bread, baked it, cut it up, buttered it, and gave it away, then a number of inferences lie latent in the proposition, and can be explicated by the Canons of Explication, but not by the syllogism. No proposition that is not in logical form may enter into a syllogism; and these propositions are not in logical form. They contain no copula. The syllogism, unless several are combined in a sorites, can deal with two premisses only at a time,

and here are five. The syllogism knows of no relation but inclusion in, and exclusion from classes, and these do not express either. If we try the syllogism on the first two propositions, we get the premisses

She made the bread ;
She baked the bread ;

and, as neither of these contain the copula, the syllogism, if rigorously applied, is helpless, and can give us no conclusion. If, however, we waive this condition, as logicians constantly do in practice, in the examples they give, though they lay down with strictness the principle that the copula is indispensable, we may get two conclusions,—The person who made the bread, baked it ; and The person who baked the bread, made it. It is very doubtful whether logicians would admit that these are logical conclusions, but let us give Traditional Logic the credit of finding them. Now compare this poor result with the multitude of conclusions that the Method of Explication gives. By this method we may infer all the reciprocals. The bread was made, baked, cut, buttered and given away by her. We may infer all propositions with equivalent, contained or implied ratios and terms. We may infer, therefore, that she mixed the dough, kneaded it, and let it rise ; that she put it in the oven, and left it there till it was baked ; that she divided it into slices, spread butter on them, and distributed them. We may infer all conditions necessary to the postulate. We may infer, therefore, that she had flour, water, yeast, fire, an oven, a knife, butter, and some one to give the bread to. She must also have known how to make bread, and how to bake it. We may deny all propositions inconsistent with the postulate. We may deny, therefore, that she was without flour, and the other necessaries. We may deny that she had lost an arm, that she failed to make or bake the bread, that she left it uncut or unbuttered, that she kept it, did not give it away, gave it away dry, or in loaves, and so forth, and so on.

It is true that these are most of them very obvious inferences. They only state over again, in other words, what was stated in the postulate. They do not 'advance from the known to the unknown'; but, in the first place, they compare in this not unfavourably with the two conclusions that alone were obtainable from the quasi-syllogism ; and in the second, to state in other

words what is given in the postulate is the nature of all inference or deduction. It is a mistake to suppose, as Mill and other logicians suppose, that deduction 'proceeds from the known to the unknown.' The utmost it can do is to render manifest what was obscure. It is a mistake to suppose that we can get out of a thing more than there is in it, or out of two things more than is in them. It is not possible to get more than a pint out of a pint pot, or more than two pints out of two pint pots; and it is impossible to get out of a premiss or postulate, or out of two premisses or postulates, more than they contain. The object and purpose of Inference is to extract and state plainly what is implied in a proposition, but may not be plainly apparent; and if more is inferred than the proposition contains, the fourth Canon of Inference is violated, and the inference is invalid. The syllogism is a method, a clumsy and roundabout method, of extracting from a Compound proposition one of its implications. The Method of Explication is, I submit, a more direct, and a more efficacious method of extracting them all.

In the foregoing examples, the common element in the two propositions, that combines them into a Compound proposition, is the Ratio. Traditional Logic does not profess to treat Compound propositions of this class. It confines its ministrations to those in which the common element is a term; and it is with respect to these alone that the Syllogism and the Method of Explication come into competition. Before contrasting the two methods, however, it is necessary to note the important difference, from the point of view of Inference, between the Simple and the Compound propositions.

The third Minor Canon of Explication permits us to replace any term in a postulated proposition, by any other term which is, for the purpose of the argument, equivalent to, included in, or implied in the term replaced. Our field of search, for a substitute to replace a term in a simple proposition, is limited to the known equivalents, contents, or implications of that term, as drawn from its connotation or denotation; and, by the fourth Canon of Inference, we are forbidden to go beyond them. The compound proposition gives us this great advantage, that it supplies us with an equivalent, content, or implication, that may not be obtainable from the mere connotation or denotation of that term, and would be utterly inaccessible and unattainable unless specially granted by the second postulate given in the compound proposition.

From the simple proposition, 'Democracy ends in despotism,' we can get, by the third Minor Canon of Explication, 'Mob-rule ends in despotism,' 'Democracy ends in autocracy,' 'Democracy ends in tyranny,' and a few more equivalents; but we cannot infer any relation between democracy and anything that is not clearly equivalent to, included in, or implied in, despotism. We cannot from this postulate infer any relation, for instance, between democracy and revolution, or between democracy and the character of the governed, or the morality of the governing classes. But the additional postulate, that converts the Simple proposition into a Compound proposition, may give us a substitute for democracy or for despotism, that we could not by any other means obtain. It may tell us that democracy leads to despotism, and despotism leads to revolution; and then it is clear that, for the purpose of the argument, revolution is implied in despotism, and may replace it in the first part of the postulate. By this means we get 'Democracy leads to revolution'; and so obtain an implication that we could not have obtained from any Simple proposition. By the same means, if democracy leads to despotism, and despotism deteriorates the character of the governed, democracy leads to the deterioration of the character of the governed. If democracy leads to despotism, and despotism to corrupt government, democracy leads to corrupt government.

Logicians may declare that these conclusions could be reached equally well by the syllogism, thus:—

Despotism leads to revolution,
Democracy leads to despotism;
∴ Democracy leads to revolution.

Not being bound in syllogistic fetters, I should regard this as a perfectly valid argument; but Traditional Logic is precluded by its own rules from so regarding it. The constituent propositions are not in logical form: they have no copula. The middle term, despotism, is undistributed; for it is indesignate in quantity, and the rule is that an indesignate term is to be taken as particular. Logicians of the Traditional School are precluded by their own principles from attaining this conclusion, as well as the others, by this method. Granting them the liberty of regarding this specimen as a syllogism, and of thus attaining the conclusion, still the syllogistic process, as a mode of inference, is immeasurably

inferior to the Method of Explication here propounded; and is so for the following reasons:—

1. There are many compound propositions to which the syllogism cannot be applied. There are none that do not yield to the Method of Explication.

2. There are many inferences that cannot be attained by the syllogism. There are none that cannot be extracted by the Canons of Explication.

3. Syllogisms are divided into four figures and nineteen moods, all of which must be remembered by the student. Explication knows nothing of figures or moods.

4. The reasoning of the syllogism is not always self-evident. To render it so, syllogisms, of figures other than the first, must be reduced to the first figure, by a process that is often complicated, and therefore liable to error. The reasoning of the Method of Explication is self-evident. As there are no figures, there is no reduction.

5. The Canons of the Syllogism are not self-evident. They have an appearance of arbitrariness, which logicians seek to overcome by explanation and argument. The Canons of Explication are, I think, self-evident, and have the appearance of truisms.

6. Finally, I say it with bated breath, but in my opinion the Canons of the syllogism are not true; while the Canons of Explication seem to me self-evidently true.

This indictment of the syllogism is sufficiently formidable; and the claims of the alternative method that I propose must, I fear, appear extravagant; but I will now endeavour to show that I have not spoken without reason.

1. In the first place, there are many Compound propositions to which the syllogism cannot be applied; many cases of Mediate Inference which cannot be brought under syllogistic methods.

This needs no proof. It is sufficiently notorious. It is admitted in nearly every modern text book on Logic, and in many of old time. There is a whole range of Compound propositions, typified by the argument *à fortiori*, and $A = B = C$, $A > B > C$, which thrust implications upon us; which shout aloud their implications; whose implications jump at us and hit us in the face; and yet, when we try to apply the syllogism to them, and to show how the

implications may be formally obtained, we are obliged to confess our failure. If A precedes or follows B, and B precedes or follows C; if A is the cause of B and B the cause of C; if A controls or depends on B, and B controls or depends on C; if A is simultaneous with B, and B with C; if A kills B, and the death of B saves C from the gallows; in every case a plain, unmistakeable, unavoidable, inference, not merely presents itself, but flings itself violently at the assertor and receiver of the proposition. Yet in not one of these cases is the syllogism applicable; in not one can Traditional Logic give the grounds of the inference, or even assert that it is valid. For twenty centuries Traditional Logic has been explaining how, if man is mortal, and Socrates is a man, we can arrive at the conclusion that Socrates is mortal. For twenty centuries Traditional Logic has shirked the problem How, if A is greater than B, and B is greater than C, we infer that A is greater than C. With respect to this problem, Traditional Logic appears to have employed a modification of the syllogism which is not among any of the authorised figures or moods of that venerable institution, and which it does not openly avow. It must run somewhat as follows:—

All reasoning is syllogistic,
Reasoning *à fortiori* is not syllogistic;
∴ The less said about reasoning *à fortiori*, the better.

The plain truth is that, as explained in the chapter on the Ratio, the limitation of the Ratio of the logical proposition to the copula, and the limited interpretation that logicians place on the copula, preclude the syllogism from taking count of any relation but those of class inclusion and exclusion. In spite of the asseveration of logicians, that the Predicate is to be understood in intention or connotation, their practice, as shown by the rule of conversion, is to understand every proposition as expressing inclusion or exclusion; and consequently, no other relation can be dealt with by the syllogism. This is the reason it is incapable of following reasoning of the *à fortiori* class.

If A is equal to B, and B is equal to C, then, to the non-logical mind, it is an inescapable inference that A is equal to C. But Traditional Logic is incapable of drawing the inference. It has been attempting for many generations to find the process by which the conclusion is reached; and it has failed. It has failed

mainly because of its unreasonable adherence to the copula. As explained in a previous chapter, Logic demands that the Compound proposition shall be stated in the form of premisses, thus :—

A — is — equal to B;
B — is — equal to C.

Here there are four terms, and the fallacy *quaternio terminorum* is fatal to a syllogism. If Logic were to adopt the method of Mathematics, and state the premisses thus :—

A — is equal to — B;
B — is equal to — C,

which, to the non-logical mind, seems the natural and proper statement, and expresses the relations as they actually exist in the mind, this particular fallacy would disappear; but the doctrine of the copula forbids the adoption of this form, and Logic accordingly rejects it. To suppose that there is one mode of Reasoning in Mathematics, and another mode of reasoning in Logic, seems to me a gratuitous and unwarranted assumption. If it is asserted that the conclusion A = C, from the premisses A = B = C, is reached by a process different from that by which we reach the conclusion A is equal to C from the premisses A is equal to B and B is equal to C, then it seems to me that the onus of proving so strange a thesis lies on those who assert it; and though the assertion is made, or the assumption begged, in every text book of Logic, I know of no attempt to prove it.

The argument may be, and in many books of Logic is, stated thus :—

Things that are equal to the same thing are equal to one another,
A and C are equal to the same thing;
∴ A and C are equal to one another;

but there are fatal objections, both logical and other, to this course. For one thing, there is no mention of B in this argument; and, though it is alluded to as 'the same thing,' there is considerable doubt whether Traditional Logic would admit B and B to be the same thing without a preliminary syllogism to prove it. Indeed, I doubt whether Logic would, or, on its own

principles, ought, to admit, that 'A and C are equal to one another' is equivalent to A = C.

But whether Traditional Logic would or would not admit the equivalence of this syllogism with the argument that since A and C are both equal to B, they are equal to one another, I should reject the syllogism on the ground that it is not the process of reasoning that the mind goes through in order to reach the conclusion from the postulate. In my view, the conclusion can be reached, and is in fact reached, from the postulate alone, without praying in aid a *principium* of such gigantic dimensions, for which the postulate gives no warrant whatever. All that the postulate grants is 'A is equal to B and B is equal to C.' This grants us the particular case, but it does not grant us the general principle. It may be that we have the general principle in our minds, but it does not follow that we are entitled to use it, or that we actually do use it, in reaching the conclusion A is equal to C. For my part I should deny both the one and the other. I see in the postulate 'A is equal to B and B is equal to C,' no more warrant for assuming the general case 'Things that are equal to the same thing are equal to one another' than I see in the postulate 'The ship went to sea and foundered in a storm' the general case 'Ships that go to sea founder in storms'; and when we receive the postulate 'A is equal to B and B is equal to C,' we can, and in my opinion we do, proceed at once to the conclusion 'A is equal to C,' without begging any *principium*, and without the intermediation of any major premiss.

Granting, however, for the sake of the argument, that the conclusion is, in this case, reached through the intermediation of this major premiss, how if the postulate is A is greater than B, and B is greater than C? We cannot now beg the major 'Things which are greater than the same thing are greater than one another,' or, if we do, it does not help us towards a valid conclusion. We could, indeed, beg as a major, 'A thing which is greater than another, which other is greater than a third, is greater than that third'; but in this case the lack of warrant, as well as the lack of necessity, for the imported *principium*, is even more plainly apparent. Many logicians, *quorum pars minima fui*, have attempted to supplant the *Dictum de omni et nullo* by a more comprehensive formula, which should include the argument *à fortiori* and its congeners; but no one has succeeded to the

satisfaction of any one else; and if such a formula could be found, we should still need some warrant for introducing it as a major into our arguments. We should still be going beyond the postulate, and so violating the fourth Canon of Inference.

When, however, we apply to these arguments the Method of Explication, all difficulties vanish; and not only is the conclusion reached directly, but we see at once that it is inevitable, and why it is inevitable. If A is equal to B, and B is equal to C, it is manifestly given that C, for the purpose of the argument, is equivalent to B, and may, by the third Minor Canon of Explication, replace B in the first constituent of the postulate, which then becomes A is equal to C. It is given also that, for the purpose of the argument, A is equivalent to B, and may replace B in the second moiety of the postulate; and thus again we get A is equal to C.

If A is greater than B, and B is greater than C, then, for the purpose of the argument, C is implied in B, and may be substituted for B in the first constituent—A is greater than B—of the postulate. Also, for the purpose of the argument, A is implied in B, and may be substituted for B in the second moiety of the postulate; and thus again we get A is greater than C.

An obvious difficulty confronts us here. If any term in a postulate may be replaced by one that is implied in it, and if C is implied in B, then C may be substituted for B, not only in the first constituent of the postulate—A is greater than B—but in the second constituent also; and we should then get C is greater than C, which is absurd. The objection would be perfectly valid if the rule were as just stated; but it is not. The rule is that any term may be replaced by any other term, not that is generally implied in it, but that *for the purpose of the argument* is implied in it; and the words italicised make all the difference. For what is the purpose of the argument? It is not to establish a relation between A and B, or between B and C, for those relations are already given. It is to find what else than B is greater than C; what else than B, A exceeds in magnitude; or what the relation is between A and C. For the purpose of this argument, A is not implied in B *in the proposition A is greater than B*. A does not become implied, until B is introduced into the second constituent of the postulate. For the purpose of the argument, C is not implied in B *in the proposition B is greater than C*. C is not

implied in B until B is introduced into the proposition 'A is greater than B.' This meaning of the phrase 'for the purpose of the argument' being understood, the Canon will be seen to be impeccable, to whatever proposition it is applied.

If A revolves round B, and C is fixed to A, then, for the purpose of the argument, C is implied or included in A, and may be substituted for it, and we get C revolves round B. If A depends on B, and B depends on C, then, for the purpose of the argument, A is implied in B, and depends on C. But if A cheats B and B cheats C, we are clearly not entitled to conclude that A cheats C; nor, if A is killed by B and B is killed by C, are we entitled to conclude that A is killed by C. It is the difficulty of providing for the first two cases, without including the two latter, that has frustrated every attempt to discover a satisfactory formula, on the lines of the Dictum, to account for these arguments. But the Method of Explication renders the distinction clear, and satisfactorily includes what ought to be included, and excludes what ought not. If A depends on B, and B on C, then it is evident that, for the purpose of the argument, 'A depends on B,' C is implied in B, and may replace it; and we may safely and properly infer that A depends on C. But if A cheats B and B cheats C, it is equally clear that C is not, for the purpose of the argument, implied in B; nor, if A is killed by B, and B is killed by C, is C implied in B.

Still, even in the last two cases, we are not precluded from drawing any inference at all. By the method of the syllogism, indeed, no inference can be obtained from the premisses A killed B, and B killed C; but by the Method of Explication we can get, by the first Canon, C died before A, and several others; by the first Minor Canon, C was killed by B and B by A; the third Canon shows us that C did not survive A; and several others. Finally, the fourth Canon gives us that A and B were both homicides, and that they resemble each other in this respect.

If A is equal to B, and B is unequal to C, the syllogism does not enable us to draw any conclusion; but, by the third Canon of Explication, we are permitted to deny any proposition inconsistent with the postulate; amongst others, we may deny any proposition in which a term of the postulate is replaced by a term inconsistent with it. For the purpose of this argument, C, if substituted for B in the postulate A is equal to B, is inconsistent with B; and

we may therefore deny the proposition A is equal to C. By the second Minor Canon, this implies A is unequal to C. The same method will give corresponding results in all propositions of the class.

2. Apart from the argument *à fortiori* and its congeners, there is an immense range of propositions to which the syllogism is inapplicable, and in which it gives no assistance: all of these yield readily to the Method of Explication.

It is my knife: I know it by a nick in the blade, and a chip out of the handle. It is not my knife, for mine is smaller than that. He had been there, for his name was in the visitors' book. He was not there, for I searched every room in the house without finding him. Europeans differ from Asiatics, for the former are capable of self-government, and the latter are not. Europeans resemble Asiatics, for they both have the same physical structure. These arguments are either not attainable at all by the syllogism, or, if a syllogism can be constructed by which the conclusion can be reached, it clearly does not represent the mental transaction employed in attaining the conclusion.

It is my knife: I know it by a nick in the blade and a chip out of the handle. If I reach this conclusion by the syllogism, What is the missing major? Is it 'All knives with a nick in the blade and a chip out of the handle belong to me'? Even a logician would scarcely venture on such an assumption. Moreover, I know my knife by the particular size, shape, and position of the nick in the blade and of the chip out of the handle. In other words, I identify it as a particular individual thing, without going through the medium of a universal. If an individual is a Universal, then, I suppose, the missing major is universalised by expressing the whole of the knife, but I do not see how this helps us; and if a singular proposition may be a Universal, and some logicians contend that it can and ought to be so considered; then *à fortiori*, a proposition whose Subject is two, or three, or several individuals of the same class, must be more than a universal, and the distinction between the universal and the particular is submerged.

Is this the argument?

My knife is one with a nick, &c.;
This knife is one with a nick, &c.;
∴ This knife is my knife.

This is no syllogism. The middle term, being in both premisses the predicate of an affirmative proposition, is undistributed. I do not see how the conclusion can be reached through syllogistic reasoning; but by the Method of Explication, the course of the reasoning is clear enough, and the conclusion may be reached *secundum artem*. By the third Minor Canon, we are allowed to replace any term in a proposition by one that is, for the purpose of the argument, equivalent to it. Very well. In the first of these propositions, 'My knife' is given equivalent to 'one with a nick, &c.' 'My knife' may, therefore, replace the term 'one with a nick, &c.,' in the second premiss; and this gives us at once the conclusion we seek—'This knife is my knife.' No major premiss—no Universal—is employed, for none is needed.

'That knife is not mine, for mine is smaller than that.' If this is an enthymeme, what is the missing major? I suppose the complete syllogism would be something like this:—

No knife, than which mine is smaller, is mine;
My knife is smaller than that knife;
∴ That knife is not mine. Fesapo.

If there are people so constituted that they prefer to invent a principium of this gruesome character, and to obtain, or fancy that they obtain, their conclusion by means of it, I have no objection, so long as they do not insist upon my doing the same. For my own part, I prefer a more direct route to my destination. If my knife is smaller than that, then that knife is inconsistent, for the purpose of the argument, with my knife; and what is inconsistent with the postulate may, by the third Canon of Explication, be denied. In other words, that knife is not mine.

'He had been there, for his signature is in the visitors' book' can be reached by a syllogism if we invent the major 'All whose signatures are in the visitors' book had been there'; but we are not warranted in assuming this major. His signature may, for aught the postulate grants, be the only one in the book. We may, however, get the same conclusion, without the intermediation of any major, by the first Canon of Explication. A postulate implies every condition necessary to it. A necessary condition of writing his name in the visitors' book is that he must have been there. On the other hand, 'He was not there' cannot be reached syllogistically from 'I searched every room in the house

without finding him,' unless we invent such a major as 'In all cases in which every room in a house is searched without finding a person, that person is not there.' This is manifestly not the process of thought by which the conclusion is reached. No such major would, in fact, be constructed by the most enthusiastic syllogiser, unless he wished to bring the syllogism into ridicule. The actual process of thought is very different, and is that indicated by the fourth Canon of Explication. Every thing inconsistent with the postulate may be denied. If I have searched every room in the house without finding him, it is inconsistent with this postulate to say he was there; and that he was there may properly be denied.

'Europeans differ from Asiatics, for the former are capable of self-government, and the latter are not.' No syllogism can be constructed to represent the course of thought by which this conclusion is reached from the premiss. If the argument is considered, it will be seen that the conclusion is attained directly from the single premiss, and that no major is required; unless, indeed, the fifth Canon of Explication is taken as a major. When two terms are postulated in inconsistent relations to a third, they differ from one another with respect to that third.

There is an old example, first discovered by the Port Royal logicians, of a conclusion that is too manifest to be questioned, but that baffles all the resources of Traditional Logic to attain. It runs as follows:—

The Persians worship the sun;
The sun is an insensible thing;
∴ The Persians worship an insensible thing.

This is not a syllogism, for it contains no Universal, and the middle term is undistributed.

It is clear, however, that, for the purpose of the argument—that is, of what the Persians worship,—the sun is given equivalent to an insensible thing, and may therefore replace it in the first premiss. This replacement gives us the conclusion. Could any process be more simple, or more manifestly indicate the actual process of thought?

These examples are sufficient to establish my first two theses—that there are many Compound propositions to which the syllogism cannot be applied: many inferences that it cannot attain;

and that when the syllogism is insufficient and incapable, the Method of Explication displays the course of the reasoning.

3. The next thesis is that the syllogism cannot extract, even from those compound propositions to which it can be applied, any but a very few of the implications they contain; while the Method of Explication can extract an indefinite number. If all birds fly and no pigs fly, no syllogistic inference can legitimately be drawn from these premisses, for neither of them is in strict logical form. But if we waive this objection, we can get, in Cesare, that No birds are pigs; and in Camestres, that No pigs are birds; but beyond these inferences we cannot go. The resources of Traditional Logic are exhausted. But by the Method of Explication we can get much more than this. We can get 'All birds can do what no pigs can do'; and 'No pigs can do what all birds can do.' We can get 'Birds and pigs do not both fly'; 'Birds and pigs differ from one another in respect of flying'; and 'Flying marks a difference between birds and pigs.'

The last three propositions are instances of a very important advantage that the Method of Explication has over the syllogism. In no syllogism does the middle term appear in the conclusion. Yet it is often a very valuable result to get the middle term into the conclusion; and many arguments are undertaken with no other purpose. If Hamlet lectured his mother on virtue, and if Hamlet murdered Polonius, then the same man that lectured his mother on virtue, committed murder. This is a significant implication of the postulate. If most birds fly, and some fish fly, then some fish are like most birds in respect of flying. If penguins and auks can not fly, and other birds can, then penguins and auks are unlike other birds in respect of flying, and the ability to fly marks a difference between them. If typhus fever has a confluent rash, and typhoid fever a discrete rash, then typhus and typhoid have different rashes, and the character of the rash marks a difference between typhus and typhoid. Few inquiries are more important, on occasion, than Are these things alike or different? and In what respects are they alike or different? What is the resemblance between this and that, what the difference between that and the other? These are problems which confront us daily and hourly, but Traditional Logic knows nothing of them, and leaves us without means of solving them. Modern Logic has detected the omission of the middle term from the conclusion, and regards the

omission as not inherent in the nature of syllogistic inference, but as an accident. The middle term could be, and I gather that Modern Logic considers that it ought to be, expressed in the conclusion. If this the opinion of Modern Logic, it goes too far. Whether the middle term ought or ought not to appear in the conclusion depends on the purpose of the argument. It depends on the aspect of the subject-matter in which we are interested. It may be that an inference is useless to us unless the middle term appears in the conclusion: it may be that the presence of the middle term in the conclusion is surplusage and redundancy. It depends on the purpose of the argument.

4. The fourth advantage of the Method of Explication over the syllogism is that in the Method of Explication there are no figures or moods to be remembered, and no need of reduction from one figure to another to make the argument convincing. In some syllogisms, the argument is not convincing. It is, at any rate, not self-evidently valid. It does not at once carry conviction to an ordinary mind, unaccustomed to the peculiarities of the syllogistic figures. Take Fesapo, for instance:—

No applewoman sells flowers,
Selling flowers is a profitable occupation;
∴ Some profitable occupation is not followed by applewomen.

There seems to be an hiatus here. Some step in the reasoning appears to be left out. The sequence of the argument is not self-evident. We have to go over it again to assure ourselves that the conclusion is justified. Some assurance of its justification is lacking. It is in order to supply this assurance that syllogisms in the last three figures are reduced to the first; and this reduction requires, in this case, two operations. First the major premiss is converted, and becomes 'Selling flowers is not followed by applewomen'; and next, the minor premiss is converted *per accidens*, and becomes 'Some profitable occupation is selling flowers'; and from these new premisses it is contended that the conclusion is more self-evidently reached than from those of the original syllogism. Whether this contention is justified, the reader must judge for himself; but whether it is or no, it is, in my opinion, far more satisfactory to follow a mode of reasoning which is transparently and manifestly valid, and needs no reduction to another mode to make it appear valid. By the Method of Explication, the con-

clusion is thus reached;—Since, by the first Minor Canon of Explication, every postulate implies its reciprocal, 'No apple-woman sells flowers' implies 'Selling flowers is not followed by applewomen.' For 'selling flowers' we may, by the third Minor Canon, substitute the term 'a profitable occupation,' which is postulated equivalent to it; and thus we get 'A profitable occupation is not followed by applewomen.'

By this method, whatever conversion of premisses is desirable in order to make the argument self-evident, is effected in the course of the argument, and is not left over to a subsequent process after the argument is finished. By the syllogistic method, in short, the proof of a conclusion requires further proof before it can be fully accepted: by the Method of Explication but one process of proof is necessary. At every step we are assured that we are on firm ground before we go on to the next. By the institution of the process of reduction, it is admitted and declared that no such assurance is given by any figure of the syllogism except the first; for the purpose of reduction is, by bringing the other figures into the first, to carry to the mind of the syllogiser that his argument is valid. The purpose of reduction is to reassure the syllogiser; to convince him that his argument is not mere hocus-pocus; and to this end he is furnished with the mnemonic verses concerning Barbara, Celarent, and the rest, to enable him to perform reduction in every case. The process is by no means easy. In some cases it is very elaborate; and furnishes the novice with ample opportunities for error. Take, for instance, Bokardo, now known by the more euphonious title of Doksamosk; and let us try this specimen:—

Some men are not vegetarians;
All men are mortals;
∴ Some mortals are not vegetarians.

In order to reduce this to Darii in the first figure, the following series of processes must be conducted. First contrapose the major premiss. Contraposition we have found to be not a very simple process. To obtain the contrapositive, we must first obvert, and then convert the obverse.

Major premiss: Some men are not vegetarians;
Obverse: Some men are non-vegetarians;
Converse: Some non-vegetarians are men.

Now take the proposition, thus obtained from the major premiss of your syllogism, and make it the minor premiss of a new syllogism, having the minor premiss of your old syllogism for a major. You will then obtain the premisses:

All men are mortals;
Some non-vegetarians are men;

and from this you get the conclusion, 'Some non-vegetarians are mortals.' This, by conversion, yields 'Some mortals are non-vegetarians,' and finally, by one more obversion, you arrive at the end of your long journey, and triumphantly attain the conclusion 'Some mortals are not vegetarians.'

Whether the importance of the result is commensurate with the time and trouble necessary to attain it, the reader must judge for himself; but if, notwithstanding the reduction to Darii, he is still unsatisfied with his syllogism, and cannot be convinced of its validity without reducing it to Barbara, he will be pleased to know that he is not at the end of his resources. All he has to do is to substitute for his major premiss the contradictory of his conclusion. By this means he gets a syllogism in Barbara, the conclusion of which contradicts his original major. Thus he reduces his syllogism to absurdity, a result not without further significance.

It does seem that if a simpler method of ensuring the validity of a syllogism could be found, it would be preferable; and such a method is, I submit, found in the Method of Explication. By this method, we are authorised to replace any proposition by its reciprocal, and any term by its equivalent or its part. We may, therefore, replace 'mortals' by 'some mortals' and 'All men are mortals' by 'Some mortals are all men.' 'Some men' are included, for the purpose of the argument, in 'all men', and may therefore be substituted for 'all men'; and thus we get 'Some mortals are some men.' But 'not vegetarians' is given, in the major premiss, equivalent, for the purpose of the argument, to 'Some men,' and may therefore be substituted for 'some men.' Hence we get, in three steps, 'Some mortals are not vegetarians.' Thus the two processes, of deriving the conclusion, and assuring ourselves of its validity, are carried on simultaneously, and attained in three very simple steps; and all the many processes of reduction, together with their rules, the mnemonic verses which enable us to remember them, and the quaint

and curious names of the moods, in which the rules are summarised and conveyed, may all be dispensed with, and relegated to the limbo of antiquarian curiosities, where they may take their place beside the pentacle and the philosopher's stone. Barbara will then occupy the same glass case as Abracadabra and phlogiston, as the crystal spheres of Ptolemy and the hypostatised 'forms' of Plato; and the curious spectator will recognise the congruity of them all.

5. The fifth advantage claimed for the Method of Explication is that its Canons are self-evidently valid, while those of the syllogism are not. We intuitively recognise that a proposition implies its reciprocal; that any term may be replaced by its equivalent; that when a postulate is granted, all the conditions necessary to it are granted; that every proposition denies what is inconsistent with it; and so forth. But we do not intuitively perceive the necessity for every argument to contain three propositions and no more, three terms and no more; that the middle term must be distributed at least once; that the premisses must not be both particular, nor both negative. We may be able to acquiesce in the validity of these rules when they are explained to us, though for my own part I am not able to do so; but we certainly do not perceive it intuitively.

6. Lastly, the rules of the syllogism are erroneous, and productive of fallacy. That they are in some respects erroneous has been discovered by Modern Logic; but the criticism of them by Modern Logic is far less drastic and thoroughgoing than that to which I should subject them. A distinction must be drawn here, however. Some of its rules are untrue of the syllogism itself; that is to say, the syllogism does not, or need not, conform with them. Others are valid as applied to the syllogism itself, but are not true of reasoning generally. They are falsified, as Canons of Inference, by our experience of inferences drawn by the Method of Explication. If the syllogism poses as the Universal Principle of reasoning, they are untrue; if it is accepted as but one method, and that an imperfect and clumsy method, of explicating some of the implications of the Compound proposition, they may pass as Canons of that method.

CHAPTER XX

THE FAULTS OF THE RULES OF THE SYLLOGISM

THE first rule of the syllogism is that it must contain three, and no more than three, terms. Otherwise put, this means that the powers of the syllogism are limited to explicating those Compound propositions that have no more than three terms. To propositions more comprehensive than this, it is inapplicable, and in this rule it confesses its incompetence to explicate them. But compound propositions can be constructed with as many terms as we like, and it is as easy to explicate these by the Method of Explication as to explicate those with three terms only. The multiple proposition is outside the purview of both Traditional and Modern Logic.

'All wits are envious and malicious.' From this postulate, Traditional Logic can deduce but two conclusions:

All wits are envious;
All wits are malicious;
∴ Some malicious people are envious. Darapti.

All wits are malicious;
All wits are envious;
∴ Some envious people are malicious. Darapti.

These are all the conclusions that Traditional Logic can give us; but it can give us these conclusions, and so far it may be patted on the back, and commended. But if, instead of the Compound proposition 'All wits are envious and malicious', we give it the postulate 'All wits are envious, malicious, untruthful and spiteful,' neither Traditional Logic nor Modern Logic can extract any inference at all. They can only contemplate it with helpless stupefaction. Envy and malice are fair and proper subjects of Inference; but envy, malice, untruthfulness and spitefulness are outside the pale of reasoning, or, if admitted, must come in through a turnstile, two by two, like schoolgirls under the eye of their mistress.

To the Method of Explication, four terms, or forty, present no more difficulty than three. Grant the postulate 'All wits are envious, malicious, untruthful and spiteful,' and this Method will furnish you with the inferences that envy, malice, untruthfulness, and spite are qualities of all wits; that these four qualities are consistent with one another; that all wits are alike in possessing them; and many more. Nor are the powers of the Method of Explication limited to the Compound proposition with a multiple Object-term. 'All anglers and some golfers are untruthful, and addicted to exaggeration of their own success.' This contains two Subjects, two Objects, and two Ratios;—eight propositions altogether—and I do not know what Traditional Logic could do in the presence of such a proposition, except sit down and cry; but to the Method of Explication it yields readily enough an innumerable multitude of implications. If Traditional Logic attempted to deal with such a postulate at all, it must first break up the postulate into its eight constituent propositions, and then take them two by two; but even then it would be helpless. For what could it do with such a pair of propositions as 'All anglers are untruthful,' and 'All golfers are addicted to exaggeration of their own success'? Traditional Logic might scratch its head into a hole before it could make a syllogism out of such a pair.

Modern Logic would, I suppose, refuse to look at such a postulate, for, to Modern Logic, 'Inference is the indirect reference to reality of differences within a Universal by means of the exhibition of this universal in differences directly referred to reality.' Whether 'All anglers and some golfers' constitute together a Universal; whether their unanimous and lamentable addiction to untruthfulness and exaggeration are differences within this universal; whether, if so, all anglers and some golfers are exhibited in these differences; and whether or no the differences are directly referred to reality; are questions that I am not competent to decide. At any rate, Modern Logic, through the mouth of Mr. Bosanquet, is emphatic in asserting that 'Inference must have three terms and no more.'

The second Canon of the syllogism states that the syllogism must consist of three, and of no more than three propositions. This rule seems, on the face of it, to deny the possibility of more than one conclusion being deduced from any one pair of premisses. There is no rule, as far as I know, explicitly stating that two

premisses can lead to but one conclusion; but such a rule seems implicit in the second Canon of the syllogism; and there is no instance, in any text book, of a second conclusion being drawn from any one pair of premisses, except the weakened conclusion, in which we deduce a conclusion with respect to some, when we are entitled to predicate it of all; and the unique case of Camestres and Cesare. I think, therefore, that it is not unfair to interpret the Canon in this sense. Yet how many implications are there not latent in every Compound proposition! How many manifest; how many permissible; how many possible! Take as an instance the teetotal argument,—

Every one who drinks poison commits suicide;
Every one who drinks wine, drinks poison.

From these premisses the syllogism permits of but one conclusion:—

∴ Every one who drinks wine, commits suicide.

But from the same premisses, the Method of Explication will extract twenty conclusions, all manifestly contained in the premisses, and all valid; for instance—

No one who drinks wine escapes death by suicide.
Drinking wine ensures death by suicide.
Drinking wine and suicide are compatible.
Every one who drinks wine, drinks poison and commits suicide.
Some people drink poison in the shape of wine.
Some people commit suicide by drinking wine.
Every one who drinks wine poisons himself.
Some people poison themselves by drinking wine.
One way of committing suicide is to drink wine.

And so forth, and so on, indefinitely. It may be said, and it may be freely admitted, that these are alternative conclusions, and that in any one argument only one of them can appear, so that, after all, there would be but three propositions in the argument. I do not see why the conclusion from a compound proposition should not itself be a compound proposition; but waiving this, and

granting for the sake of argument that these examples do not invalidate the syllogistic rule against the employment of more than three propositions in an argument, it is very easy to construct examples that do violate the rule.

If Many are called;
Few are chosen;
And Still fewer are found suitable;
Then Very few of those who are called are found suitable.

If some are green, more are blue, a few are yellow, and the rest are brown, then none of them is white. In these examples advantage is taken of the quantities that Traditional Logic ignores; but without utilising these quantities, we may still construct perfectly valid arguments with more than two premisses. Take, for instance, the following:—

Ptomaine poisoning is due to eating toxic food;
Several persons suffered at the same time from ptomaine poisoning;
They had all partaken of the same dish;
∴ The toxin may have been in that dish.

From the third Minor Canon of Explication we get out of the first two premisses, the implication 'Several persons ate toxic food.' The third premiss gives us that these persons had all eaten of that dish, so that by the fourth Canon of Explication, toxic food and that dish are consistent. In other words, that dish may have contained toxic food. This is a conclusion that no syllogism could extract. The syllogism knows nothing of what may have been. The conclusion is a Modal proposition, and as such is excluded from syllogistic Logic. But will anyone have the temerity to maintain, either that this conclusion is not a valid inference from the premisses, or that it is not a valuable conclusion to obtain? Surely it is as important to prove that that dish may have contained the toxin, as it is to prove that Socrates is mortal. It may be objected that here are two inferences, and not one only; and that the true form of the argument is a sorites, in which the conclusion of one argument becomes the premiss of the next. I do not see that the nature of the process is in any way affected by the name we give it. Call it Sorites or Baralipton or

anything you please, but you will not alter the fact that the conclusion cannot be obtained by any process known to Traditional Logic, but is obtained with the greatest ease and certainty by the Method of Explication. We have seen in our examination of Bokardo, that the conclusion, even of a syllogism, cannot always be attained by a single step; but that, to assure ourselves of its validity by the strictest syllogistic reasoning, may require as many as seven successive operations.

The third rule of the syllogism is that the middle term must be 'distributed' in at least one of the premisses. This is true if the two quantities of Traditional Logic—the Particular and the Universal—are the only quantities that exist. But if it is true, as I maintain, that the quantities few, many, most, this, that, scarcely any, nearly all, and the rest of them, were devised by man to satisfy his needs, and to characterise quantities about which he desired to reason; then the rule, that the middle term must be 'distributed,' in the sense in which Logic understands 'distributed,' is untrue, and falls to the ground. No logician would admit that 'Nearly all' distributes the term it quantifies. 'Nearly all' is a variety of 'some,' and 'some' is the mark of the particular. But take the following argument:—

Nearly all in the pit were miners;
Nearly all in the pit were killed;
∴ Some of the killed were miners.

This inference is unimpugnably valid; and so is the following:—

Very few people are strict vegetarians;
Scarcely any strict vegetarians are vigorous;
∴ Scarcely any people are vigorous vegetarians.

I don't know whether logicians would admit that this is a syllogism. Probably they would not; but then so much the worse for Traditional Logic; for it is indisputably a mode of reasoning, and a valid mode.

The actual rule, which ought, in my opinion, to be substituted for the rule of the distributed middle is this:—If the middle term is quantitative (it need not be, but if it is) then it must not be of less ample quantity than the term that replaces it. This follows from the third Minor Canon of Explication; which allows us to

replace any term by one which is equivalent to it or is included in it. A term which is of the same quantity as another is quantitatively equivalent to it. A term which is of less quantity than another is quantitatively included in that other. It makes no difference whatever to the validity of the argument how limited is the quantity of the middle term, so long as the term substituted for it in the conclusion is not of greater amplitude. In the last example, the middle term—strict vegetarians—is undistributed in the major as the predicate of an affirmative proposition; it is undistributed in the minor by the quantification 'Scarcely any.' Yet, since vegetarians include vigorous vegetarians, the latter term may be substituted for the former, and the middle, undistributed as it is, is of sufficient amplitude for the purpose of the argument.

The fourth rule of the syllogism is that no term may be distributed in the conclusion that is not distributed in a premiss. This rule is good as far as it goes; but it does not go far enough. It is sufficient for the two quantities of Traditional Logic, but it is not sufficient if the other quantities are allowed to enter into the argument. If a semi-definite quantity is admitted, and it has been shown that perfectly valid arguments may be constructed with the semi-definite quantity, then the argument may be invalid even though the rule is punctually observed. It will be invalid if the quantity of a term in the conclusion, although not distributed, is yet in excess of the term it replaces.

Most brave men are generous;
Most sailors are brave men;
∴ Most sailors are generous.

No term is distributed in this conclusion that is not distributed in a premiss; yet the argument is invalid. As a syllogism, it is invalid because both the premisses are particular; but the rule against particular premisses will be shown presently to be itself invalid. The fallacy in this argument must rest, therefore, on a different ground; and it is easy to see what the ground is. The fourth Canon of Inference is violated. According to this Canon, we may not assume more than is in the postulate. Among other prohibitions, we may not replace a term by one of greater quantity. A term may be substituted for any term that contains it; but not for any term by which it is contained; and this is what is done in

this argument. 'Most sailors' in the second premiss are substituted in the first premiss for 'Most brave men,' in order to get the conclusion 'Most sailors are generous.' But 'Most sailors' are not given equivalent to, or less than, 'Most brave men.' They are given, in the second premiss, equivalent to 'brave men'; and 'most brave men' is a term of less ample quantity than 'brave men.' Hence, in substituting 'most sailors' for 'most brave men' we are substituting a term of greater quantity for a term of less—a containing term for a contained—and so are violating the fourth Canon of Inference. The fallacy is a kind of illicit minor, but a kind unknown to Traditional Logic.

The fifth rule of the syllogism is that one of the premisses at least must be affirmative, and no conclusion can be drawn from negative premisses. Modern Logic repudiates the rule, and I respectfully signify my agreement with Modern Logic. Even exponents of Traditional Logic so devoted as Jevons have long recognised that a conclusion may be drawn from premisses, one of which contains a negative ratio, and the other a negative term; and have offered an explanation that seems to me valid,—that an affirmative ratio with a negative term makes, or may make, in fact, an affirmative proposition. With this I should agree; but in this case, what becomes of the Universal Negative, the E proposition, of Traditional Logic, with its negative subject? As far as I can see it becomes, or may become, a Universal Affirmative. My objection to the prohibition of negative premisses does not rest, however, on any quibble concerning the negative proposition. When both premisses are negative, in the ample sense of having negative Ratios, it is still possible to deduce from them good, valid, and useful conclusions.

The coachman is not beautiful;
Beauty is not necessary in a coachman;
∴ The coachman is not incapacitated by his want of beauty.

I do not claim that this is a syllogism, and frankly, I don't care whether it is or not; but it is a good sound argument from two negative premisses. So is the following:—

We have no paste;
Paste is not a bait for pike;
∴ Our want of paste does not deprive us of a bait for pike.

From the negative premisses

No pigs fly;
No pigs hop;

the syllogism can deduce no inference; but the Method of Explication allows us to infer that pigs neither fly nor hop; that some things that neither fly nor hop are pigs; that all pigs are alike in respect that they neither fly nor hop; that any thing that either flies or hops is not a pig; and so on.

Mr. Bosanquet suggests the argument

No mere animal has language;
A deaf mute is no mere animal;
∴ A deaf mute has language,

and says 'Horrible as these arguments must appear to anyone conversant with syllogistic rules, I do not see how they are to be kept out if the argument from two negations in fig. 3 is admitted.' This specimen seems to me plainly a fallacy *quaternio terminorum*, perpetrable solely on account of a peculiar English idiom. It has been maintained above that an argument may have four terms and still be valid; but it is not maintained that a syllogism may have four terms and still be valid. 'No mere animal,' in the major premiss, is a negative term; but 'no mere animal,' in the minor, is an English idiom for 'not a mere animal.' The negative belongs to the Ratio, not to the Object. Hence there are two middle terms,—'No mere animal' and 'a mere animal'—and it is plain that the second of these is neither equivalent to, included in, nor implied in the first; and may not, therefore, be substituted for it. The pseudo-argument is a mere quibble.

The sixth and last of the primary rules of the syllogism is that if one premiss is negative, the conclusion must be negative; and if the conclusion is to be negative, one premiss must be negative. This is very far from the truth. It is as easy as possible to reach, by the Method of Explication, an affirmative conclusion from premisses, one of which is negative; and a negative conclusion from premisses, both of which are affirmative. If some of the jury were for the plaintiff, and some were not for the plaintiff, then the jurors were divided in opinion. This argument violates no fewer than five of the rules of the syllogism; and yet it is

perfectly valid. It has five terms; the middle term is not distributed; both premisses are particular; the affirmative conclusion is drawn from premisses, one of which is negative; the conclusion is universal, though not only one, but both of the premisses are particular. It is true that the argument is no syllogism, and does not pretend to be a syllogism; but it is a good, sound, valid argument for all that. The conclusion cannot be obtained by any syllogistic process, but yet it is not only valid, but it is attained by a single step—by a single process of inference. The Canon of Explication that authorises us to draw the conclusion is the second—a postulate implies all that is necessary to it. If some of the jury were for the plaintiff and some were not, it is implied that there was a jury; that the jurors had opinions; that some were of one opinion and some of another; that their opinions were divided. Again,

Many Irish go to America;
Some do not leave it;
∴ Some Irish remain in America,

and an irrefragable affirmative conclusion results from a negative premiss, a valid conclusion from two particular premisses.

Nor is it true that if the conclusion is negative, one premiss must be negative.

Most of the balls were black;
The rest of them were white;
∴ None of them was red.

This is not a syllogism, it is true; but it is a perfectly valid argument. It exhibits the power of the Residual quantity in enabling us to draw a universal negative conclusion from premisses, both of which are affirmative, and both particular.

Some of the men were Spaniards;
The rest were French;
∴ All the men were Europeans, and
∴ None of them was Russian.

Here, again, Universal conclusions, both positive and negative, are drawn from the same particular premisses. It is true that in strictness we require further postulates about Europeans and Russians, and cannot reach the conclusions unless these postulates are in our minds; but in every inference something must be taken

for granted. Some knowledge on the part of the reasoner must be presupposed. We cannot even infer from 'Man is mortal' to 'No man is immortal' unless we know that 'immortal' excludes 'mortal,' for the purpose of the argument; and this knowledge is not what biologists call an 'innate quality.' A person who had never heard the word immortal, and did not know what it meant, would need a further postulate before he could draw the inference; but as most of us do not need the postulate, the logical necessity for it, to those who do, escapes our notice; and the logical necessity for postulates about Europeans and Russians in the one argument is not really greater than the necessity for a postulate about 'immortal' in the other.

Arguments in which universal conclusions are drawn from particular premisses, negative conclusions from affirmative premisses, and valid conclusions, either negative or affirmative, from premisses, one or both of which is negative, present themselves in such profusion that it is difficult to make a selection; but perhaps the following will suffice:—

Particular negative conclusion from affirmative premisses:

All men are mortal;
Some men are vegetarians;
∴ Some mortals do not eat meat.

Universal negative conclusion from particular affirmative premisses:

Some of the jurors were for the plaintiff;
Some of the jurors were for the defendant;
∴ The jurors were not unanimous.

This is not the 'Universal Negative' of Traditional Logic, which needs a negative Subject, but it is not difficult to get such a Universal Negative from particular affirmative premisses:

Some of them went East;
The rest went North;
∴ None of them went South.

Valid negative conclusion from two negative premisses:

No logician agrees with these doctrines;
No logician is infallible;
∴ Some fallible persons do not agree with these doctrines.

Valid affirmative conclusion from two negative premisses :

Some were not killed;
None were cowards;
∴ Some brave men escaped.

Finally :

If This little pig went to market;
and That little pig stayed at home;
and The other little pigs scattered to different parts of the country;
then None of the little pigs remained together;

and thus every child in the nursery can reach a valid conclusion from an argument which violates every rule but one of the syllogism; from an argument that has eight terms and four propositions; that has no middle term; that has every term undistributed and all its premisses particular; that reaches a universal conclusion from particular premisses; a negative conclusion from affirmative premisses. Thus, out of the mouths of babes and sucklings is the syllogism discredited, defeated, and set at naught.

This view of Deduction, which regards it as the explication of the implications that lie latent in every proposition, seems to me to have many advantages. Neither Mediate nor Immediate Inference is thus regarded in any book on Logic known to me, though now and then Hamilton utters statements that are consistent with this doctrine. Logicians do admit that Deduction is the logic of Consistency, but in spite of this admission, they constantly try to show how Deduction reaches the unknown from the known. In my view it does nothing of the kind. It merely reveals what is implied in the postulate. De Morgan draws a sharp distinction between knowing a thing *from* premisses and knowing it *with* them. 'Persons not spoiled by sophistry will smile when they are told that knowing two straight lines cannot enclose a space, the whole is greater than its part, &c.—they as good as know that the three intersections of opposite sides of a hexagon inscribed in a circle must be in the same straight line. Many of my readers will learn this now for the first time; it will comfort them much to be assured, on many high authorities, that they virtually knew it ever since their childhood.' In this passage,

De Morgan is insisting on the doctrine that Deduction does 'enable us to proceed from the known to the unknown'; and if the example he gives were, in fact, an instance of deductive reasoning, his contention would be unassailable. But the reasonings of geometry and of mathematics generally are not deductive. They are reasonings by quantitative analogy, as will be demonstrated in a subsequent chapter; and De Morgan's contention falls to the ground. One of the capital grievances that I have against Traditional Logic is its failure to discover the mode of reasoning by quantitative analogy, and its confusion of this mode of reasoning with the syllogism.

I do not think that any logician can contend that Immediate Inference is anything but the extraction of implications from a Simple proposition. The discussions, in books on Logic, as to whether Immediate inferences are inferences or not, rest upon the assumption that an inference is not an inference if it is plainly and immediately apparent; but if this is true of the inferences from Simple propositions, it is equally true of inferences from propositions that are Compound. I cannot see that the inference that if all men are mortal and Socrates is a man, Socrates is mortal, is any less apparent, or any more difficult to extract, than the inference from 'All birds are feathered,' to 'Nothing that is without feathers is a bird.' That the process of Inference is, in fact, nothing more than the explication of meanings implied in a postulate, seems to me to be proved beyond question by the results of the Method of Explication, which enables us to arrive at all the inferences that are attainable by the syllogism, and at a great many more besides.

Part of the confusion as to the nature of Inference is due to the practice of logicians of applying this term to Induction as well as to Deduction. This seems to me to be regrettable. If I contemplate the postulate 'The sky to-night is red,' I can infer, according to the Canons of Explication, 'Redness is in the sky to-night,' 'The sky is not blue to-night,' and so forth. But if I contemplate, not the postulate, but the fact, that the sky is red to-night, and compare it with previous experience, I can argue, or infer, in another sense of the word infer—I can induce—the conclusion that it will be a fine day to-morrow. It is, of course, possible to deduce this conclusion from a Compound proposition. For the purpose of argument I may postulate 'A red sky at night will

probably be followed by fine weather the next day; and the sky is red to-night.' From this postulate I can deduce the implication 'It will probably be fine to-morrow'; but this verbal explication is totally distinct from material reasoning, and need have no relation whatever to fact. The premisses are postulated; and for the purpose of argument I may postulate what I please. I can postulate that if the sky is red at night, it will rain incessantly for ten years, or it will never rain again; and any implication I may extract from that postulate, in conjunction with the further postulate 'The sky is red to-night,' will be valid, for the purpose of the argument, if it is conducted *secundum artem*. But when I induce from 'The sky is red to-night' that 'It will probably be fine to-morrow,' I do not go on postulation. I am now in the region of material argument. I am appealing, not to a postulate, but to experience; and am proceeding from the known to the unknown in a sense which is foreign to the proceedings of Explication. In Inference, or Deduction, or Explication, we proceed from that which is explicitly given to that which is implicitly given—from that which is manifest to that which is implied—from that which is avowedly postulated to that which is unavowedly postulated. With fact, with advance from the known to the unknown, we have nothing to do, except in as far as 'the unknown' is a misnomer for 'the unavowed.'

If the syllogism is, as I contend, merely one way of extracting from the Compound proposition one of its implications, then the question of the *petitio principii* said to be inherent in every syllogism, takes on a new aspect; and *solvitur ambulando*. If the whole syllogistic process is the extraction of an implication from the postulate, then it is clear that we can get nothing out of the postulate that was not in it. We are forbidden by the Fourth Canon of Inference to do so. If the conclusion were not contained in the premisses, it could not be got out of them.

The problem of the *petitio principii* inherent in the syllogism has been stated by no one so neatly as by Prof. Carveth Read, who puts it in the form of a dilemma. 'If *all* the facts of the major premiss have been examined, the syllogism is needless; and if *some* of them have not been examined, it is a *petitio principii*. But either all have been examined or some have not. Therefore, it is either useless or fallacious.' The dilemma is notoriously a dangerous form of argument, epigrammatic as it is, and inde-

feasible as it appears; and this example is no exception to the rule. Examination of the facts is irrelevant to the construction of the syllogism. Whether they have all been examined, or whether some of them have not, or whether none of them have been examined, makes no difference to the validity of the conclusion as an inference from the premisses. It makes no difference to the consistency of the conclusion with the premisses, which may not be regarded as true or false, except for the purpose of the argument. If none of the facts have been examined, the conclusion is yet valid as an inference—as a deduction—if it is consistent with the premisses, whether they are true or false. And it is not useless to have an implication, that may not have been apparent, dragged into light and set plainly before us.

If the syllogism were a means of ascertaining material truth, Prof. Carveth Read's dilemma would be insurmountable and inescapable; but Prof. Carveth Read himself seems to recognise what I think is the true function of Deduction when he says 'Logic discusses the proof or disproof, or (briefly) the testing of propositions.' If by Logic is meant Deductive Logic; if by proof and disproof is meant demonstration of consistency and inconsistency with postulates; and if by testing of propositions is meant testing their consistency with the postulates from which they are derived; then this statement seems to me punctually correct. 'Logic,' says Prof. Read, 'does not investigate the truth, trustworthiness, or validity of its own principles.' If by Logic is meant Deductive Logic; and if by principles is meant postulated premisses, then I am entirely at one with Prof. Read. Other logicians state that Logic is the test of truth. I think that these logicians also are right; but that when they say Logic, they mean Inductive Logic. I differ from all schools in denying that the same Logic that tests the validity or consistency of Inference from postulates can also discover material truth. It is true that, formally, all writers on Logic now make some distinction between these two provinces of Logic, and treat of the one under Deduction, and the other under Induction; but throughout their treatment of Deduction, they assume, as Prof. Carveth Read assumes in the passage above quoted, that the Universal of Deduction is formed by the accumulation or examination of material instances; and throughout their treatment of Induction

they constantly endeavour to show that material fact is discovered by the use of the syllogism—the Inductive syllogism as some of them call it. In no book of Logic known to me is the distinction between Inferential reasoning and Material reasoning maintained throughout, or fully appreciated.

It is true that Modern Logic shifts the ground a little, and interprets the Universal of Deduction, not as an enumerative, but as a generic proposition. By this interpretation, 'All men are mortal' means not 'Every man has been examined with respect to his mortality, and found to be mortal,' but 'Mortality is a quality inseparable from our notion of man.' This is merely taking 'mortal' in connotation instead of in denotation, or rather, it is merely inserting mortal into the connotation of man: and does not in the least extricate us from the dilemma. If 'mortal' is part of the connotation of 'man,' then when it is said that Socrates is man it has already been said that Socrates is mortal; and to bring this out formally is merely explicating an implication that is already there, not proceeding from the known to the unknown.

If the Universal of Deductive Logic is obtained by enumeration of all the instances contained under it, it is obtained from experience of these instances. If it is obtained, as a generic Universal, by the discovery that the predicate is an inseparable quality of the subject, this also must have been gained from experience. In either case we are importing experience into a region of argument in which it has no place, is irrelevant and misleading. The function of the syllogism is not to bring us into contact with experience, but to explicate one of the implications contained in a Compound Proposition. If an implication stares us in the face, a formal syllogism is not needed, though many syllogistic inferences are of this character; but a few of the less obvious implications contained in postulates can be extracted by means of the later figures of the syllogism. This is the sole function of syllogistic reasoning; and this function it performs, clumsily, it is true; with much creaking, jolting and rattling; with an expenditure of labour out of all proportion to the result; but still the syllogism does perform a certain small function that is occasionally useful. I am not among those, therefore, who reject the syllogism as utterly worthless; but I acknowledge that it has the following defects:—

1. It is not applicable to all Compound propositions, but to those only in which the common element is a term.

2. Of those Compound propositions in which the common element is a term, the syllogism is applicable to those only which express relations of inclusion and exclusion.

3. Of those Compound propositions whose common element is a term, and which express relations of inclusion and exclusion, the syllogism is applicable to those propositions only in which the Subject is definitely quantified.

4. Of those Compound propositions whose common element is a term, and which express relations of inclusion and exclusion of definitely quantified Subjects, the syllogism is applicable to those expressing two quantities only of the Subject.

5. From propositions of the very limited class to which alone it is applicable, the syllogism can extract but one, or at most two, implications, out of the multitude they contain.

6. The syllogism cannot be applied without a knowledge of its figures and moods.

7. The rules of the syllogism are faulty, and some of them are untrue.

8. The syllogism is not self-evidently valid, but in all figures except the first, needs reduction to the first figure to give assurance of its validity.

9. This reduction is in some cases lengthy, difficult and complicated, and therefore liable to error.

CHAPTER XXI

THE CONDITIONAL PROPOSITION AND ITS IMPLICATIONS

THE second Canon of Inference allows us to assume, for the purpose of argument, any postulate we please. It follows, by the first Canon of Explication, that we may assume or grant a postulate under any condition we please. The conditions under which a postulate may be granted or assumed are virtually infinite, and cannot be enumerated; but certain main classes may be indicated.

1. The condition under which a postulate is granted may be general or specific, and may have any degree of specificity. We may take it that A is generally B, or that A is under some circumstances B, or we may state the circumstances with any degree of minuteness of particularity. Pneumonia is generally dangerous: Pneumonia is in some cases dangerous: Pneumonia when it is septic is dangerous.

2. The condition may be single or multiple. If I am not detained, I will come: if I am not detained, and it is fine, and I am well enough to travel, and nothing intervenes, I will come.

3. The condition may attach to the Subject, or to the Object, or to both, or to neither. A man, if he is young, is prone to fall in love with a woman: A man is prone to fall in love with a woman if she is attractive: Men, when they are young, are prone to fall in love with women, if they are attractive: Birds, if it is spring time, build nests.

4. The conditions under which a postulate is granted may be positive or negative. Ships, if well classed, are insurable: Ships, if not well classed, are dangerous risks.

5. The condition may qualify either an affirmative or a negative postulate. Milk, if it is pure, is wholesome: Milk, if it is contaminated, is not wholesome.

6. The condition may be sole or alternative. Much space is given in text books of Logic to the alternative condition; but I do not find any mention of the sole condition, though it is by no

means unknown or unimportant in argument. Like the alternative condition, it cannot be fully stated in a single proposition, but it is less complicated in form than the alternative condition, to which it is allied, and to which it is an appropriate introduction.

The sole condition is in fact, paradoxically, a double condition. It states that under a certain condition, and under no other condition, is the postulate granted. The only way to make him pay is to get judgement against him, includes two conditions—If you do not get judgement against him, he will not pay: if you do, he will. The only way to be successful is to work hard—If you do not work hard you will not be successful: if you do, you will.

This example of a condition that is apparently single, though really double, is a useful introduction to the alternative condition, or, as it is called, the Disjunctive proposition, which purports to be a single postulate, but in fact contains necessarily three, and may ambiguously contain six propositions: that is to say, two undistinguishable alternatives, of three propositions each.

The alternative condition is expressed by what is called the Disjunctive proposition, and is characterised by the words 'Either —or.' The proposition so constituted is, however, an abbreviated and approximate construction, and does not express the full sense in the mind of the utterer. For this reason, the Disjunctive proposition, 'A is either B or C,' has been the subject of secular controversy, as to whether it implies 'and may be both,' or should be accepted to mean 'and cannot be both.' On one side are the great names of Whately, Mansel, Mill, Jevons, Venn, and Keynes; and on the other are the equally great names of Kant, Hamilton, Thomson, Bode, Ueberweg, Bain, Bradley, and Fowler. I feel it presumptuous of me to interfere in a battle of such giants; but it appears to me that one set of antagonists has been looking at one side of the shield, and the other at the other: so that both are right and both are wrong.

The Disjunctive proposition is of very peculiar character, and really embodies half-a-dozen propositions in what is ostensibly one, though really two, propositions, each of which is compounded of three others. 'A is either B or C' may mean

$$\text{A is either B or C} \begin{cases} \text{and if it is B, is not C} \\ \text{and if it is C, is not B.} \end{cases}$$

In this case, A cannot be both B and C. But the meaning may be

$$\text{A is either B or C} \begin{cases} \text{and if it is not B, is C} \\ \text{and if it is not C, is B.} \end{cases}$$

In this case, A may be both B and C.

It is clear that the two sets of propositions are inconsistent with each other. It is clear that 'A is either B or C' cannot have both meanings simultaneously. But it seems to me equally clear that it may have either of the two meanings that we choose to ascribe to it. In this case, as in the case of 'some,' logicians have attempted to fix arbitrarily a single meaning to an expression which is in its nature ambiguous. The meaning is not to be fixed by any declaration of logicians that it is this or that. Logicians have no power to enforce their decrees; and still less are their decrees enforceable when they are, as in this case, contradictory. The only way to fix the meaning of the phrase in use is to indicate, when it is used, which meaning is to be attached to it; and this can easily be done by affixing the necessary qualification 'A is either B or C (and may be both)': 'A is either B or C (and cannot be both).'

Although authority, however high, could not, even if it were unanimous, fix which of the meanings is to be read into the Disjunctive proposition, the subject-matter may determine the meaning for us. It depends upon whether the B and C of the proposition are compatible or incompatible. If they are incompatible, A cannot be both B and C. If they are compatible, A may be both B and C. If it is said that a man is either honest or dishonest, we know he cannot be both, for honesty and dishonesty are incompatible: if it is said that he is either knave or fool, we know he may be both, for knavery and folly are compatible. Such extensions or fixations of the meaning of Disjunctive propositions may or may not be legitimate in logic, according as we are or are not entitled to take into consideration the connotation and denotation of the words we use. If we are not entitled to infer, from 'He saw her do it,' to 'He was there when she did it,' then we are not entitled to infer from 'He is either honest or dishonest' that 'He cannot be both.' If we are permitted to make the assumption in the second case, because of our knowledge of the subject-matter of the postulate, equally we are permitted to make it in the first

case. If the Formal nature of Deduction is insisted upon, and applied with rigour, then we are not entitled to infer that he cannot be both honest and dishonest, until we have assumed the further postulate that honesty and dishonesty are incompatible. Unless the compatibility or incompatibility of the alternatives is postulated or known, the Disjunctive proposition remains ambiguous, and we are left in the dark, with all our authorities, from Kant and Whately to Keynes and Fowler.

There is a cognate problem that may be examined before we leave this part of the subject. 'A, if it is not B, is not C'; Aye, but may it not be both? Of course it may, but it would be *ultra vires* to speculate whether it is or not. The postulate gives us nothing of what happens if A is B; and to guess what might happen if the postulate were other than it is, is *ultra vires* and extra-logical. So, too, is it extra-logical to speculate what would not be the case if the postulate were other than it is.

7. Logicians give a good deal of attention to conditionality, but I do not find any reference by them to the restriction or denial, in the postulate, of conditionality. Such restriction or denial is, however, not infrequent in practice. Since, for the purpose of argument, we may postulate what we please, we may postulate that our postulate is without any specific condition, or without any condition at all. 'Whether I am ill or well, I will go' excludes conditionality on the state of my health. 'Whatever happens, I will go' excludes conditionality on events. 'In any case, I will go' excludes all conditionality.

It is evident that we are here brought into contact with the 'apodeictic' proposition. 'It is unconditionally true' has much the same meaning as 'It is certainly true'—'It must be true.'

A good many distinctions have been made by logicians among Disjunctive propositions. They have been divided into the Conditional, the Hypothetical, the Inferential Disjunctive, the Contingent Disjunctive, the Divisional Disjunctive, and so on. Those who are interested in them will find these matters discussed in the larger text books, where they will find also that different logicians allocate these names differently among the different kinds of Disjunctives. The divisions are not important enough to discuss here.

The Consequent, as well as the Condition, of a Conditional proposition may vary without limit. It may be general or

specific, sole or multiple, positive or negative, and of any quantity in its terms. In fact, any form of postulate whatever may be granted under any condition whatever. It is clear that the more numerous and the more comprehensive the conditions, the more limited is the postulate; and *vice versâ*. 'It will do if it is strong enough' restricts the postulate less than 'It will do if it is strong enough, and light, and elegant, and cheap.' 'I will come if it is fine' gives us a less restricted postulate than 'I will come if it is fine, and if I get my work done in time, and if I am not prevented.'

The Implications of Conditional Propositions.

A Conditional proposition contains two or more complete propositions; and each of these contains all the implications that we have already found to reside in Simple propositions, and that are explicable by the Canons of Explication. Any of these implications may be substituted, in either or both the constituent propositions of the Conditional, without altering the meaning of the whole. 'If trees are skilfully pruned, their crop is increased' is not altered in meaning by substituting the reciprocal, in either or both constituents. It is still true in the form 'If skilful pruning is applied to trees, increase is produced in their crop,' nor is the Conditional 'If men are honest, they pay their debts' altered in meaning by substituting the double negatives 'If men are not dishonest, they do not fail to pay their debts.' 'If logicians are right, I am wrong' is not altered in sense by substituting the equivalent terms 'If the writers of text books on Logic are correct, the author of this book is mistaken.' Such implications follow, of course, from what has already been said of the implications of Simple propositions, and from the Canons of Explication. But in addition to these, the Conditional proposition has, by virtue of its constitution, an additional implication, not to be found in Simple propositions.

In books on Logic, it is laid down that, in order to deduce a conclusion from a Conditional proposition, the Antecedent must be affirmed, or the Consequent denied: and that no conclusion can be reached, either by denying the Antecedent or by affirming the Consequent. These rules are laid down; but, as far as I have been able to ascertain, no reason is given for either of them, except that it is understood that the nature of the Conditional

proposition renders them applicable. It is not, I think, pretended that they rest upon the Laws of Thought, which are advanced as the Canons of all Inference; and the only approximation to a reason that is given for them is that it is recognised, somehow, that a conclusion is not justifiable when the antecedent is denied, or the consequent affirmed simply; while, in the opposite case, a conclusion is legitimate. Good and sufficient reasons may, however, be found in the Canons of Inference here inculcated.

The Antecedent, or, as I think it ought to be called, the Condition, may not be denied, because it is part of the postulate; and the third Canon of Inference forbids us to withdraw the postulate in the course of the argument. The Consequent may not be affirmed unconditionally, because the postulate grants it under a condition; and to assume it without this condition is a violation of the fourth Canon, which forbids us to assume anything that is not in the postulate. So far, the negative rule is amply justified by the Canons of Inference, and cannot be obtained from the Laws of Thought—at any rate, I know of no attempt to obtain it from them.

It is said, further, in the text books, that we are at liberty to affirm the Antecedent and to deny the Consequent. These, however, are beyond our powers. They are altogether *ultra vires* of Inference, for they go beyond the postulate, and violate the fourth Canon. What the postulate grants is that If A is B, it is C. There is nothing in this postulate to warrant the denial of the Consequent. The postulate does not deny that A is C. On the contrary, it affirms that under a certain condition A is C. Yet it is sufficiently clear that if A is not C it is not B. By what process of explication, in conformity with what Canon of Inference, is this conclusion reached? It is reached, validly and justifiably, under the fifth Canon, which states that when a postulate is granted, all its implications are granted. The inference that, if A is not C it is not B, is an implication of the postulate, and is allowed by the third Canon of Explication, which says that everything inconsistent with the postulate may be denied. We have found one meaning of this to be that a postulate implies all its double negatives. Hence 'If A is B it is C' implies that if A is not C it is not B. But it is most particularly and especially to be noted that this implication does not deny the Consequent. There is not, in the postulate, any warrant for the denial of the

Consequent. The Consequent is part of an affirmative postulate, and to deny it would be a violation of the fourth Canon of Inference, which forbids us to go beyond the postulate. What is stated in the implication 'If A is not C it is not B,' and all that we are warranted by the Canons of Inference in inferring, is not that A is not C, but that *If* A is not C, the condition does not hold good, and A is not B. The postulate being a conditional postulate, every implication it contains must also be conditional. To deny that A is C, on the ground that if it is B it is C, is manifestly and grossly fallacious. To make such a denial, we must drag in a new postulate in the course of the argument, and so violate the fourth Canon of Inference. If, in the course of the argument, we may assume the postulate that A is not C, by the same authority we may assume that A is not B, and so reduce the postulate to nullity, and the argument to absurdity.

The text books give us licence to affirm the Antecedent, and the stock argument from the Conditional proposition is thus given :—

If A is B, it is C.
But A is B.
∴ A is C.

Why, of course it is, but the conclusion is extra-logical; or at least, it is outside the logic of Inference from a single postulate, with which we are now concerned. The postulate gives that if A is B, certain consequences follow. But, you say, A really is B, and therefore the consequences really do follow. No doubt they do, but in order to get them you must assume another postulate, beyond and in addition to your original postulate, which is all that you have to go upon in the Conditional proposition. I give you that if A is B, it is C; and you tell me that A really is B, and therefore really is C. I thank you for nothing. Your assertion is impertinent. It gives me no assistance in explicating the implications of the postulate. When I have the postulate, If A is B, it is C, the assurance that A really is B carries me no forwarder in extracting the implications of what I have. It introduces a new element. It destroys that very conditional character of the proposition on which all my inferences from it must depend. For the purpose of deducing the implications of the postulate, it is mere surplusage, and is irrelevant. For the

purpose of argument, I may postulate what I please; and my postulate is then assumed to be true for the purpose of the argument. To tell me that it is true in fact, implies that my argument has some purpose other than its legitimate purpose—implies that it is concerned with fact, and is a material argument. To grant that the postulate is true for any purpose other than the purpose of the argument, grants that for which the Logic of Inference does not thank you, for which it has no use, and with which it is incompetent to deal. Give to the Logic of Inference a postulate, and that Logic will show you all the implications of the postulate; but whether or no the postulate is true in fact, is not, to the Logic of Inference, a matter of the least concern. To assume that the postulate is true in fact, and to suppose that any inference, properly so called, can be drawn from this assumption, is to commit the fallacy that will presently be explained, the Fallacy of Confusion of the Modes of Argument.

BOOK IV

ANALOGY, &c.

CHAPTER XXII

ANALOGY

ANALOGY was defined by Aristotle as *ἰσότης λόγων*—comparison of Ratios: Euclid uses Analogy and Proportion as convertible terms; and to this sense I propose to restore the term Analogy, which has been sadly perverted and extended in meaning by logicians. Mill says 'There is no word, however, which is used more loosely, or in a greater variety of senses, than Analogy,' but instead of restoring it to its original and proper use, he unfortunately lent the great weight of his authority to the employment of Analogy to denominate Induction, especially those modes of unassured Induction that have been described in the chapter on that subject in this book. I regard this misapplication of a useful term, which already had a definite and restricted meaning, sanctioned by the usage of two thousand years, as regrettable. Analogy is a reasoning process quite distinct from both Induction and Deduction; and has a range of application, and a domain of usefulness, peculiar to itself. At the present time, Analogy is used, in the writings of logicians, sometimes, though rarely, in its original and proper meaning; sometimes to mean Inference; sometimes to mean Induction, especially Imperfect Induction of low validity; and sometimes in a slipshod way, to mean any kind of resemblance between any two things.

The use sanctioned by Mill has already been quoted. 'Two things resemble each other in one or more respects; a certain proposition is true of the one, therefore it is true of the other.' It is clear that this is not that comparison of ratios to which Aristotle and Euclid applied the term, and to which it has been applied ever since their time. Understood in the sense sanctioned by Mill, Analogy is the comparison, not of two ratios, but of two terms; or rather, of two whole propositions, element by element, beginning with one pair of homologous terms. In Analogy proper, there is no assimilation or comparison of the terms of the sub-relations. It does not matter to Analogy how dissimilar or incomparable these terms are. The comparison is of ratios, and

of ratios alone. 'A is like B' is not an Analogy, for what are compared are terms. 'The ratio of A to B is like the ratio of C to D' is an Analogy, and is the only form of true Analogy. 'Smith is like Brown' is not an Analogy, for what are compared are terms. 'The devotion of Smith to his business is like the devotion of Brown to his wife' is an Analogy; for this comparison is not of terms, but of relations between terms. The terms are not compared. There is no comparison of Smith with Brown, or of Smith's business with Brown's wife. The comparison is between the relation of Smith to his business, and the relation of Brown to his wife. Smith's business and Brown's wife are neither compared nor comparable; and whether Smith and Brown are alike or not, has nothing to do with the analogy. All that are compared are the ratios.

An Analogy is stated in a proposition; and a proposition consists of two terms united in a relation by a Ratio. The peculiarity of the Analogical proposition is that its terms are themselves relations. The abstract or generalised form representing all relations has hitherto been expressed in the form 'A is B'; but it may be expressed more correctly in the more generalised form A : B. In the Analogical proposition, each of the terms of this relation is itself a relation. The Subject-term, A, is a relation: let us call it $a : b$; and the Object-term, B, also is a relation: let us call it $c : d$. Then the whole analogical proposition becomes $(a : b) : (c : d)$; or $a : b :: c : d$. But this is the expression of a proportion. We see, therefore, what Euclid means when he says that Analogy is the same as Proportion.

Analogy is as indifferent to the nature of the terms of its sub-relations as Inference is indifferent to the truth of its postulates. (The statement is itself a good example of Analogy.) The nature of Analogy is not altered, and its truth is not altered, by altering the nature of its terms, so long as the proportion between them is maintained. Analogy is still Analogy, whether its terms are concrete or abstract, whether they, or either of them, are persons, or things, or qualities, or numbers, or what not.

'The relation of a parson to his parishioners is like the relation of a shepherd to his flock' is an Analogy. 'The relation between resistance and extension is like the relation between colour and surface' is an Analogy. 'The relation between the angles at the base of an isosceles triangle is like the relation between the sides'

is an Analogy. 'The relation between two and four is like the relation between six and twelve' is an Analogy. Every comparison of relations is an Analogy, and every Analogy is a comparison of relations.

We have seen that Analogy and Proportion are the same thing. A proportion may be expressed $a : b :: c : d$, or it may be expressed $\frac{a}{b} = \frac{c}{d}$; and thus we discover that the equation of fractions is Analogy, and the statement of such an equation is the assertion of an analogy.

We have already seen that our warrant for arguing from

$$(a + b)^2 = (a + b)(a + b)$$
$$\text{to } (a + b)^2 = a^2 + 2ab + b^2$$

is given by the third Minor Canon of Explication, which allows us to replace any term in a proposition by its equivalent. But this Canon will afford us no warrant for arguing that if $a = b$, then $a^3 = b^3$; nor can any warrant for this conclusion be extracted from the Laws of Thought or the *Dictum de omni et nullo*. But if we realise the nature of an Analogy, we see at once that the conclusion is justified, and why it is justified. Analogy is a comparison of ratios, and is indifferent to the nature of its terms. In quantitative reasonings, therefore, it is indifferent to the quantities of the terms, and regards nothing but the ratios between them. In this case, the ratio of equality between a and b is compared with the ratio between a^3 and b^3; and though the terms have been altered, it is at once recognised that the ratio between them has not been altered. Hence, whatever ratio existed between a and b will exist between a^3 and b^3. The ratio between a and b is one of equality; therefore the ratio between a^3 and b^3 is one of equality. In this case, again, the New Logic here propounded offers an explanation of mathematical reasoning, which Traditional Logic does not attempt, and seems to regard as outside of its province. The divorce of Mathematical reasoning from Logic appears to me illogical. If Logic purports to discover, describe, and explain modes of reasoning, it must include modes of reasoning about quantity, or confess its inadequacy. Logic assumes that quantitative reasonings are so different in nature from qualitative reasonings, that the science and art which comprise the latter need take no account of the former. In this, Logic appears to me to be

profoundly mistaken. Logic does not include mathematics, in the sense that Logic need teach the operations of addition and subtraction, and of the solution of equations; but Logic does include mathematical reasoning, in the sense that Logic is bound to show by what modes of reasoning mathematics conducts its operations and reaches its conclusions. Mathematical reasonings are reasonings, and the science and art of reasoning should include every kind and variety of reasoning. The subject will be resumed later on in this chapter.

It has already been explained that a proposition expresses the formation or establishment of a relation. The formed or established relation is differently expressed. The established relation becomes a term, which may enter, as a term, into a new relation, and be expressed in a new proposition. 'Chalk is white' expresses the establishment of a relation between chalk and whiteness. The established relation is expressed by 'the whiteness of chalk.' 'Brutus killed Cæsar' expresses the formation of a relation: the relation thus formed is expressed by 'The killing of Cæsar by Brutus.' 'Some men are vegetarians' expresses the formation of the relation 'the vegetarianism of some men.'

Analogy is the comparison of relations. It is the comparison, not of the formation of relations, but of fully formed relations. It is the comparison of relations, not in the making, but after they are made. It expresses the formation of a relation between the results of previous processes of the same kind. But whereas Induction and Deduction attain the establishment of relations of all orders and of every kind, Analogy is capable of forming but two relations—likeness, and its opposite, unlikeness; of which equality and inequality, identity and non-identity, are derivatives.

The formation of relations of likeness and unlikeness is at the base of all reasoning. In Induction, the first step, upon which the whole process depends, is the discovery of a Datum; that is to say, the discernment of likeness between an element in the Problem, and an homologous element in some proposition derived from previous experience. The next step is the establishment of identity; that is, of complete likeness, between the second element of the Problem and its homologous element in the premiss. The third step is the assimilation of the third element in the premiss to the quæsitum. In Inference, if one proposition, or ratio, or term, is equivalent to, or included in, or implied in another; the equivalence,

or inclusion, or implication, rests upon likeness. If one term is excluded from, or inconsistent with, another, the exclusion or inconsistence rests upon unlikeness. In both Induction and Deduction the gist of the process lies in the substitution of one term or ratio for another. In both cases, the proposition which is the subject of the reasoning process is altered. In Induction an incomplete proposition is completed: in Deduction, the Ratio or a term is replaced by a new Ratio or term. Analogy differs from both of these modes of reasoning in that its proposition undergoes no alteration. In Induction and in Deduction, the proposition, having been stated, is then modified *secundum artem*, and appears in the conclusion in a new form. In Analogy, the proposition is stated merely. When it is stated, the reasoning process is complete. The reasoning process is the discernment of likeness, or the discrimination of difference, between two Ratios, and the proposition expresses the likeness or difference; and when the likeness or difference is stated, the analogy is complete; the reasoning process is at an end. This dissimilarity between the process of Analogy and the processes of Induction and Deduction may be the reason why Analogy, as understood in the Aristotelian and Euclidian sense, is excluded from all books on Logic. Presumably, it is not regarded as a reasoning process at all. The term 'Analogy' is, indeed, used freely enough by logicians; but by analogy they do not mean analogy as defined by Euclid and Aristotle, and as it is understood by me.

'The relation of a parson to his parishioners is like the relation of a shepherd to his flock.' 'The relation of the Government to the country is like the relation of the brain to the rest of the body.' 'The relation of the trunk of a tree to its limbs is unlike the relation of the trunk of a man to his limbs.' These are analogies. They are propositions expressing likeness and unlikeness of relations; they express the result of a reasoning process—an elementary process of reasoning, but still a process of reasoning; and one that in many cases requires and evinces a very high degree of intelligence. When Oken discovered that the relations of the parts of the skull to one another resemble the relations of the parts of the vertebra to one another, he discerned an analogy in the Aristotelian sense. When Goethe discovered that the relations of the parts of the flower to their stem resemble the relations of the leaves to the branch, he discovered a true analogy. But it

would require some hardihood to maintain that these discoveries were not instances of reasoning. If they were not attained by a process of reasoning, how were they attained? If, indeed, Induction and Deduction are the sole processes of reasoning, then the insight of Oken and Goethe must receive some other name; but then it will be a matter of words, and of names; and I will be no judge of such matters. But unless we choose to limit the meaning of reasoning arbitrarily, according to the preconceptions and prejudices of logicians, I know not how such exercises of high intelligence as these are to be excluded from reasoning. If there are any who say that these are instances, not of reasoning, but of imagination; then I shall be glad to have a definition of imagination that shall exclude reasoning.

When it is said that the relation of a parson to his parishioners is like the relation of a shepherd to his flock, the analogy is full-blown, and completely expressed; as it is also in the following examples:—

> The horsemen dashed among the rout,
> As deer break through the broom.
>
> It is not growing like a tree,
> In bulk doth make man better be.
>
> From rainbow clouds there flow not
> Drops so bright to see,
> As from thy presence showers a rain of melody.

But more often a part, sometimes a very large part, of the analogy is left to be understood, just as, in what is erroneously called an enthymeme, one or both premisses of an Inference are omitted, and left to be understood—just as the Object-term of an intransitive verb is left to be understood.

> The Assyrian came down like a wolf on the fold.

In this analogy, the Object-term of one relation, and the Ratio of the other, are left to be understood. The full analogy is 'The Assyrian came down (on Israel) like a wolf (comes down) on the fold.' 'He is as slow as a slug' (is slow) leaves both Ratio and Object of one relation unexpressed. 'Ghost-like, I paced round the haunts of my childhood' compresses the whole of one of the

constituent relations, together with the mark of assimilation characteristic of Analogy, into a single word.

On the other hand, the relations compared may be so numerous, and so complex, that a page, many pages, a whole book, may be occupied in their expression; and thus an analogy is expanded into a parable or allegory, as in the Pilgrim's Progress, the Holy War, the Tale of a Tub, the Hind and the Panther, &c. An analogy that is completely expressed is sometimes called a Simile, while an analogy from which several elements are dropped out is called a Metaphor. The same analogy may of course be expressed with any degree of fulness. 'The Government stands to the nation in the relation of the brain to the body' is a fully expressed analogy. 'The Government is the brain of the nation' is a metaphor; and 'The brain of the nation' as a synonym for 'the Government' is a metaphorical expression which is not even a full metaphor.

As already stated, pure Analogy compares relations only, and makes no comparison of the terms of the sub-relations. If I say he is as slow as a slug, I compare nothing but his motion to the motion of the slug; and even the motions I compare only as to their rapidity. I take no account of their direction, continuity, or other qualities. In drawing the analogy, I make no comparison between him and a slug. I do not liken him to a slug in shape, in absence of limbs, in sliminess, or in the possession of horns. I compare nothing but a pair of simple relations. But in literature, Analogy is seldom as pure as this. There is nearly always, in literary Analogy, a covert suggestion of likeness, not only of the relations, but of the homologous terms of the relations also.

When Byron says 'The Assyrian came down like a wolf on the fold,' he does formally compare nothing but the two relations of action; but under cover of this assimilation of Ratios, he contrives to sneak in an assimilation of the Assyrians to wolves, and so invests them with some of the ravenousness and remorselessness of the wolf. 'Protestantism will end by destroying the nation, as gangrene destroys the members of the human body.' Here the intention is not only to compare the destructive action of Protestantism to the destructive action of gangrene, but, under cover of this comparison, to invest Protestantism with some of the horror and loathesomeness with which gangrene is regarded. In describing the stillness of a child, holding its breath in some

hiding game, we should rather say it is 'as still as a mouse' than 'as still as death.' It is the stillness alone that is formally compared, and for the purpose of emphasis, 'as still as death' is the stronger and more appropriate expression; but we find it difficult to avoid a comparison of the terms also; and though, strictly speaking, it has nothing to do with the analogy, we feel it more appropriate, as some comparison of the terms will be made, whether we like it or no, to let the harmless child be compared to the harmless mouse. If we wanted to find a comparison for the stillness of a snake about to strike, or a tiger about to spring, we should rather select 'as still as death,' because of this well-nigh unavoidable comparison of the terms, as well as of the ratios.

It is in the comparison of qualitative relations only that this habit of comparing the terms also exists, and in this region the habit is inveterate. If I say 'You are as slow as a slug,' 'You serve him as faithfully as a dog,' 'You are as illogical as a logician,' my interlocutor would be apt to turn upon me with indignation, and demand 'Do you say I am a slug?' 'Is thy servant a dog, that he should do this great thing?' 'Do you take me for a logician?' Patience, my friend; those were not my assertions. I compared, not you to a snail, but your motion to that of a snail; not you to a dog, but your faithfulness to that of a dog; not you to a logician, but your illogicality to that of a logician. I compared, in short, not the terms but the relations. My explanation is not likely to give satisfaction, however. My interlocutor will still have his grievance; for the habit of importing into the comparison of relations, a comparison of their constituent terms also, is, with qualitative ratios, inveterate.

This importation or inclusion of the terms into the comparison does not, however, merge Analogy into either Induction or Deduction, or approximate it to them. It remains a distinct process even when it is not pure. When it is said that the Assyrian came down like a wolf on the fold, there is a certain assimilation of the Assyrian to the wolf. He is invested with some of the ravening and ruthlessness of the wolf; but these qualities are attributed to the Assyrian by no process of reasoning. Their possession by the Assyrian is not necessarily implied in the analogy; neither is it given as the solution of a problem. It is merely hinted at. It is suggested. It is sneaked in. It partakes

of the nature of an assertion, though it does not attain to the positiveness of an actual assertion. As far as it goes, however, it is merely assertory, and not argumentative. The reasoning process is at an end when the relations have been compared; and any comparison of the terms is surplusage.

Applied to qualitative relations, Analogy belongs more to Rhetoric than to Logic. It gives to a statement emphasis, impressiveness, picturesqueness, and often intelligibility, that it would not otherwise have, and that can be given in no other way. Hence it is especially frequent and valuable in poetry, for it adds to mere assertion a powerful reinforcement. 'Her feet appeared and disappeared beneath her petticoat' is a dry statement of fact. 'Her feet beneath her petticoat, like little mice stole in and out' raises the dry statement of fact into poetry. 'He argued forcibly' is a statement of fact that we may accept without being impressed by it. 'He argued with sledge-hammer force' is immensely more impressive. 'The bullets fell thickly' is far less impressive than 'The bullets fell like hail.'

But comparison of qualitative relations is of more use than merely to add picturesqueness and emphasis to a statement. It has a very high value in explanation. By assimilating them to what is familiar, it enables us to appreciate and comprehend relations that are unfamiliar, and that we should find it difficult to appreciate without Analogy. Used in this way, Analogy has received yet another name—that of Illustration. Few novices in electrics are able to grasp the meaning of the passage of electricity along a wire, of its storage in accumulators, of the difference between amperage and voltage, without help from the illustration of the flow of water in pipes, its accumulation in cisterns, and the difference between volume and pressure. The apprehension of the origin of all animals from a single form, by variation in innumerable directions, determined by the competition for food, &c., is greatly assisted by the analogy of the branches of a tree, ramifying in innumerable directions, that are determined by the competition for light.

The vast majority of words have been put to their present uses by the agency of analogy or metaphor in a nearer or remoter ense.

But the great value of Analogy in reasoning is in its application to quantitative ratios; and when applied to quantitative ratios, it

is always pure. It never includes any of that assimilation of the terms of the compared ratios that we have seen to be the rule in qualitative analogy. When we compare the ratio of two to six with the ratio of seven to twenty-one, and declare the ratios to be alike or equal, we never take it that this declaration carries any similarity or equality of two to seven or of six to twenty-one. We compare the ratios only, and there the comparison ends. So far from assimilating the terms, the whole validity of mathematical analogy lies in keeping the comparison of ratios pure, and eschewing altogether any comparison of terms. If $a = b$, then I may conclude by Analogy that a^3 has the same ratio of equality to b^3; but it would vitiate the argument altogether to predicate the same ratio between the terms, and to say that $a = a^3$ or $b = b^3$. The whole validity of the argument lies in assimilating the ratios and ignoring the terms. Similarly, if $a > b$, then I intuitively perceive by Analogy that this ratio remains unaltered by any equivalent alteration of the terms; so that $3a$ is still greater than $3b$. The several steps in the solution of every equation or Euclidian theorem are analogies. They are recognitions of the equality of ratios, in spite of the alteration of the terms between which the ratios subsist.

Much ingenuity has been expended by logicians in explaining how it is that we instantly apply to every triangle, parallelogram, or circle, the conclusions proved by Euclid about any similar triangle, parallelogram, or circle. The explanations given are various; but the favourite is that the transfer depends on the essential qualities of these figures, or on the fact that the conclusions that we thus transfer depend on essential qualities and not on accidental qualities. The explanation seems to me to explain nothing. When we ask what these essential qualities are, and how they are to be distinguished from non-essential qualities, logicians are non-plussed. It is the story of the Uniformity of Nature over again. It is a verbal explanation that does not explain.

It is not as if the explanation were difficult. It is simple enough. Once the nature of Analogy is appreciated, the explanation jumps at you, and hits you in the face. What Euclid demonstrates, when he shows that the angles at the base of an isosceles triangle are equal, is a similarity of ratios. It is an analogy. The ratio of the angles to one another is shown to be the same as the ratio of the sides to one another; and the reason

we immediately and intuitively accept this as true of every isosceles triangle, as well as of the one on which it has been demonstrated, is that in quantitative analogies we take no account of the terms, but look to the ratios alone. The reason that we accept the equality of the angles as true, whatever the length of the sides, or whatever the size of the contained angle, is that the length of the sides and the size of the angle do not enter into the ratios that are compared. They have nothing to do with the case. No alteration in the length of the sides of an isosceles triangle alters the ratio between them, so long as the triangle remains isosceles. No alteration in the size of the contained angle alters the ratio of the angles at the base to one another. Alteration of the length of the sides, so long as it does not alter their ratio, or alteration of the size of the contained angle, have no more to do with the compared ratios than the birds and the blossoms of spring. The sides and the angles are the terms of the ratios; and it is the ratios, and not the terms, that are compared.

'Things that are equal to the same thing are equal to one another.' This is an analogy. To say that two things are each equal to a third, is to state two relations of equality. To say that the two things are equal to one another, is to discern a ratio between them similar to that already discerned between each of them and the third. The whole process is an assimilation of ratios—an Analogy. It is true that this axiom has already been regarded as an Inference, and has been shown to be provable by the Canons of Inference, and it may be alleged that this lays me open to the charge of inconsistency that I have made against my predecessors. But there is no inconsistency. The axiom may also be regarded as an Induction, without laying me open to this charge. That the axiom is in fact a comparison of ratios, and that the ratios are intuitively perceived to be alike, is indisputable; and therefore it is indisputable that its validity rests on Analogy. But this does not prevent us from postulating, if we choose to do so, that two things are each of them equal to a third. For the purpose of argument, we may postulate what we please; and when this postulate is granted, we may deduce from it, *secundum artem*, the inference that, in that case, the things are equal to one another. And if any real A is equal to any real B, which, in its turn, is equal to a real C, the problem 'Is or is not this A equal to this C?' may be solved by the method of Induction.

Analogy has been defined as the comparison of Ratios, and the discernment of their likeness or unlikeness ; and this definition is true and is adequate with respect to qualitative analogies. But the comparison of quantitative Ratios permits of more extended reasoning than this. When quantitative ratios are unlike, we may often go further than the mere discrimination of unlikeness, and discern in what respect or degree they are unlike. We may see not only that $a : b$ or $\frac{a}{b}$ is unlike $c : d$ or $\frac{c}{d}$, but we may discern that the one Ratio is greater or less than the other, and this is a mode of reasoning frequently employed in mathematics, and extremely useful. I am offered odds of 5 to 4 by one, and odds of 11 to 8 by another. Which ought I to choose ? This I cannot determine except by Analogy. Comparison of the Ratios shows not only that they are unequal, but that the Ratio of 11 to 8 is greater than that of 5 to 4, and those are the odds, therefore, that I ought to accept if I bet at all. Which motor car has the best chance of surmounting the hill, that of 12 horse-power which weighs 15 cwt., or this of 20 h. p. which weighs 28 cwt. ? I cannot tell except by Analogy, which shows me that the ratio of 20 to 28 is less than the ratio of 12 to 15, and enables me to fix my choice on the car of lower power.

The greater part of geometrical and algebraical reasoning, and a large part of purely arithmetical reasoning, proceed by Analogy, as is manifest when it is avowed that a large part of mathematical reasoning consists in the establishment and manipulation of Ratios. The demonstrations of Euclid are successive analogies. The rule-of-three sum is an analogy. The algebraic equation, when it deals with fractions, is an analogy. Analogical reasoning is of incalculable importance; but it is a kind of reasoning that logicians have not discovered, and to which no logician makes any allusion whatever. They do indeed speak of ' reasoning by analogy,' but in so speaking they are guilty of the fallacy of equivocation ; they pervert the use of words, and mean, not Analogy, but a totally different process.

CHAPTER XXIII

COMPOSITE REASONING

We have now reviewed in turn all the processes of Reasoning, and the subsidiary factors and processes that are ancillary to reasoning. We have analysed them into their elements, described their forms and varieties, formulated the Canons by which they are regulated, and investigated the conditions of their validity. It yet remains to show how they are combined together.

In their origin, all modes of Reasoning spring from one root—from the discernment of likeness and the discrimination of difference, which are two aspects of the one fundamental process of comparison. All reasoning is, in the last resort, and when analysed out, comparison, and the consequent discernment of likeness and discrimination of difference. Hence the simplest of all instances of reasoning—the instance of Axioms—may be referred to either type of reasoning indifferently. They are explicable, we find, as examples of Induction, of Deduction, or of Analogy; and there is nothing inconsistent or paradoxical in this triple explanation. It merely means that, in these simple cases, the three types of reasoning, which all spring from a single root, are as yet undifferentiated. As we rise to more and more complex instances, to more and more specific examples, the differentiation becomes more and more complete, until the three modes of reasoning are at length discrete and separate. This fundamental identity of origin must not be confused with that superficial similarity of composition which has led to the imperfect discrimination of one form of reasoning from another, and which we have found to be such a radical defect in existing systems of Logic. Logicians hold, or, without explicitly teaching, their whole system is founded on the notion, and penetrated with the notion, that the three modes of reasoning here distinguished—Induction, Deduction and Analogy—merge and blend into one another; and the boundaries of the three are by them blurred and confused. I hold, on the contrary, that while they are identical in origin, and are branches of a single trunk, yet they are, except

in their origin, distinct and separate; and that we may always identify the mode of reasoning we employ, if we take the trouble to do so. But although the three forms of reasoning are completely distinct and discriminable, it does not follow that either need be employed alone to the exclusion of the others. On the contrary, it very seldom happens in argument, or even in Mathematical computations, that we adhere exclusively to one mode for long together. Seldom do we pursue an argument through more than a very few steps without employing every process of reasoning, and alternating them repeatedly. It is this alternation of argument, and not the confusion of one mode of argument with another, that constitutes Composite reasoning as I understand it, and Method as understood in some Text books.

I want to know the nature of Light, and the mode of its promulgation. This is a Material argument. It seeks to ascertain Truth—Fact—and consequently, my first task is to find a premiss—to find in experience a case as similar as possible. Unfortunately, there is nothing in experience that is closely similar. Light is promulgated in all directions from a centre: What can I find in experience that is at all similar? I can find plenty of instances in experience of things being transferred from place to place—an arrow from a bow, a stone from the hand, a bullet from a gun, leaves and light objects by the wind, dust in a storm, and so forth; and from these not very similar data I can form the hypothesis that light is particulate, and is projected in streams of particles from the luminous body. So far Mediate Induction: now Inference comes into play. If light consists of particles thrown off from the luminous body, then, by the second Canon of Explication, we may infer that the luminous body will waste away in proportion to the amount of light it disperses. Follows Immediate Induction—the direct appeal to experience. Do luminous bodies waste away? Yes, candles, lamps, fires, all consume away in giving off light, and roughly and generally, the consumption is in proportion to the amount of light given off. Here, then, is some corroboration, by the direct appeal to experience, of the hypothesis; but this hypothesis is not the only one possible. Light is the promulgation of something in all directions from a centre. There are other cases of such promulgation that will yield data. When a stone is thrown into a pond, waves are propagated from the centre of disturbance in all

directions in one plane. When a bell is struck, waves are propagated from the centre of disturbance in all directions in all three dimensions. Moreover, there is a further similarity in a material respect. The intensity of the waves of water and of air is inversely proportional to the square of the distance from their place of origin. So, too, is the intensity of light. Here, then, are data; and data that yield premisses; and from these premisses we may draw conclusions, which, since the terms of the data are not closely assimilable, are tentative conclusions, or hypotheses only. So far Induction; now comes Inference into play. If Light consists of undulations, then, by the second Canon of Explication, there must be a medium of which it is undulations. Water, we know, is an undulatory medium; so is air. As light travels otherwise than through water, by the third Canon of Explication, the undulations of light are not aquatic. As it travels through a vacuum, and through transparent solids, by the same Canon, they are not aerial. Direct appeal to experience fails to find any medium, and therefore the hypothesis is dropped, as, on the whole, less consistent with experience than the corpuscular hypothesis. Presently, however, Analogy is called in; and by comparison of relations it is discovered that a corpuscular light must travel faster in water than in air: an undulatory light faster in air than in water. Again direct appeal is made to experience, by means of an experiment specially devised for the purpose; and experiment shows that the rate is faster in air. From this it is concluded that the promulgation of light must be undulatory, even though experience yields no medium of which it can be undulations.

The conclusion of the analogical argument may be put in the form of a 'Conditional syllogism.' If light travels faster in air than in water, it is propagated by undulation; but it does travel faster in air than in water; ∴ it is propagated by undulation. This is a perfectly sound and valid argument, that has led to a valuable discovery: why then was it condemned in the chapter on the Conditional proposition? The condemnation was launched, not against the combination of different modes of reasoning in a composite argument, but against the confusion of two modes of argument. The argument from If A is B, it is C is an argument from a postulate, and in reasoning from a postulate, we are not entitled to go beyond the postulate; but no prohibition

was uttered against combining the argument from postulation with the argument from experience, as long as we recognise that we are employing two modes of reasoning, and do not deceive ourselves into the belief that we are using one only. The fault that is charged against Traditional Logic is not that of using the argument that it calls the hypothetical syllogism, but of calling that argument an Inference, and supposing that in thus reasoning, we are using but one mode of reasoning. The reasoning is a composite argument, combining Inference with the direct appeal to experience, or Immediate Induction. It is a perfectly valid argument, and my objection to it was raised, not against its validity, but against the supposition that in using it, we are employing Inference or Deduction alone. Deduction is formal Logic, and exceeds its function if it takes account of material truth. In fact, by its very nature it is incapacitated from taking account of material truth. The ' hypothetical syllogism ' is not formal. It is a combination of the formal argument and the material argument. Since it is valid, logicians have concluded that no objection can be taken against it as an Inference. But an Analogy may be valid, and yet not be an Inference. It is not the use of the composite argument called the hypothetical syllogism that is here condemned; it is the failure to discern that it is a composite argument.

What is the cause of specific fevers? We have already seen how, from the datum, that they are like living organisms, in coming into existence after the lapse of an interval succeeding a contact, the hypothesis was formed that they might be due to something of the nature of eggs or seeds; how this hypothesis was formed also, from another datum, to account for tuberculosis; and how the direct appeal to experience discovered micro-organisms in tuberculosis; but the crucial question remained, Are these micro-organisms indeed the cause of the tuberculosis? Do they constitute the tuberculous infection? Direct appeal was again made to experience. The organisms were injected into guinea-pigs; and the guinea-pigs suffered from tuberculosis. But is the tuberculosis due to the properties of these organisms as living organisms, or do they act merely as mechanical irritants? Recourse is had to Inference, which tells us that if they act by their vital properties as living organisms, they will so act when they are alive, but not when they are dead; while if they act as

mechanical irritants or as chemical poisons, they will act equally well whether alive or dead. Direct appeal to experience is made again. The organisms are killed by boiling, and again injected; and tuberculosis does not follow. The hypothesis that the organisms produce tuberculosis by their vital activity is verified by the direct appeal to experience. But in some respects material to the argument, specific fevers are like tuberculosis. From this datum we obtain, by Mediate Induction, the hypothesis that specific fevers are due to micro-organisms. Similar direct appeal to experience confirms this hypothesis.

The main topic of Inductive Logic, as expounded in the text books, is the direct appeal to experience. Inductive Logic lays down the conditions under which this appeal should be made, in order to test hypothesis and conjecture. This is a very important topic; but it covers but one moiety of the field of Induction. The indirect appeal to experience, which is equally important, is always regarded as a mode of syllogising, which it is not.

Is fermentation due to the presence of living yeast cells? By Deduction we can infer that if it is, then fermentation will not occur if yeast cells are excluded; if, though they are admitted, they are first killed; or if, though not killed, their vital activity is arrested; that the presence of matter other than yeast cells will not produce fermentation; and that the introduction of living and active yeast cells will always produce fermentation in fermentable matter. All these are Deductions. They are all explications of the postulate that fermentation is due to the activity of living yeast cells. They do not depend in the least on the truth of the postulate, and are equally true as deductions from the postulate, whether there are or are not such things as yeast cells; whether there is or is not such a thing as fermentation. All of them, however, can be put to the test by direct appeal to experience. Yeast cells, supposing that they exist, can be excluded from fermentable matter by allowing no air to reach it that has not been filtered through cotton wool. Yeast cells can be killed by heat before they are added to fermentable matter. If the fermentable matter is kept at a low temperature, the vital activity of the yeast cells is inhibited. Under none of these circumstances does fermentation take place. Neither does it take place if, while yeast cells are excluded, other living organisms are introduced into fermentable

matter; and finally, the introduction of living yeast cells into fermentable matter that is kept at a proper temperature, and contains nothing to prevent the vital activity of the cells, is always followed by fermentation. Thus the direct appeal to experience converts the conjecture into a proved Induction.

The original conjecture, that fermentation may be due to the action of living yeast, was arrived at by Empirical reasoning—by Indirect or Mediate Inductions—something in this way:—Yeast is very often, perhaps always, present in fermenting liquor: and the quantity of yeast increases as the fermentation goes on. Now it is fairly constant in experience that a condition that is always present when a change takes place, and especially when the quantity of the condition bears a relation to the quantity of the change, is causally connected with that change. It is fair to conclude, therefore, as a conjecture, that it is probable that yeast is causally connected with fermentation. But if yeast is not only causally connected with fermentation, but produces fermentation by the vital activity of its cells, then Inference allows us to deduce the consequences set forth above, and the direct appeal to experience enables us to discover whether these consequences tally with fact, and thus the chain of reasoning is complete, and we are led to the discovery of truth.

CHAPTER XXIV

FALLACIES

Of all the anomalies and antinomies of Traditional Logic, of all its defects and futilities, none strikes a new-comer as so anomalous or so extraordinary as the fact that the fallacies it enumerates, specifies, and describes, are not breaches of its own rules. If the syllogism were the universal principle of reasoning that Traditional Logic claims that it is, it would clearly be impossible to perpetrate any fallacy without infringing some rule of the syllogism. Yet not one of the fallacies of the Sophistici Elenchi is a breach of any syllogistic rule. The very fact that there are fallacies that admittedly have nothing to do with the syllogism, and can be perpetrated though every syllogistic rule is punctually observed, is of itself proof that the syllogism is not the only mode of reasoning, and ought to have aroused a suspicion, at least, that there is some other mode of reasoning besides and apart from the syllogism; but this suspicion seems never to have arisen in the minds of logicians.

Modern Logic provides many modes of reasoning, but these are to be regarded, not as substitutes for the syllogism, but as variants of it; whichever they may be, however, Modern Logic does not recognise, any more than Traditional Logic, that a fallacy in reasoning, if it is indeed a fallacy, must be a breach of some Canon of Reasoning. In any complete scheme of Logic, every fallacy should be referable to the Canon that it violates, thus revealing how and why it is a fallacy, and placing it in its proper position in the scheme of fallacies. Nothing of the sort is attempted in any book on Logic known to me. There are many different classifications of fallacies, but there is no classification founded on the Canons that are fallaciously broken; and the reason is that there is no system of Rules to which fallacies can be referred. There is no recognition in any book on Logic that such reference is necessary or desirable; and to this necessity or desirability, Modern Logic is as blind as Traditional Logic or Inductive Logic.

Not only are the Classical fallacies *extra dictionem* not breaches of any of the rules of the Syllogism, or of those of Immediate Inference, but by no means, by no skill, by no artifice, can these fallacies be brought into conflict with the Laws of Thought, or with the *Dictum de omni et nullo*. Surprising and marvellous as are the meanings read into the Laws of Thought by Modern Logic, I do not find it suggested that any of them contains a prohibition of the fallacy of many questions, of arguing *post hoc, ergo propter hoc*, of the *ignoratio elenchi*, or of any other of the fallacies *extra dictionem* of Traditional Logic.

If, therefore, a scheme of Logic is propounded, in which every one of these fallacies falls naturally into place as the breach of a recognised Canon, constructed, not with a view to catching the fallacies, but with an eye solely to the exigencies of the scheme; surely that in itself substantiates a claim on logicians for the consideration of that scheme. The Canons of Inference, and the Canons of Induction, as laid down in this book, were formulated as guides to those two modes of reasoning respectively: not until they were completed for this purpose, was it discovered that every one of the classical fallacies of Traditional Logic is a breach of one or other of these Canons. This being so, I submit that the scheme is entitled to assume to itself some of the prescription that attaches to the venerable antiquity of these fallacies; and that this result may fairly be claimed as a corroboration of the accuracy and comprehensiveness of the scheme. At any rate, I submit that this result may be advanced as an indication that the New Logic here propounded is superior in amplitude and adequacy to previous systems, none of which can show a similar result.

The fallacies here enumerated and examined include all the fallacies of the Sophistici Elenchi, together with others, that have not hitherto been recognised by logicians. One or two of them are sufficiently frequent, and sufficiently important, to have been recognised by practical reasoners, though no book on Logic treats of the fallacy of jumping to a conclusion, and no one but Prof. Carveth Read mentions the fallacy of failing to recognise that circumstances alter cases.

The Aristotelian division of fallacies, into fallacies *in dictione* and fallacies *extra dictionem* is scarcely sound. Fallacies *in dictione* are mistakes, rather in the art of expression, or of interpretation

than of reasoning. They are confusions of meaning, and are sources of fallacy rather than themselves fallacies. This distinction, valid though it is, is perhaps a little too fine to be practically workable; and, for practical purposes, we may divide fallacies on the Aristotelian plan into Fallacies *in dictione* and Fallacies *extra dictionem*.

Of Fallacies *in dictione*, the Aristotelian class of Equivocations is a natural and valid class, and may stand. The fallacies of Composition and Division are particular cases of Equivocation, and are not entitled to separate treatment. Next will come a fallacy new to Logic, though familiar enough to practical reasoners—the fallacy of Bivocation. The fallacies of the Accent and of Figure of Speech are unknown in English, and there are two common fallacies *in dictione* that Aristotle does not mention. One of these, the fallacy of Emphasis, is confused by Jevons, and most other writers, with the fallacy of Accent; the other is unnoticed hitherto by any logician, though fallacies of Punctuation are, in practice, common enough, and misleading enough; especially in English. It is of sufficient importance in practice to require, in some cases, the judgement of Courts of Law to determine the proper interpretation to be placed upon the presence or absence, or the position, of a comma; yet it is a matter to which no logician has given any attention.

Fallacies *extra dictionem* are the only true fallacies, properly so called. They are the only mistakes in the reasoning process itself. Each of these fallacies is a breach of some one or more of the Canons of Reasoning; and they fall naturally into classes, according to the kind of reasoning in which they occur, and according to the Canon of that mode of reasoning that they violate. Thus we get the three classes, of Fallacies of Empirical Reasoning, or Induction; Fallacies of Inference, or Deduction; and Fallacies of Analogy. These include all the fallacies *extra dictionem* of Aristotle, and several others, that neither he, nor any other logician, has recognised; though some of them are sufficiently patent, and sufficiently frequent, not only to have been recognised, but actually to have been named by practical reasoners. In addition, there is a fourth class of fallacies, that has hitherto lain undiscovered and unappreciated. The perpetration of fallacies of this class is the besetting sin of logicians themselves, and is one of the chief defects of Traditional Logic.

They are Fallacies of Confusion of the Mode of Argument, and will need careful attention.

The classification of fallacies here adopted is, therefore, as follows:—

I. Fallacies *in Dictione.*
   - Fallacies of Equivocation.
   - Fallacies of Bivocation.
   - Fallacies of Amphiboly.
   - Fallacies of Punctuation.
   - Fallacies of Emphasis.

II. Fallacies *extra Dictionem.*
   - Fallacies of Confusion of the Mode of Argument.
   - Fallacies of Empirical Reasoning, or Induction.
   - Fallacies of Inferential Reasoning, or Deduction.
   - Fallacies of Analogy.

I. Fallacies *in Dictione.*

The Fallacy of Equivocation.

The fallacy of Equivocation is a pervading and ubiquitous fallacy. It varies in subtlety from a manifest pun, that would not deceive a child, to a confusion the most subtle, the most difficult to detect, to recognise, and to avoid, of all fallacies; and of all fallacies it is the most frequently perpetrated. Nothing is more frequent in reasoning, and especially in disputation, than the use of a term in two or more senses, without any appreciation on the part of either of the disputants, or of the single reasoner, that it is used in more than one; nor is there any source so fertile of difference of opinion. In fact, difference, that appears to be difference of opinion about facts, is very often, unknown to the disputants, difference about the meaning of words; and no controversy can be useful or fertile, that is not preceded by a definition of the words to be used, and an agreement about the meanings to be attached to them. It is not too much to say, that in most controversies, each party uses some important term, on which the controversy hangs, in a sense different from that understood by the other party; or uses the term, first in one sense, and then in another, without any recognition or appreciation of the equivocation. It requires an effort, and a consider-

able effort, to adhere to the same meaning in using a word of current and large signification, throughout a controversy that is at all prolonged.

It is idle to discuss the advantages and disadvantages of Socialism, until we have settled and agreed upon the meaning that is to be attached to 'Socialism.' When one disputant understands by it the organisation and management of industries by the State, and another takes it to mean the equalisation of reward for labour, and a third intends by it the abolition of private property, it is evident that the argument of each will be to the others, beside the mark, irrelevant, and mistaken. It is idle to discuss whether it is right for a clergyman to repel from the communion table (which he erroneously calls the altar) a man who has married his sister-in-law, until we have settled what meaning is to be attached to 'right.' Does it mean consistent with statute law? or with canon law? or with the custom of the Church, or of some part of the Church? or with the scruples of the clergyman? or with some code or rule of morality? While the dispute is in progress, any of these meanings may be temporarily uppermost in the minds of either of the disputants, and be shortly replaced by another, without any appreciation, even by himself, that he has shifted his ground; and it is unlikely, unless care is taken both to define the term and to keep to the definition, that both disputants will use the word in the same sense at the same time. A totally different set of meanings clings about the word when the question is asked whether women have a 'right' to the suffrage. Is the 'right' a legal right, a constitutional right, or a moral right? If a legal right, what is the law that gives it to them? If a constitutional right, what is the meaning of 'constitutional'? Does it mean consistent with established custom, or consistent with the fiction that taxation and representation go together, or with the principle that they ought to go together? Or does it mean that the granting of the suffrage to women would be beneficial to them, or to the nation? If a moral right, it means consistent with some scheme of morality, but with whose scheme? Yours, or mine, or his? Any discussion that ignores these ambiguities in the meaning of 'right,' is barren *ab initio*.

Does the syllogism contain a *petitio principii*? That depends on the meaning we attach to *petitio principii*. If we take it in

the literal sense, of begging or assuming a principium, or major premiss, then the syllogism certainly contains a *petitio principii*, for in every syllogism the premisses are assumed for the purpose of argument. If we take it as assuming that the major premiss is true, outside the purpose of the argument, then we beg, not the principium, but the truth of the principium, a very different thing, as will presently be shown. If we take it in the Aristotelian sense, to mean the assumption in the premiss of the conclusion that is to be proved, then the syllogism must contain a *petitio principii*, or the conclusion could not be deduced from it.

The Aristotelian fallacies of Composition and Division are merely instances of equivocation. They reside in the ambiguity of the word 'All.' The 'all' of the Universal proposition is out of place, and ought not to be used. What is meant by it is 'every.' What is meant by 'All men are mortal' is 'Every man is mortal.' Strictly speaking, 'all' is a collective, not a distributive quantity; but Traditional Logic, with its usual perversity, chose the wrong word, though the right one was available. If 'All men are mortal' is understood in the proper and strict sense of the word 'All,' then any individual man is not necessarily mortal. This is clearly brought out if we add the definite article. 'All the men will receive five shillings' does not mean 'Every man will receive five shillings.' In the Aristotelian scheme of fallacies, those of Composition and Division are regarded as separate forms, but it is manifest that they are merely special cases of equivocation, and are not entitled to separate treatment, any more than is the following:—

No fool can design a battleship;
He is no fool;
∴ He can design a battleship.

This argument is manifestly fallacious, and the fallacy consists in the equivocation of the term 'no fool.' In Traditional Logic it is invalid on the ground that both premisses are negative. It is true that it is invalid, and that both premisses are negative; but we have seen, in the chapter on the syllogism, that the negative quality of both premisses does not necessarily invalidate an argument. The true ground of the invalidity is equivocation. In the major premiss 'no fool' means 'no one who is a fool': in the minor, 'no fool' means 'one who is not

a fool'; and in reaching the conclusion, the latter meaning has been illegitimately substituted for the former. The equivocation is brought out more clearly if we substitute for the major, one of its implications. 'No fool can design a battleship' may, by transfer of the negative, be explicated, without change of meaning, into 'A fool cannot design a battleship.' It is now clear that from a premiss postulating who cannot design a battleship, we are not entitled to infer who can.

The Fallacy of Bivocation.

There is a fallacy cognate with the fallacy of Equivocation, and not very infrequently perpetrated, but unmentioned, as far as I know, by any writer on fallacies, even De Morgan. Equivocation is giving the same name to different things, and treating them in statement or argument as if they were the same. The fallacy of Bivocation is giving two names to the same thing, and treating it in statement or argument as if it were not one, but two. Thus I have heard instances of deliberation and choice, exercised by the lower animals, adduced as proof that these animals were capable of reasoning; and I have heard that argument met by the objection that these instances of deliberation and choice were evidence, not of reason, but of a high degree of sagacity only. In this case, the two names, sagacity and reason, were given to the same thing, which was then treated not as one thing, but as two contrasted things. Instances of the same fallacy are to be found in those books on Logic which treat of Enumerative Induction and Generalisation as different processes; which give the name of Classification to successive steps of Generalisation, and yet regard them as different things. The term Classification is, in Logic, both equivocal and bivocal. It is equivocal in that it is applied both to Division and to Generalisation, which are different; it is doubly bivocal in that it as well as Generalisation are applied to the same thing, and it as well as Division are applied to the same thing.

When Jenner discovered that, under the one name of typhus fever, two distinct diseases were included, he exposed a fallacy of equivocation. Though certain symptoms are common to both diseases, and thus led, not merely to the inclusion of both in one class, but to the confusion of the one with the other; yet certain

other symptoms are proper to each disease respectively, and thus distinguish the one from the other. But when Kraepelin gives to some cases of insanity the title of dementia præcox, and fails to show that there is any symptom proper to those cases and unshared by other cases of insanity, he perpetrates a fallacy of bivocation. He calls the same thing by two names, and forthwith treats it as two different things.

A term is, of course, not necessarily bivocal because it has a synonym. Mariner and seafaring man are not bivocal, though they both refer to the same thing. They are not bivocal, because it is recognised and understood that they refer to the same thing, and they are used in statement and argument not bivocally but as equivalents. But if it were denied that A. B. is a seafaring man on the ground that he is only a mariner, the term would be bivocal.

The Fallacy of Amphiboly.

The fallacy of Amphiboly, or ambiguity in the construction of sentences, is rarely illustrated in text books of Logic by any other than the stale examples, copied from book to book, of 'Aio te, Æacida, Romanos vincere posse,' and 'The King yet lives that Henry shall depose'; and we are consequently led to suppose that it is a fallacy so rare, that it may be practically neglected. Nothing could be much more erroneous. It is one of the most frequent sources of confusion, especially in compositions in the English language, which, being destitute of inflection, depends for the accuracy of its meaning on the proper order of its words.

A familiar example, and one that deceives no one, is 'A small labourer's cottage,' for 'a labourer's small cottage,' or 'a small cottage for a labourer.' It is not generally recognised, though it is interesting as illustrating the use of inflections, and the necessity of supplementing the absence of inflections by the ordering of the words, that the first construction may be made grammatically and syntactically accurate, though the sense is of course altered, by changing the inflection. If, instead of writing 'a small labourer's cottage,' we write 'a small labourers' cottage,' the expression is punctually correct, and is univocal. It cannot now be understood ambiguously; for the plural of the substantive, 'labourers,' excludes the possibility that the singular adjective can

apply to it, and leaves outstanding, as the only alternative, that 'a small' qualifies 'cottage.'

The fallacy is not always as transparent as it is in the case just cited. 'A lady's sound, quiet hack' is grammatically as correct as 'a lady's hack, sound and quiet,' but it does not mean the same. The first means 'a sound quiet hack, belonging to a lady,' the second means 'a sound quiet hack, suitable for a lady to ride.'

Nowhere do we find the fallacy of Amphiboly so rampant as in Acts of Parliament, despite the labours of Parliamentary draughtsmen in interpreting the intentions of legislators.

'Habitual drunkard means a person who, not being amenable to any jurisdiction in lunacy, is, notwithstanding, by reason of habitual intemperate drinking of intoxicating liquor, at times dangerous to himself or others or incapable of managing himself and his affairs.'

What is the effect, on the meaning of the rest of the definition, of the insertion of the words 'not being amenable to any jurisdiction in lunacy'? Does it or does it not mean that the drunkard must be partially insane, or must be bordering on lunacy,—not insane enough to be certified as a lunatic, but yet to some extent disordered in mind? High authorities are divided on the question.

How does 'by reason of the intemperate drinking of intoxicating liquor' affect the meaning of 'at times dangerous, &c.'? Does it mean that any person who becomes dangerous, &c., when he is drunk, and is also in the habit of intemperate drinking of intoxicating liquor, may be regarded as an habitual drunkard; or does it mean that, however dangerous, &c., a man may be when he is drunk, and however habitual may be his intemperate drinking, he is not an habitual drunkard within the meaning of the Act, if his dangerousness can be ascribed to the single state of drunkenness in which he then was, and need not of necessity have been due to his long-continued drinking? The question had to be taken to the Court of Appeal for decision.

'At times.' How much of the following clause does this affect? Does it qualify 'dangerous to himself and others' only, or does its effect extend to the subsequent clause, 'incapable of managing himself and his affairs'? Again, authorities are divided in opinion.

'Incapable of managing himself and his affairs.' Must he, in

order to be an habitual drunkard within the meaning of the Act, suffer from both incapacities, or is one enough? Again, different authorities interpret the Act in different senses.

As with this Section of this Act of Parliament, so with other Sections and other Acts. Nothing is more difficult, in many cases, than to interpret the intention of the Legislature from the wording of the Statutes; and the greater part of the difficulty arises from what Aristotle called Amphiboly—the ambiguous or indefinite construction of sentences.

The commonest fault of construction is misplacement of the relative. 'There was a swallow's nest in the shed, which was pulled to pieces by sparrows.' The writer probably did not mean what he said, that the shed was pulled to pieces by sparrows. Even careful writers, even distinguished writers, and reputed masters of style in English writing, sometimes slip into this mistake. 'Not because the bishops obtained any gifts or graces in this consecration which she herself respected' writes Froude, evidently meaning 'not because the bishops obtained, in their consecration, any gifts or graces that she herself respected.' And again 'a feeling approaching to contempt . . . has prevented them from carrying the weight in the councils of the nation which has been commanded by men of no greater intrinsic eminence in other professions.' Froude did not mean to convey that the nation has been commanded by men of no greater intrinsic eminence &c. What he meant was that the feeling has prevented them from carrying, in the councils of the nation, the weight which has been commanded by &c.

The Fallacy of Punctuation.

Much confusion in the meaning of written sentences arises from neglect of punctuation, and from erroneous punctuation. Punctuation is becoming a lost art. Many writers, perhaps not recognising its importance, and certainly shirking its difficulties, leave it to the printer to insert what stops seem to him expedient. Most printing offices have their own rules and conventions with respect to punctuation, which are applied indifferently to all writings, and from which some printers will not be moved by any entreaty or objurgation on the part of an author, to depart. In very many cases, however, the punctuation determines the meaning, and, this being so, it is no more justifiable to tamper with the

punctuation adopted by an author, than to garble the words of his text.

'Do you know,' a lately deceased author was asked, 'a man with one eye named Matthews?' 'No,' was the answer, 'what was the name of his other eye?' If the question was put in the form which is given to it above, the retort was completely justified, and was logical. The question, in the form here stated, clearly attributes the name to the eye, and not to its possessor. Strictly speaking, the proper construction is, 'a man named Matthews, with one eye'; but this construction is rather pedantic, and is a little awkward. The original arrangement can be deprived of its ambiguity, and the intended meaning conveyed with certainty, by proper punctuation. If it had been written 'a man, with one eye, named Matthews,' the retort would have been inappropriate, for the separating commas accurately indicate that the words they enclose constitute a clause qualifying the word 'man,' and that in true construction, the sentence runs, 'a man—named Matthews.' It is now a frequent practice to omit the first of the commas limiting a qualifying clause, and the omission does not often lead to ambiguity, since the first comma is understood. The sentence would still pass, and would still be unambiguous, if it were written 'a man with one eye, named Matthews.' The vice of the practice is that the omission of the first comma is apt to lead to the omission of the second; and there are cases in which the omission of even the first comma alters the meaning of the sentence. 'The object in my view was the construction of an unambiguous sentence.' This means that the construction of an unambiguous sentence was the object I desired to attain. 'The object, in my view, was the construction &c.,' means 'My opinion is that the object was the construction &c.' If we retain the second comma and drop the first, as the custom is with qualifying clauses, we lose this meaning, and restore the former. 'The object in my view, was the construction &c.,' means the object I desired to attain. The single comma is, in fact, redundant and awkward. It breaks the continuity of the words at a place at which there is no break in the continuity of the sense. The second meaning cannot be conveyed by punctuation without the insertion of both commas. It can, of course, be conveyed by altering the arrangement of the words.

'She cooked the meat and the potatoes and the beans she kept

raw till next day.' What was the fate of the potatoes? That cannot be determined except by punctuation. Insert a comma after 'potatoes,' and the potatoes were cooked. Take out the comma and insert it after 'meat' and the potatoes are kept raw.

'O fools, and slow of heart to believe all the prophets have spoken' characterises the persons addressed as unworthy because they are slow to believe. 'O fools and slow of heart, to believe all the prophets have spoken' characterises them as unworthy for precisely the opposite reason.

'General Kharki, the Commander in Chief having secured his communications, determined to advance.' General Kharki and the Commander in Chief are, in this sentence, two different persons. 'General Kharki, the Commander in Chief, having secured his communications, determined to advance.' The effect of inserting the comma is to identify General Kharki with the Commander in Chief, who are now no longer two, but one.

It is the less excusable to ignore this source of confusion, since most of us were made familiar with it in the nursery. The following lines are familiar to most children:—

I saw a little ant swallow up a whale;
I saw the sea full of good sparkling ale;
I saw a glass full fifteen yards deep;
I saw a well full of men's tears that weep;
I saw two watery eyes all in flames of fire;
I saw a house high as the moon and higher;
I saw the sun upon the darkest night;
At least I saw the man who saw this wondrous sight.

The assertions are sufficiently outrageous and incredible as they stand; but if we take away the stops from the ends of the lines, and insert them after the first substantive in each line, they are changed into very commonplace assertions. They then become a series of rhetorical inversions:—I saw a little ant; Swallow up a whale I saw the sea; Full of good sparkling ale I saw a glass; &c.

The Fallacies of Accent and Emphasis.

These two fallacies may be treated together; the rather, since English logicians have gratified their insatiable appetite for

perpetrating fallacies, by confusing them together. In English, we speak of the emphasised syllable of a word as the accentuated syllable, and say we place the accent, when we mean the emphasis, on this or that syllable. Then, since emphasis is employed to render prominent, not only one syllable in a word, but also one word in a sentence, this word is spoken of as accentuated; and the misplacement of emphasis on words is regarded as an example of the fallacy of the accent. A more transparent equivocation has never been perpetrated, even by logicians. The Aristotelian fallacy of the accent was the omission or misplacement of the accent-mark on a letter or syllable in a word, and the consequent alteration of the meaning of the word. In English, we have no accent marks, and the fallacy, strictly speaking, does not exist. It is, however, represented by the wrongful omission or insertion of the aspirate, which is conveyed in Greek by an accent mark. 'I never said that nothing made 'er hill; I said she lived at Maida 'ill.' This is a fallacy of the accent in the Aristotelian sense, and it would be a fallacy of the same kind to speak of the great 'art of the English nation. These are evidently puns, and, as such, are simple and crude examples of equivocation.

The fallacy of emphasis is much more frequent, and, though not of much importance, and rarely the cause of serious misunderstanding, deserves a brief notice. We have already seen that the problem Did Brutus kill Cæsar? contains three distinct problems, which may be explicated by appropriate construction. They may also be brought out by the distribution of emphasis. Did *Brutus* kill Cæsar? Did Brutus *kill* Cæsar? Did Brutus kill *Cæsar?* The affirmative proposition 'Brutus killed Cæsar,' though it cannot be said to contain three propositions, is a proposition with three aspects, either of which may be so prominent in the mind as to relegate the other two to a position of insignificance. In speaking, emphasis may stand in the place of formally correct composition of the sentence, since emphasis can indicate what aspect of the proposition it is that attention is to be concentrated on; but in written composition, italics, the equivalent of emphasis in spoken discourse, are to be sparingly employed. The proper way to convey the meaning with accuracy, is to compose the words of the sentence in due order; and in nothing is mastery of the English language so displayed as in the due order and arrangement of words. Italics are permissible to indicate foreign words, or technical terms

of art, thus drawing attention to a change of medium, and saving the reader from a momentary embarrassment; but italics are very rarely permissible for the purpose of mere emphasis. The free employment of italics in written discourse is comparable with swearing in speaking. It shows that the writer who uses them is unable to convey the emphasis he desires by the choice of appropriate words, or by arranging them in appropriate order, and therefore must resort to adventitious and illegitimate means to attain his end. They are comparable with the Elizabethan stage directions. 'This is a forest'; 'A room in the palace.' With appropriate scenery, such directions are not required; and with appropriate choice and arrangement of words, italics are rarely required for the purpose of emphasis.

Dr. Johnson's reading of the ninth commandment is well known, and is, no doubt, correct for the occasion on which it is usually read; but there are as many alternative readings as there are words in the sentence, and the emphasising of each word imports a new suggestion into the sentence. *Thou* shalt not bear false witness (but other people may). Thou *shalt* not bear false witness (for I will prevent thee). Thou shalt *not* bear false witness (in spite of the suggestion that thou wilt or mayst). Thou shalt not *bear* false witness (but thou mayst hint it ?). Thou shalt not bear *false* witness (but thou mayst bear true witness). Thou shalt not bear false *witness* (but thou mayst treat him falsely in other ways). Thou shalt not bear false witness *against* thy neighbour (but thou mayst bear false witness in his favour). Thou shalt not bear false witness against *thy* neighbour (only against other people's neighbours). Thou shalt not bear false witness against thy *neighbour* (but hast free licence to bear false witness against other people, not thy neighbours).

CHAPTER XXV

FALLACIES *EXTRA DICTIONEM*

Fallacies of Confusion of the Modes of Reasoning.

These are the most fundamental and far-reaching of all fallacies. They are fallacies, hitherto unrecognised and undescribed, to which logicians are especially prone, and which no logician up to now has escaped; but which are not confined to books on Logic. The several modes of reasoning we have found to be three, Inference, Empirical Reasoning, and Analogy; and the realm of Logic includes, also, the subsidiary or preliminary processes of Abstraction, Generalisation, Classification and Definition. The last four are different aspects of one process: the first three are different processes, distinct, discrete, and neither interchangeable nor miscible. These three modes of reasoning may, as we have seen in the last Chapter, be employed alternately or in succession, in trains of reasoning, to attain results; and such successive or alternate employment involves no fallacy, as long as their use in combination does not degenerate into confusion of one with another. But when they are confused with each other, or with a subsidiary process; when it is sought to deduce a conclusion from an Analogy, or a material conclusion by means of Inference; or when Generalisation is called Induction; then is perpetrated a fallacy of confusion in the mode of reasoning. This is the fallacy of the hypothetical syllogism: this is the fallacy of the *petitio principii* said to be inherent in the syllogism: this is the fallacy of supposing that we can 'reason from analogy'; this is the fallacy that vitiates every book on Logic that has ever been written.

It is postulated that A is C under the condition that A is B. If, when A is B, it is C, then certain inferences may be drawn from this postulate. To add that A is really B, when all that the postulate gives, and all that Inference needs, is that if A is B it is C, is *ultra vires* of Inference, irrelevant, and fallacious. But surely, an objector may say, in the actual reasonings of life, to which you so desire to make the processes of Logic apply, such

arguments are often stated, and useful conclusions and sound conclusions are drawn from them? Certainly they are,—but not in the Logic of Inference; not by means of Deduction. If parsley is fatal to parrots, my parrot will die if I feed it on parsley. But parsley really is fatal to parrots. Is it not useful to know that my parrot will really die if I feed it on parsley? Certainly it is. It is useful *in materiâ*. It is useful in the regulation of conduct. It is useful as an empirical proposition. But it is utterly useless as an aid or an adjuvant to the argument from the postulate. If parsley is fatal to parrots, then if I feed my parrot on parsley, it will die. This conclusion from the premiss is valid as it stands, and its validity is not enhanced by a hair's breadth by the knowledge that parsley really is fatal to parrots. Parsley may be the most wholesome diet in the world for parrots, and yet the validity of the conclusion—I do not say its truth—the validity of this conclusion, as an inference from the postulate, will not be impaired by the breadth of an electric ion. I say that if parsley is fatal to parrots, my parrot will die if I feed it on parsley; and you tell me that parsley really is fatal to parrots. Your assurance is totally irrelevant to my argument. Don't you see what you are doing? You are giving me unconditionally that knowledge that I already had conditionally. You are destroying that very condition which is an integral part of the reasoning, and without which reasoning of that kind cannot exist. In the same argument and in the same breath, you assert and deny conditionality—you deny that to be a condition which you have just asserted to be a condition. If you tell me that parsley really is fatal to parrots, —that its fatality to parrots is constant in experience—that is useful information, for which, in another connection, I should be obliged. It would enable me to solve the problem, if such a problem were in my mind, Will or will not my parrot die if I feed it on parsley? But it does not assist me in the least in drawing, from the postulate 'If parsley is fatal to parrots' the inference, 'Parsley will be fatal to my parrot.'

If, as Sterne speculated, I should see a white bear, what then? Why, then a white bear would be seen by me; I should be in the presence of a white bear; a white bear must have been born; it is not true that there is no such thing as a white bear; and so forth. All these inferences are valid inferences from the postulate, and are valid whether the subject of them is a white

bear, or a centaur, or a phœnix, or a jabberwock. Whether parsley is or is not, in experience, fatal to parrots, is as irrelevant and out of place in the one argument, as whether white bears, or centaurs, or phœnixes, or jabberwocks, really exist, is irrelevant and out of place in the other; or as whether Socrates really is or is not mortal is out of place and irrelevant in the syllogism.

Almost every logician points out that the conclusion of a syllogism may be true, though its premisses are false.

> All large glass bottles are covered with the craters of volcanoes;
> The moon is a large glass bottle;
> ∴ The moon is covered with the craters of volcanoes.

In this case, the conclusion happens to be true, though the truth of the premisses leaves something to be desired; and instances to the same effect are adduced by most logicians; who, nevertheless, on another page, blandly assure us that the truth of the conclusion depends on the truth of the premisses. A just appreciation of the nature of Deduction would have shown them that it is not permissible even to discuss the truth of the conclusion of an Inference. We might as well discuss whether it is white or black, transparent or opaque. Inference is not concerned with material truth. It is concerned solely with consistency, and to discuss the truth of its conclusions is fallacious. It is a fallacy of Confusion of the Modes of Reasoning.

It is this confusion of the argument *in materiâ* with the argument from postulates that constitutes the fallacy of supposing that, if a man's reasoning is consistent, his conclusions must be true that since his conclusions are true, his reasoning must be valid; that if we can find a flaw in his reasoning, his conclusion must be false; and that if his conclusions are not true, his reasoning must be invalid. All these are fallacies not infrequently perpetrated; none of them is enumerated among the fallacies of the *Sophistici Elenchi*, or in any subsequent chapter on fallacies. They eluded even the vigilant and penetrating eye of De Morgan; but they are brought to light by the system of Logic here expounded.

The problem of the *petitio principii* in the syllogism is put in various ways in books of Logic. It is put variously: If all men are mortal, and Socrates is a man, how do we know that Socrates is

mortal? Does the conclusion tell us anything new? Do we gain any knowledge from the argument? Have we not already stated the conclusion in the premisses? Every reader who has come thus far with me will see that the answers to these questions are—We do not know *from this argument*, that Socrates is really mortal; the conclusion tells us nothing that is not in the premisses. We gain from the argument, no accession of knowledge; all that we gain is a new statement of part of the premisses, in which the conclusion is implicit, and is explicated by the argument.

Prof. Carveth Read comes nearer than any other writer to the doctrine here propounded. He distinguishes between the formal character and the material character of the syllogism. As formally stated, it is, he says, useless or fallacious; but nevertheless, those who perceive its material grounds retain and defend it. He describes the material argument, and appreciates that it is distinct from the formal argument, but, like all other logicians, he still regards the material argument as a syllogism. This is the point at which I part company with him, and with all my predecessors. He and they look on the syllogism as having two aspects, or as capable of being put to two uses—the formal use and the material use. My contention is that the material argument never is a syllogism. To the syllogism it has a superficial and deceptive resemblance, which has blinded every logician to the profound and fundamental difference between them. The Datum resembles the minor premiss; but it is radically different in that, while the minor premiss predicates inclusion in a class or exclusion from a class, the datum predicates likeness for the purpose of the argument. The identical elements of problem and premiss simulate the middle term of the syllogism, by appearing in identical form in both the propositions that make up the argument; but they are radically different, for the identical elements of Empirical Reasoning need not be terms at all. They may be Ratios. The premiss of Empirical Reasoning bears a deceptive resemblance to the major premiss of the syllogism, for both are Universals; but they are profoundly different; for the premiss of Empirical Reasoning predicates a relation that has been found constant in experience, and may be a relation of any kind whatever; while the premiss of a syllogism is detached from experience, and expresses the relation of class inclusion or class exclusion, and that relation only.

Petitio principii is, literally, assuming a *principium*, or major premiss; and this is what every argument *ex postulato* does, and must do. In the syllogism, and in Deductive reasoning generally, it is no fallacy: it is a necessary preliminary to the reasoning process. In material argument, to assume, as constant in experience, a relation that is not in fact constant, is fallacious; but the fallacy is not *petitio principii;* it is the fallacy of jumping to a conclusion. What is ordinarily meant and understood by *petitio principii* is the fallacy of assuming that a conclusion, validly and properly deduced, *secundum artem*, from postulates, is true in fact; and this is the fallacy now under consideration, of Confusion of the Mode of Argument.

The confusion between Analogy and Empirical reasoning, which appears in Mill's description of Analogical reasoning, and is followed by all his successors, including the exponents of Modern Logic, is not so much a confusion of modes of reasoning, as an equivocation. It is the application of the term Analogy to a process that is not Analogy. These logicians give to one thing a name that had already been applied to another and very different thing. How far they confuse the two things, is difficult to discover. Many writers have detected the equivocation, and, though they retain the names Analogy and Analogical reasoning, have recognised that what they so denominated is not what Aristotle meant by Analogy. Although, however, they describe correctly, if very incompletely, Empirical reasoning under the name Analogical reasoning, they still unanimously confuse the reasoning so described with the syllogism, and thus perpetrate the fallacy of Confusion of the Mode of Reasoning.

Fallacies of Empirical Reasoning.

Fallacies of Induction are violation of its Canons.

The first Canon of Induction is that the relation expressed by the premiss must be constant in experience, or must be subsumable under one that is constant in experience. We have already seen, in the discussion on Imperfect Induction, that this mode of reasoning is not necessarily vitiated by want of constancy in experience of the premiss. A conclusion, and a valid conclusion, can be drawn from a premiss that is not constant in experience. A conclusion from such a premiss must, however, be recognised to be

conjectural only, or it will be fallacious. Fallacy resides, not in drawing a conclusion from a premiss that is not known to be constant in experience, but from regarding such a conclusion as assured. The fallacy is so frequent in the reasonings of daily life, that it has received a colloquial title; yet it does not appear to be known to logicians, not one of whom has ever mentioned the fallacy of jumping to a conclusion; which is said, I know not with what truth, to be perpetrated with special frequency by the female sex.

'The Robinsons have returned to town, for, as I passed their house, I noticed that their blinds were up.' Displayed as a formal induction, this would run:—

Premiss. The raising of blinds is, constantly in experience, a sign that the householder's family is at home.

Datum. The raising of Robinson's blinds is like, in respects material to the argument, the raising of other people's blinds.

Conclusion. The raising of Robinson's blinds signifies that his family is at home.

This conclusion would be unimpeachable, if the relation expressed in the premiss were, in fact, constant in experience, or were subsumable under one that is constant in experience; but it is neither, so that the conclusion is not warranted as an assured conclusion. Nevertheless, though not constant in experience, the relation is tolerably frequent in experience; and does justify a conclusion, but a conjectural conclusion only. The want of constancy in experience of the premiss must be reflected in a want of assurance in the conclusion; and if the conclusion is stated with this qualification, it is unimpeachable. The proper form of the conclusion from this premiss is 'It is probable,' or 'There is evidence,' or 'I conjecture,' that the Robinsons have returned to town.

'His red nose proclaims him a toper' is a fallacy of jumping to a conclusion. It assumes that the relation between redness of the nose and excessive drinking is constant in experience, which it is not. The datum is satisfactory. The redness of his nose is like, in all material respects, to the redness of the nose that is produced by drinking; but the want of constancy in experience of the premised relation, that redness of the nose is produced solely by drinking, is so great, that we are scarcely justified in concluding even that there is evidence that he is a toper.

As long as Fermat was content with surmising, from the result of his calculations, that $2^{2^x} + 1$ is probably always a prime number, he kept within his warrant, and was justified in this conclusion; but as soon as he concluded that it certainly is so, he jumped to a conclusion; for the relation had not been verified sufficiently often to be constant in experience, in the sense in which constancy is to be understood in this connection; and it could not be subsumed under any relation that is constant in experience.

The second Canon of Induction is that the terms of the datum must be assimilated, in respects material to the argument; and to argue from a vague and approximate assimilation, or from an assimilation, however close, that is not material to the argument, is fallacious, and is a fallacy frequently perpetrated.

There is no fallacy in arguing from a vague and approximate assimilation of the terms of the datum, if the conclusion from such a datum is accepted as tentative, and is not regarded as assured. The conclusion is then an hypothesis, and is perfectly justifiable as such; but fallacy lies in taking an hypothesis for an assured conclusion.

The main source of the fallacy that resides in the breach of this Canon is the assimilation of the terms of the datum in respects that are not material to the argument.

Has this insect a sting? Yes, for it is like a wasp, which, constantly in experience, possesses a sting. But is it like a wasp in material respects? Is it hymenopterous? Has it the features which mark it as belonging to the great family of bees and wasps? No, but it is like a wasp in size, and colour, and marking, and mode of flight. It won't do. Size and colour and marking and mode of flight are not respects material to the argument. These may all be imitated by moths or diptera. To conclude that it has a sting because it resembles a wasp in these respects is fallacious.

Will this mile of railway cost more to lay than that? No, because it is no longer. But is length the only or the chief respect in which resemblance is material to the argument? No. That mile runs on the flat; this must run through a tunnel. That mile runs through agricultural land; this must run through a town. That mile runs over uninterrupted land; this must cross a bridge of wide span. To extract an assured conclusion from such a datum is fallacious.

Will this war be successful? Yes, because that war, waged against a nation no more numerous, was successful. But is the numerousness of the antagonist nation the only, or the chief, respect material to the argument of success in war? It is not. We are to consider whether it is warlike, wealthy, brave, prepared; whether its armies are well organised and well disciplined; whether it is well supplied with material of war. All these, and other circumstances, are material to the argument.

The omission of some material resemblance from the datum constitutes the fallacy of the Accident, in the Aristotelian sense. The fallacy is usually confused, in the text books, with the fallacy *a dicto secundum quid ad dictum simpliciter*. It is, in fact, very different. The Aristotelian fallacy of the Accident was the taking of an accidental quality for an essential quality. We have already seen that the term 'essential' may be replaced, with great advantage to clearness of expression and definiteness of meaning, by 'material to the argument'; and, if we make the substitution in this case, the fallacy of the accident is the fallacy of taking, for a similarity material to the argument, a similarity that is not material; and this is the fallacy under consideration. It is the construction of a datum on the ground of a likeness that is not material to the argument. It is a curious result of the demoralising effect of the study of Traditional Logic, that whenever logicians depart from the teaching of Aristotle, they are invariably wrong; while in matters in which he is wrong they follow him with servile imitation.

The third Canon of Induction is that the second given element in the problem must be identical with its homologue in the premiss. It is not at all infrequent for an inaccurate thinker to take for identical, things that are not identical. Breach of this rule constitutes another of the recognised fallacies of Traditional Logic.

If Johnny's illness is like, in material respects, to Jenny's, and if Jenny's illness was caused by a faulty diet, then, since uniformity of causation is constant in experience, Johnny's illness was caused by a faulty diet, or by something that is like, in material respects, to faulty diet. As already set forth, the Induction is

Jenny's illness	was caused by	faulty diet
Johnny's illness	was caused by	(*x*) *faulty diet.*

In this argument, the identical homologous elements are the ratios; and if these elements are indeed identical, and the illnesses are in fact alike in material respects; and if causation is, in experience, constant; then the reasoning is unimpeachable; and the cause of Johnny's illness is discovered. But how if the elements that are taken to be identical are not in fact identical? What effect will this have upon the validity of the argument? How if Jenny's illness was preceded merely, and was not caused, by unsuitable diet? How if it was neither caused nor preceded, but accompanied, by faulty diet? Then, clearly, there is no reason for supposing that Johnny's illness was thus caused. The reasoning is then fallacious; and the fallacy, in this particular instance, is the fallacy known to Traditional Logic as *non causa pro causâ*, or *post hoc, ergo propter hoc*. This fallacy is utterly out of place in Traditional Logic, which knows nothing of causation, or of the means whereby causation may be ascertained; and its presence in that Logic makes us wonder, first how it ever obtained admission; and second how, being in, it did not stimulate logicians to discover the rule whose breach constitutes the fallacy.

The relation of causation is far, however, from being the only relation that is the subject of investigation; nor is the ratio the only element in the problem that is, on occasion, identified with its homologue in the premiss; so that the fallacy *non causa pro causâ* is but a sample of the fallacies of this class. It may, however, be taken as a type of the class. In this, as in other matters, Traditional Logic, in departing from the teaching of Aristotle, has gone astray. Τὸ μὴ ἄιτιον ὡς ἄιτιον does not signify taking that for a cause which is not a cause; it signifies taking that for a reason which is not a reason; and is thus, on the one hand, identified with the fallacy now under consideration; and on the other, is with difficulty distinguished from the current meaning of the *non sequitur*, into which logicians have corrupted the Aristotelian fallacy of the Consequent. Thus, by departing from Aristotle they have got their whole scheme of fallacies, if that can be said to be a scheme which has no organisation, arrangement, or coherence, into an inextricable muddle.

Let the problem be With what percentage of sewage in the water will tench thrive? Tench will thrive with x per cent. of sewage in the water: find x. It is found in experience that carp

will live in water containing, say, three per cent. of sewage: hence the Induction :—

Carp	live in	three per cent. of sewage.
Tench	thrive in	(*x*) *three per cent. of sewage.*

In this induction, the datum is sound. Carp are, in respects material to the argument, like tench. The identified homologues are the Ratios; and these we see, are wrongly identified. All that experience proves is that carp will live in three per cent. of sewage, and if we concluded that tench, which are like carp for the purpose of the argument, also will live in three per cent. of sewage, we should be abundantly justified. But we have concluded more than this. We have concluded that tench will not only live, but thrive, in water of that degree of pollution, and in so concluding we have committed the fallacy under consideration, of taking that for identical which is not identical. The true title of the fallacy should be, not *non causa pro causâ*, but *non idem pro eodem.*

The identified elements, so far from being always causes, need not even be Ratios. They may be terms. Take an example, the like of which has served us before. Does this insect possess a sting? Yes, for it is like, in all material respects, to those other insects which possess what I take to be stings.

Those insects	possessed	stings;
This insect	(*x*) *possesses*	a sting.

The Induction is correct at all points, except in the identification of the second term in the problem with its homologue in the premiss. The datum is quite satisfactory. This insect is so like those insects of which I have had experience, and have found to possess what I take to be stings, that I am safe in arguing from the one to the other. The relation expressed in the premiss is, as previously shown, subsumable under one that is constant in experience. But the argument is fallacious because the elements taken as identical are not in fact identical. What I have taken to be stings, in examining the insects, are not stings, but ovipositors. Consequently, the argument, that this insect possesses a sting, is unsound; and is unsound because it contains the fallacy *non idem pro eodem.*

The Fourth and Fifth Canons of Induction are that the quæsitum is obtained by adopting into the problem the homo-

logous element of the premiss; and that the difference, as well as the likeness of the datum, must be reflected in the conclusion.

The adoption into the problem of the homologous term of the premiss, is fallacious only when the fifth Canon is neglected, and the non-assimilation in any respect, of the terms of the datum, is not allowed for and reflected in the conclusion. If I argue that since typhoid fever is due to a micro-organism, typhus, which is like typhoid in so many respects, is due to the same micro-organism, or fail to recognise that there must be some dissimilarity in the bacilli, corresponding with the differences between the two diseases, I commit a fallacy of this nature. The fact that a burglary has been committed in my house, as well as in Robinson's, justifies the conclusion that both were committed by members of the same—of the criminal—class; but it does not justify the conclusion that they were committed by the same men. It does, however, justify an hypothesis that they were committed by the same men. The fact that this picture is like, in the material respects of handling, technique, and general nature of the subject, to pictures by Corot or Millet, warrants the conclusion that it was painted by some one of the school of Corot or Millet; but the inferiority in its design and execution forbid the conclusion that it was painted by Corot or Millet himself.

This is not one of the recognised fallacies of Traditional Logic, but it is well known by practical reasoners that 'circumstances alter cases'; and that there is fallacy in arguing from one case to another that is not precisely alike in material respects. It might appropriately be called the fallacy of indiscrimination, since it depends on want of discrimination between the terms of the datum.

The Sixth and last of the Canons of Induction is that Nothing may be assumed in the problem that is not warranted by experience. Breach of this Canon is the fallacy known to Traditional Logic as the fallacy of many questions. It should rather be called the fallacy of the previous question, for it is the illegitimate assumption of an answer to some question that should have been answered, and has not been, before the problem was stated. It is, indeed, a true begging of the question; for the problem is a question, and it begs the problem. But it is not a *petitio principii*, for it does not beg a *principium* or major premiss.

It does not beg a premiss at all. Nor does it, like the so-called *petitio principii* of the syllogism, beg the conclusion in a premiss. What it begs is the problem or question.

The fallacy of many questions, or, as it should rather be called, of the previous question, is usually considered a rare form of fallacy, and, like the fallacy of the accident, and of amphibology, is usually illustrated by the same stale example copied from one book to another *usque ad nauseam*. It is in fact a very frequent form of fallacy, and one that often escapes recognition. Seldom, indeed, does it appear in the bald form usually cited,—'Yes or no, Sir, have you left off beating your mother?'

Why does bread and butter always fall with the buttered side down? is a 'fallacy of many questions' until it is established that it does so fall. What is the connection between changes of the moon and changes of the weather? is a fallacy of the previous question until it is established that there is a connection. What is it that makes food that is cooked in copper vessels poisonous? is a fallacy of the previous question until it is established that food so cooked is poisonous. Are the rectilinear markings on Mars canals? is a fallacy of the previous question until it is proved that such markings exist. Why are savage races always cruel? is such a fallacy until it is proved that they always are cruel.

This fallacy is not in the argument, nor in the conclusion of the argument. It is in the statement of the problem; and, as the statement of the problem is the first step in Empirical Reasoning, the fallacy is the most fundamental of the fallacies of Empirical Reasoning, and should, perhaps, have been considered first. Whatever its place in Empirical Reasoning, it has certainly no place in syllogistic reasoning; and, when we find it among the classical fallacies of Traditional Logic, we know not whether to admire most the acumen that discovered a fallacy to the nature and origin of which Traditional Logic gives no clue, or the want of acumen that stopped short at that stage, and failed to discover the mode of reasoning which accounts for the fallacy, finds a place for it, and supplies a Canon which forbids it.

Fallacies of Inference.

The first Canon of Inference is that every Inference is deduced from a postulate. It follows that, in arguing of consistency,

and in explicating the implications of propositions, we may not go outside the field of postulation. We may not assume nor regard the material truth of the postulate. To do so would be to commit one of those fallacies of confusion of the mode of argument that have already been described.

The second Canon of Inference allows us, for the purpose of argument, to postulate what we please, except self-contradictions. This Canon forbids us, therefore, to limit our postulates to what is materially true. It forbids us to object to any argument on the ground that its postulates are improbable, impossible, inconceivable, absurd, or nonsensical. But the Canon does limit us strictly in one direction. It forbids us to postulate what is self-contradictory. Any argument, therefore, is fallacious, which is founded on such postulates as that an irresistible force can be applied to an immoveable body; that there is an unconscious mode of consciousness; that matter may become immaterial; that a material argument need take no account of its matter; that eternity had a beginning; that infinite space has a limit; or any similar proposition. It may seem an unnecessary precaution to forbid the postulation of self-contradictories, but experience shows that it is by no means unnecessary. Instances given in a previous chapter show that logicians themselves are by no means insensible to the lure; and the postulation of an unconscious mode of consciousnes is not rendered any the more justifiable by substituting for the term 'unconscious,' the term 'subliminal,' which means the same thing, thus hiding the fallacy of Self-contradiction behind the fallacy of Bivocation. Self-contradiction is a very important fallacy, and not the less important that, although it seems, on the face of it, so manifestly fallacious that no one is likely to fall into it; in practice, it is committed without any recognition of its fallaciousness.

The Canon allows us to postulate what we please for the purpose of the argument; and it is important to observe the limitation: fallacious to exceed the limitation. The argument must be limited by its purpose; and to go outside the purpose of the argument is to commit a fallacy, which is unknown to Traditional Logic, but is none the less important. The pen is mightier than the sword; but it would be a fallacious inference from this postulate to argue that we ought therefore to arm our cavalry with quill pens, or even stylographs, in place of the *arme*

blanche. This is a fallacy, gross as a mountain, open, palpable; yet it does not come under any of the recognised fallacies of Traditional Logic. It might, perhaps, be twisted into an equivocation; but it is not really an equivocation. The fallacy consists in applying the postulate outside the purpose of the argument. The pen is mightier than the sword for the purpose of producing effects on the course and destiny of nations, not for the purpose of action on the field of battle.

What is not a mineral, must be either an animal or a vegetable; and the Court of Appeal may hold that China clay is not a mineral; but it would be fallacious to argue, from these postulates, that their lordships held China clay to be an animal or a vegetable. I do not know how Traditional Logic would place this fallacy, but to me it is clearly a neglect of the purpose of the argument. The Court of Appeal holds that China clay is not a mineral for the purpose of a certain lease of minerals; and to apply this postulate outside the purpose of the argument is fallacious. Traditional Logic knows nothing of the purpose of its arguments, and this is one of the grave charges of ignorance and neglect that I make against Traditional Logic. In Deduction, the purpose of the argument is all important; and no Deduction can be properly conducted which leaves the purpose of the argument out of account. For the purpose of some arguments, the whole includes the part: for the purpose of other arguments, the part includes the whole. For the purpose of the argument as to the position of Eastcheap, Eastcheap is included in London; but for the purpose of the argument as to whither I must go from Birmingham to get to Eastcheap, London is included in Eastcheap.

An instance of Fallacious reasoning may often be referred to different fallacies, according to the way in which it is regarded. The contention of Modern Logic, that every proposition refers to Reality, may, as we have seen, be regarded as a fallacy of confusion of the mode of argument. It may also be regarded as a fallacy of neglecting the purpose of the argument. In the Logic of Consistency, the purpose of the argument is to explicate the implications of propositions; and for this purpose, it is not material whether the proposition does or does not refer to reality.

Fallacies of neglect of the purpose of the argument will be mentioned again, and other examples given, under breaches of the fourth Canon of Inference.

An argument, once begun, must proceed on the basis of the postulate; and thus we obtain the third Canon, that *a postulate, once granted, must not be withdrawn nor ignored in the course of the argument.* I may, for the purpose of argument, postulate that chalk is white, or that Brutus killed Cæsar; and I may, for the purpose of argument, postulate that chalk is not white, or is black; and that Brutus did not kill Cæsar, or saved his life; but I may not, for the purpose of the same argument, assume contradictory postulates; nor may I, having once assumed a postulate, permit it to be denied or ignored in the course of the argument. The fallacy that lies in the breach of this Canon, consists in supposing that by denying a postulate, we refute the argument founded on it. If I argue that, if London were to be destroyed by an earthquake to-morrow, the finance of the whole world would be dislocated, you do not refute this argument by denying that London will be destroyed by an earthquake. I say that if women have votes, they will always vote for war rather than against it; and you do not refute this argument by denying that women will have votes. I say that if my scheme of Logic is valid, Aristotle and all his successors and followers, down to the present day, are wrong; and you do not refute this argument by denying that my scheme is valid.

If a pint of petrol contains so many calories, and a pound of coal so many; and if a pound of coal represents so many foot-pounds of energy; then, with a little calculation, I can tell you how many foot-pounds of energy are represented by a pint of petrol. You may deny that the number of calories that I have taken to be in a pint of petrol is correct; you may deny that the number of foot-pounds of energy, or the number of calories, that I have postulated to be in a pound of coal, is correct; but these denials do not in the least vitiate the calculation. The sum is correctly done, and you do not convict me of a mistake in my arithmetic, by proving that I began with the wrong figure. By so doing you may invalidate my result, no doubt; but you do not invalidate the process by which I reached it. The addition and subtraction, the multiplication and division, are correct to a decimal point; and this is all that the Logic of Inference requires, and all it can do. The Logic of Inference cannot determine experimentally how many calories there are in a pint of petrol. All it can do is to take the postulates given to it, and draw inferences from them.

Without being specifically denied, the postulate may be ignored; and this is a very frequent fallacy. I argue that if he is sufficiently good-natured, he will do what I ask; and to say that he is a fool if he does, does not invalidate my argument, which is founded solely on the postulate of his good nature, and does not take account of his wisdom. To say that he would be a fool to do it, *and he is not in fact a fool*, is to controvert the *argumentum ex postulato* by the *argumentum in materiâ*, and is a fallacy of confusion of the mode of argument. If I were arguing the matter of fact, whether he will do it or not, the retort would be material to the issue; but I am not. I am arguing from my postulate alone; and in Inferential argument, the conclusion is but another way of stating the postulate itself. The inference cannot, therefore, be controverted, except by showing that it is not contained in the postulate. To say that he is sufficiently good-natured to do it, is another way of saying that he will do it if I appeal to his good nature; and if the one is true, the other is true also. Inference does not assert that either is true. It asserts only the implication of the one in the other.

I say that, if the Bill is passed into law, it will remove a grievance. It is no answer to this argument to deny the postulate, and assert that the Bill will not pass; nor is it any answer to ignore the postulate, and say that I, who have imposed so many grievances, am a fine person to talk about removing one.

Denial and ignoring of the postulate together make up the fallacy known in Traditional Logic as the *ignoratio elenchi*. In that Logic, it is an illogical intruder. It violates no rule of the syllogism; it is a breach of no Law of Thought, of no recognised rule of Immediate Inference. It floats in the air, unattached and unaccounted for. Nor has Inductive nor Modern Logic any place for it. Neither provides a Canon that is broken by the *ignoratio elenchi*. In the scheme here propounded, it fits into its place, as a breach of a recognised and formulated rule of Inference, a rule not made for the purpose of providing an explanation of the fallacy, but forming an integral and necessary part of the scheme. This accidental consequence of the rule seems *primâ facie* evidence both of its validity and its necessity.

Violation of the fourth Canon of Inference provides a greater variety of fallacies than violation of any other. It is the illegiti-

mate assumption of something that is not in the postulate that constitutes the fallacy of four terms, when this is not an equivocation, the undistributed middle, and the illicit major and minor of syllogistic reasoning. It is to the same assumption that we owe the fallacy of the Consequent, the fallacy *a dicto secundum quid ad dictum simpliciter*, the fallacy *a dicto simpliciter ad dictum secundum quid*, De Morgan's fallacy *a dicto secundum quid ad dictum alterum quid;* as well as other fallacies not hitherto recognised.

If Some fish fly,
And All eels are fish; why may we not conclude that Some eels fly?

Because, says Traditional Logic, the middle term is undistributed. Because, says the Method of Explication, we have assumed what is not in the postulate. We have replaced, in the major premiss, the term 'Some fish' by the term 'some eels'; but 'some eels' is not given equivalent to, included in, or implied in 'some fish.' 'Some eels' is indeed, included in 'all eels,' and the substitution of some eels for all eels is warranted. But all eels are given, for the purpose of the argument, included in 'fish.' They are not given included in 'some fish'; and therefore they may not, nor may 'some eels,' be substituted for 'some fish.' To make this substitution is to assume what is not in the postulate.

We may, indeed, give to the argument a specious appearance of correctness by stating it thus, in Hamiltonian terms:

Some fish fly;
All eels are some fish;
∴ All eels fly.

Again Traditional Logic would ascribe the fallacy to the undistributed middle. The Method of Explication ascribes it to the ambiguity of the middle. The 'some' of the major premiss is 'this some.' The 'some' of the minor may be 'that some' or 'the other some'; and owing to this ambiguity, we are never justified in replacing one 'some' by another.

The fallacy of the illicit major rests on the same ground, of assuming something that is not in the postulate.

Prisoners who are found guilty are punished;
He was not found guilty;
He was not punished.

In Traditional Logic, this is an illicit major. The predicate of the conclusion is distributed; the predicate of the major premiss is undistributed; and thus there is illicit process of the major. By the Method of Explication, the defect is more easily identified. It is said in the conclusion that he was not punished; but there is nothing in the postulate about those who are not punished. The postulate applies to those only who are punished; and to conclude from this postulate anything about those who are not, is to assume what is not in the postulate.

Traditional Logic forbids us to draw any inference at all from these premisses; but the Method of Explication is not so niggardly. There is a sound inference, and an inference that may be useful, to be drawn from them. If prisoners who are found guilty are punished, and he was not found guilty, then we may safely and rightly infer that not on the ground of being found guilty was he punished.

The illicit minor is even more plainly a breach of the fourth Canon of Inference.

If The syllogism is a defective mode of argument;
and Some logicians argue by the syllogism;

why are we not justified in concluding that

All logicians employ a defective mode of argument?

Because, says Traditional Logic, the Subject of the conclusion is distributed, but in the minor premiss the same term is not distributed, and thus there is illicit process of the minor. The Method of Explication gives an explanation, that is more direct, 'All logicians' have been substituted for 'some logicians'; but 'all logicians' are not postulated equivalent to, included in, or implied in 'some logicians,' and therefore, in making the substitution, we are assuming what is not in the postulate.

The fallacy of concluding *a dicto simpliciter ad dictum secundum quid* is a breach of the same rule. It is the assumption of something that is not in the postulate. It is the replacement of a term by another that is not, for the purpose of the argument, equivalent to, included in, or implied in it. Arsenic is a poison, it is true; but drop doses of Fowler's solution are not poisonous. For the purpose of the argument, arsenic means arsenic in appreciable quantity: for the purpose of the argument, arsenic in drop

doses of Fowler's solution is neglectable. Conversely, though arsenic in drop doses of Fowler's solution is not poisonous, it does not follow that arsenic *simpliciter* is not poisonous. In short, 'arsenic' and 'the quantity of arsenic contained in a drop of Fowler's solution' are not, for the purpose of the argument about poisoning, convertible or substitutable terms. To substitute the one for the other is to assume what is not in the postulate, and thus to violate the fourth Canon of Inference.

The fallacy of the Consequent is usually called the *non sequitur*, and is defined by Jevons as 'any argument which is of so loose and inconsequent a character that no one can discover any cogency in it.' The fallacy of the Consequent is nothing of the kind. As defined by Aristotle, it is the unconditional affirmation of a postulate that has been granted subject to a condition. To argue from If A is B, it is C, to A is C, is a fallacy of the Consequent in the Aristotelian sense. In Traditional Logic, it is a breach of no rule except the rule created *ad hoc*, that we may not affirm the consequent of an hypothetical proposition. In the scheme here propounded, it falls into an appropriate place, ready and prepared for it, as a breach of the fourth Canon of Inference. If we affirm unconditionally that which is postulated under a condition, we exceed the limits of the postulate, and assume what is not postulated.

All these fallacies are violations of the fourth Canon of Inference, but these are far from being all the fallacies that arise from breach of this Canon. They are all the fallacies of this kind that Traditional Logic recognises; but they are far from being all that are committed. To discover the remainder, we must go through the Canons of Explication, and show how the licence granted by each of them may be exceeded, and thus give rise to a fallacy of this description.

The first Minor Canon of Explication allows us to infer, from every proposition, its reciprocal. It does not allow us to infer what purports to be the reciprocal, but is not. If a peach tree sometimes bears nectarines, it does not follow that a nectarine tree sometimes bears peaches. If Brutus killed Cæsar, it will not do to infer that Cæsar killed Brutus. If Democracy ends in despotism, it does not follow that despotism ends in democracy. Ponos is kala-azar implies kala-azar is ponos, but Ponos is a form of kala-azar does not imply Kala-azar is a form of ponos. The

converse of Traditional Logic, without being positively untrue, contains a *suggestio falsi*. 'Some human beings are writers of books on Logic,' becomes, when converted according to rule, 'Some writers of books on Logic are human beings'; thus conveying the distinct suggestion that some other writers of books on Logic are not human beings. I have been under the painful necessity, in the course of this book, of criticising with some severity the writers of books on Logic; but I have never ventured, and should not venture, to suggest that they are outside the pale of humanity. This suggestion comes from themselves, and I trust they are pleased with it. This fallacy may be called the False or Illicit Reciprocal.

The second Minor Canon of Explication allows us to infer every proposition with a Ratio that is, for the purpose of the argument, equivalent to, included in, or implied in the Ratio of the Postulate. It is not difficult to slip into the substitution of a Ratio that is ostensibly equivalent, &c., to the postulated Ratio, but is not equivalent, &c., for the purpose of the argument. 'He killed her,' may be fallaciously taken to mean 'He murdered her.' 'He stole it,' may be fallaciously substituted for 'He took it.' 'He paid willingly' may be fallaciously inferred from 'He paid promptly.' Hard words break no bones, it is true; but it would be fallacious to infer from this postulate that hard words are innocuous. Soft words butter no parsnips; but not from this postulate may we infer that a soft answer does not turn away wrath. In this instance, all three elements in the proposition have been replaced by others; and the replacement is perfectly legitimate as long as the new elements are logically substitutable for the original elements; as long, that is, as the new are equivalent to, included in, or implied in those they replace; but in this case, they are not. 'He spoke at great length' does not necessarily imply that he was tedious; nor does 'She found it' necessarily imply that she was looking for it. Such fallacies may be termed fallacies of the Illicit Ratio.

The third Minor Canon of Explication permits us to replace any term in a postulate by a term that is, for the purpose of the argument, equivalent to, included in, or implied in the replaced term; and we have seen that the fallacious substitution of a term that purports to be substitutable under this Canon, but is not, constitutes the fallacies, already examined, of the undistributed

middle, the illicit processes, and the *quaternio terminorum*. This erroneous substitution constitutes also other fallacies, of which Traditional Logic knows nothing, since it knows nothing of the valid argument of which the fallacy is a perversion. If the roof is waterproof, we may safely infer that it is proof against rain ; but we may not infer from this postulate that it is proof against snow ; for snow is not, for the purpose of the argument, equivalent to, or included in rain. If a body floats in olive oil, we may safely infer that it will float in water, for water is, for the purpose of this argument, implied in olive oil ; but if the same body will burn when soaked in olive oil, it does not follow that it will burn when soaked in water, for water is not, for the purpose of this argument, implied in olive oil. If timothy and foxtail and cocksfoot grow in this meadow, we may safely infer that couch also will grow there ; but though timothy and foxtail and cocksfoot make good hay, we may not from this postulate infer that couch makes good hay ; for couch, which is implied in the other grasses for the purpose of the first argument, is not implied in them for the purpose of the second. These fallacies may be termed Fallacies of the Illicit Term.

It will be seen that these fallacies, while they are due to be noticed here, are properly fallacies of neglect of the purpose of the argument ; and might have been dealt with, as similar fallacies have been dealt with, on a previous page. Many fallacies can, in fact, be referred to more than one class.

The second Canon of Explication allows us to infer, from any postulate, all the conditions that are necessary to the postulate. No fallacy arises from failure to take advantage of the privilege a rule allows us ; but fallacy may, in this case, arise from taking, for a necessary condition, one that is not necessary. If she saw him do it, she must have been there when he did it ; but this postulate does not necessarily imply, though it may be erroneously taken to imply, ' He must have seen her watching him.' If there is no honey in the comb, it will not do to infer that all the honey it contained has been extracted. It may be brood-comb, and may never have contained honey. If the school did not earn the grant, it would be fallacious to argue that the teaching must have been inefficient ; for that would be to assume what is not in the postulate, that inefficient teaching is a necessary condition of not earning the grant. If the fine details do not appear in this photo-

graphic print, it would be fallacious to argue that the negative must have been under-exposed ; for this is to assume, what is not in the postulate, that under-exposure is a necessary condition of want of fine detail. 'He has just taken the medicine' implies, as a necessary condition, 'The medicine glass is empty,' but 'The medicine glass is empty' does not imply 'He has just taken the medicine.' He may have thrown it out of the window. Fallacies of this sub-class also are unknown to Traditional Logic; for this Logic knows nothing of the argument of which they are fallacies. We may call these Fallacies of the False Condition.

The fourth Minor Canon of Explication allows us to deny any proposition in which the Ratio of the postulate is replaced by a Ratio that is, for the purpose of the argument, inconsistent with the Ratio of the postulate. Care must be taken that the ratios really are inconsistent, or the inference may be fallacious. If he lives, we are justified in denying that he died; for the ratios are inconsistent for the purpose of the argument; but if he lived, we cannot safely deny that he died; for, for the purpose of this argument, these Ratios are not inconsistent. If the ship foundered at sea, we may safely deny that she arrived in port from her last voyage; but we may not deny that she ever arrived in port, nor that she was seaworthy, nor that she was well navigated; for none of these Ratios is inconsistent with the Ratio that she foundered. She may have been sunk by collision with a derelict, or by the explosion of something in her cargo. If stones sink in water, we may safely deny that they float in water; but we cannot safely deny that they are moved by water; for this Ratio is not, for the purpose of the argument, inconsistent with the Ratio of the postulate. Such fallacies are denials of the Consistent Ratio.

The fifth Minor Canon of Explication permits us to deny any proposition in which a term of the postulate is replaced by one which is, for the purpose of the argument, inconsistent with the displaced term ; and again we must be careful that there is inconsistency, or we may fall into fallacy. If he shot a brace of partridges, we may safely deny that he shot nothing, for these terms are inconsistent; but if he shot a brace of partridges, we may not, on the ground of this postulate, deny that he shot a brace of hares, or of pheasants: for hares and pheasants are not, for the purpose of

this argument, inconsistent with partridges. It may be that hard words break no bones, but not on this account may we deny that hard words break friendships; for no bones are not inconsistent, for the purpose of the argument, with friendships. Though threatened men live long, we may not on that ground deny that unthreatened men live long; for threatened men and unthreatened men are not, for the purpose of this argument, inconsistent. Such fallacies are denials of the Consistent Term.

The sixth Minor Canon of Explication allow us to deny any proposition inconsistent with any condition necessary to the postulate. We fall into fallacy if, on the ground of the postulate, we deny a proposition that appears to be, but is not, inconsistent with a necessary condition of the postulate. If he has typhoid fever, we may safely deny that his temperature is normal in the evening; but it would be fallacious to deny that his temperature was normal in some hour of the twenty-four. If the plant languishes and is stunted, we may not on that account deny that the soil is suitable; since an unsuitable soil is not a necessary condition to a languishing and stunted plant. It may be suffering from drought, or infested with vermin.

All the fallacies of this class may be stigmatised by the term *non sequitur*, for in every case the conclusion is unwarranted by the premisses.

Fallacies of Analogy.

In literary or qualitative Analogy, the chief fallacy is that assimilation of the terms of the compared relations which has been explained to be beyond the province of Analogy. The temptation to this error does not beset us in forming quantitative analogies. No one supposes that, since the ratio of 3 to 6 is the same as the ratio of 8 to 16, therefore three is the same as eight; but it is not at all unusual for qualitative Analogy to be confused with Inference. If I say that a band is as good as a meal to a marching regiment, I may be met by the reply that that is nonsense, because the soldiers cannot eat the music. The assertion that the pike is the shark of the river, may be met by the reply that this cannot be so, for the pike is underhung, while the shark is overhung. Such replies evince ignorance of the nature and purpose of Analogy. They suppose that comparison of ratios

carries with it comparison of the terms of the ratios. These instances are comparable with the attempt of many logicians to assimilate Analogy to Induction; or rather, to make it a kind of Induction.

We have seen how difficult it is, in literary or qualitative Analogy, to avoid some assimilation of the terms of the compared relations; and how, in comparing the stillness of the harmless child to that of the harmless mouse, we feel that the Analogy is more appropriate than would be comparison with the stillness of death, or the stillness of the air before a storm. Some comparison of the terms, as well as of the ratios, is unavoidable, we found, in literary Analogy; and is not only unavoidable, but appropriate and satisfying. Wherein, then, lies the fallacy? It lies in this: when Byron says the Assyrian came down like a wolf on the fold, we understand him to suggest that the Assyrian partook of the rapacity and savagery of the wolf; but this suggestion is made, not as an inference from our previous knowledge, but as an addition to it. There is no reference here to constancy in experience; and consequently no Induction. There is no substitution of one proposition for another which implies it; and consequently no Deduction. All that is put forward is a suggestion. It is not a positive assertion: it is not a conclusion: it is a covert assertion, or semi-assertion, that the Assyrian has the detestable and terrifying qualities of the wolf. There is no fallacy in making the suggestion: but to take the suggestion for proof, that would be fallacious. If we turn the suggestion into an argument, and conclude that since the Assyrian came down like a wolf on the fold, therefore he is as savage as a wolf, then we perpetrate a fallacy; but so long as we receive the suggestion as a mere suggestion, it is not fallacious.

Quantitative analogy is fallacious when the ratios compared and discerned to be alike, are in fact not alike. $\frac{2}{3} = \frac{246}{359}$ is a fallacious analogy. "The ratio between the homologous sides of similar triangles is equal to the ratio between their areas" is a fallacious quantitative analogy. This application of analogy is equally fallacious when like ratios are taken to be unlike, as when triangles on the same base and between the same parallels are allowed to be of different areas, or when the odds of 15 to 12 are chosen in preference to odds of 25 to 20.

Fallacies are invalid arguments having a specious appearance of validity. There are arguments that have a superficial appearance of fallacy, and yet are valid; and this is the most appropriate place in which to notice them. A Paradox is an apparent inconsistency that is not a real inconsistency. To say that the hare beats the tortoise in a race, is a paradox. It is, on the face of it, inconsistent with the fleetness of the hare and the slowness of the tortoise. An asymptote is a paradox. It is a line that continually approaches a straight line, but never reaches it. That a bird could not fly unless it was heavier than air, is a paradox. It states an apparent inconsistency that is not a real inconsistency.

The following is a complete enumeration of Fallacies:—

I. Fallacies in Dictione.

- Equivocation.
- Bivocation.
- Amphiboly.
- Fallacies of Punctuation.
- Fallacies of Emphasis.

II. Fallacies extra Dictionem.

- Fallacies of Confusion of the Modes of Reasoning.
  - Confusion of Induction with Deduction.
  - Confusion of Induction with Analogy.
  - Confusion of Deduction with Analogy.
- Fallacies of Empirical Reasoning or Induction.
  - Jumping to a Conclusion.
  - The Accident.
  - *Non Idem pro Eodem.*
  - Indiscrimination.
  - The Previous Question.
- Fallacies of Inference or Deduction.
  - Contradiction in Terms.
  - Neglect of the Purpose of the Argument.
  - *Ignoratio Elenchi.*
  - Fallacies of Exceeding the Postulate.
    - The Fallacy of the Consequent.
    - The False Reciprocal.

The Illicit Ratio.
The Illicit Term.
The False Condition.
Denial of a Consistent Ratio.
Denial of a Consistent Term.
Denial of a Condition.

Fallacies of Analogy.
Assimilation of the Terms of the sub-relations.
Assimilation of Unlike Ratios.
Discrimination of Like Ratios.

CHAPTER XXVI

FAULTS OF THE EXISTING SYSTEMS OF LOGIC

From time to time in the course of this book, I have called attention to errors and defects that seem to me to exist in the scheme of Traditional Logic, in the scheme of Induction, and in Modern Logic. Lest, however, there should be any misunderstanding as to the nature or the extent of my disagreement with them, it seems advisable to summarise here the more important of the topics to which this disagreement extends. The promulgator of what purports to be new, is under obligation to make clear in what the novelty consists; and, irrespective of this obligation, it is germane to my purpose, of superseding Traditional Logic and Inductive Logic by a Logic that pretends to be more complete and more accurate, and Modern Logic by one that pretends to be more intelligible if less profound, to collect together what seem to me to be the main errors and defects of my predecessors, and expose them in all their naked deformity. When I am told, as no doubt I shall be told, that my system of Logic is wrong from top to bottom, and from beginning to end, I must bear the accusation with what equanimity I can summon; but I wish to forestall, if I can, the charge that my differences from pre-existing systems of Logic have been anticipated; that they are of trifling importance; or that they are mere verbal modifications.

In the first place, I regard it as a defect in existing systems of Logic, that its nature, purpose, and scope are left by them in doubt. No two logicians agree as to what Logic is, what it purports to treat of, or how far its range extends. They do not agree as to whether it is a Science or an Art. Those who regard it as a Science do not agree as to the nature of its subject-matter; those who regard it as an Art are not agreed as to what it does.

No logician up to the present time, except Spencer, who, to use an Hibernicism, was not a logician, has recognised that logical processes are not two, but three, or has admitted Analogy, properly so called, to a place among reasoning processes. The

two processes—Deduction and Induction—that they do admit, are not clearly or completely distinguished by any logician, nor has the proper distinction between them ever been identified. No logician but Hamilton, and he only dubiously and incompletely, has recognised that Deduction has no function except to explicate the implications of propositions. Every logician regards the syollogism as a means of proceeding from the known to the unknown—a means of discovering fact; every logician takes for granted that Induction, or part of Induction, is an application of the syllogism, speaks of the Inductive syllogism, or considers that Induction is reached by syllogistic reasoning. It has never hitherto been made clear that Deduction is nothing more than inference from postulates, whose truth or falsity is immaterial to the argument; and though it has been recognised by some logicians, in some connections, that Induction is based on propositions that are materially true, the Universal of Induction, as a relation found in experience to be constant, has never been clearly or consistently distinguished from the Universal of Deduction, which is a general rule postulated for the purpose of the argument. The whole of the secular Scholastic discussion of Universals proceeded upon the assumption that the Universal of Deductive reasoning must be true, or ought to be true, in fact. The assumption of Modern Logic, that every proposition refers to reality, or Reality, is a crude attempt to settle the question by dogmatic assertion. As far as it is possible to understand the mysterious and involved phraseology of Modern Logic, new Identity is old Universal writ differently. In short, in Traditional Logic, in Inductive Logic, and in Modern Logic, Deduction, Induction and Analogy are all muddled up together, and endless confusion results. A conspicuous example of this confusion is the riddle of the *petitio principii* in the syllogism, which Aristotle and all his successors have tried to solve; which every one of them has failed to solve; and which must remain insoluble until the argument from postulates is clearly distinguished from the argument from fact.

As Logic makes no clear distinction between Deductive reasoning and Inductive reasoning—between the *argumentum ex postulato*, and the *argumentum in materiâ*,—it is not to be expected that it will distinguish between the two "imports," or modes or degrees of reference to externality, of propositions, on which the

distinction between the two modes of reasoning rests. Nor does Logic make this distinction. On the contrary, Modern Logic asseverates with wearisome iteration that the reference of every proposition is to Reality, thereby necessarily implying, if Modern Logic did but know it, that the whole range of Mathematical Physics, and of higher Mathematics, is impossible and has no existence.

Another damning defect of Logic as hitherto expounded, is its failure to refer to the purpose of its argument. No previous writer on Logic known to me, recognises that the purpose of an argument is vital to its validity, or that an argument may be fully and completely valid for one purpose, and utterly false and invalid for another. When some adumbration of the importance of the purpose of the argument does reach the minds of logicians, it is straightway lost in speculations about the 'essence' of the Subject. That 'essential' means, in this connection, 'material to the purpose of the argument,' and cannot, in this connection, mean anything else, has never dawned upon their minds. If it is of the 'essence' of China clay to be a mineral, I do not see how this essential quality can be made non-essential by a decision of the Court of Appeal; but whether China clay is or is not a mineral for the purpose of a lease of minerals, is very properly within the function of the Court to determine.

Traditional Logic is defective both as to the propositions it excludes, and as to those it includes. Those it excludes on the strange ground that they are 'verbal,' as if every proposition were not verbal, are those alone whose predicate is identical with the Subject, or is a part of the Subject. Propositions that are meaningless because their terms are meaningless or contradictory, are not formally excluded from Traditional Logic. The range of propositions included by Traditional Logic is absurdly limited. By ignoring the Problem, or Incomplete proposition, Logic excludes itself from the proper conduct of Inductive reasoning, and prevents itself from appreciating the true nature of that kind of reasoning. By excluding the Modals that it recognises as Modals, Logic convicts itself of folly, and condemns itself to uselessness. By admitting that form of Modal that it does not recognise to be Modal, Logic exhibits a blindness that may be paralleled within its own limits, but scarcely exists outside of them. The Analogical proposition, which is the foundation of

an extensive and important mode of reasoning, is no more known to Logic than is the mode of reasoning itself.

Logic analyses the proposition into its constituents; and analyses it wrongly. The analysis is so manifestly and glaringly erroneous, that no logical mind could countenance it for a day; yet not only is Traditional Logic contented with it; not only does every logician with the exception of Aristotle himself, insist upon it; but Modern Logic, as far as Modern Logic can be understood, adopts and homologates it.

The Logical doctrine, that the Copula is the sole form of Ratio that can form the basis of argument, is so widely discordant with truth, that the contrary would be much nearer the mark. With marvellous perverseness of ingenuity, Logic has chosen, for its foundations, expressions that are every one of them ambiguous. The copula is ambiguous; the 'All' of the Universal Affirmative is ambiguous; the 'some' of the Particular proposition has twenty or thirty meanings; the 'either' of the hypothetical proposition is ambiguous; 'the Predicate' is ambiguous; the classical example of the Universal proposition 'All men are mortal' is doubly, trebly, and quadruply ambiguous.

By virtue of a confusion, the like of which can scarcely be discovered outside of Logical doctrine, Logic contrives to confound the meanings of the copula with the varieties of the Subject. The Subject must be an individual, a class, or a quality; therefore, says Logic, the Copula cannot express anything but the inclusion of an individual, or part of a class, in a class, or the attribution of a quality to an individual, or a class, or part of a class. This is a fallacy so ingeniously contrived, that it is difficult to find a place for it among the long list of fallacies, so many of the Canons of reasoning does it violate. It may be conveniently relegated to that class of fallacies described by Jevons, as an argument 'of so loose and inconsequent a character that no one can discover any cogency in it.'

The discussion on the connotation of terms, that finds a place in every text-book published since the researches of the Port Royal logicians, is superfluous and misleading. It implies that terms may be understood in connotation; in fact, they never are so understood in Traditional Logic, or hardly ever. In that Logic, every term must be 'distributed' or 'undistributed,' that is to say, it must be understood in denotation.

Logic divides all propositions into Universal and Particular; and the whole doctrine of the syllogism depends on the distinction. Yet most logicians so define the Particular proposition as to include it among Universals.

In supposing that Classification must, or ought to, proceed dichotomously, Traditional Logic is as wrong as it is in almost everything else—as wrong as it is, for instance, in supposing that there is any important difference between what it calls Natural Classification and other classifications. Logic confuses Generalisation with Induction and with Classification, and consequently fails to appreciate the true nature of either.

In its treatment of Quantity and Quality, Traditional Logic is deficient to the point of ineptitude. It considers that quantity is inherent in the whole proposition; whereas, in fact, it inheres in the terms only. Not only does Logic ignore by far the most of the many common and familiar quantities about which we reason all day long; but it practically denies their existence. Perhaps the most astounding defect in all Traditional Logic is its blindness to the fact that quantities, other than the 'distributive' and the 'non-distributive,' can be expressed in the Object-term, and are, in fact, as often, and as usefully expressed in the Object-term as in the Subject. That All men are mortal, is a proposition that Logic can appreciate; that it can admit into its sacred precincts; and on which it can exercise all the complicated and useful operations of its art; but that Mortality is an attribute of all men, is a proposition so strange, so bizarre, so unheard of, so monstrous, that neither Traditional Logic, nor any other Logic that has been formulated until now, even recognises the possibility of its existence. In the whole two thousand and odd years of its existence, Logic has never discovered that a property that all men possess, may be possessed by them all. An inference so startling, so amazing, is far, far beyond the range of Logic, and beyond its power to effect. Logic admits, as a logical proposition, 'All the men in the house were sportsmen,' and 'All the game on the estate were pheasants,' and it might admit, with a little demur, perhaps, that 'All the wine in the house was claret'; but that the house contained all the sportsmen, that the sportsmen shot all the pheasants on the estate, and drank all the wine in the house,—these are not logical propositions. To Logic, they are not propositions at all. No logician seems to have conceived the possibility

that such propositions can exist or be constructed, for certainly, no book on Logic makes any allusion to propositions constructed on this plan. It is not that such propositions have been examined by logicians and rejected. For Logic they have no existence. That the Object-term of a proposition, as well as the Subject, can express any quantity but the technical, conventional, and largely imaginary 'distributive' quantity of Traditional Logic, seems never, in the course of two thousand years, to have occurred to any logician. Traditional Logic stands within a chalk line drawn on the floor, and declares that the chalk line is a twenty-foot wall, that is not merely insurmountable, but that is also opaque to the vision!

Of the eight classes of particular quantities in daily use, and of the many quantities included in these classes, Logic knows nothing. That any one could wish to reason of few, many, most, nearly all, scarcely any, this, that, the other, each, any, the rest; or that, if he did so wish, his desire could be satisfied, seems never to have occurred to Logic. Of the scores of negative propositions known to common discourse and in daily use, Logic knows of five only, and practically limits its purview to two—the E and O propositions. To the rest it resolutely shuts its eyes. Of the thousands of forms of propositions that are used in daily discourse, and enter into the reasonings of practical men, as well as of logicians outside their books, Logic knows of four only—A, E, I, and O—and gravely declares that no more than these four exist, or at least, that if there are any besides, none but these four can enter into argument.

We look to the logician as our authority on propositions, just as we look to the zoologist as our authority on animals, and to the botanist as our authority on vegetables. If a logician or a botanist were to be told, by a zoologist, that there are but four forms of animals—cats, dogs, blackbeetles, and oysters—what would they think of him? what would they say? Would they not say 'We, with our limited experience, know of hundreds of forms of animals—cows, horses, goats, birds, fishes, creeping, flying, jumping, and swimming things innumerable. You, as an expert, must know of hundreds of forms for every one that is known to us, and do you say there are only four? Either you are joking, or you are bereft of your senses.' If a logician and a zoologist were to be told by a botanist that there are only four

forms of vegetables—oaks, palms, peas, and potatoes—what would they think of him, and what would they say? Would they not say 'We, who have never paid any attention to vegetables, know of hundreds more forms than this. In every garden, in every country walk, we see scores for every one you have enumerated. You, with your wider experience, and your expert knowledge, must be acquainted with innumerable forms that are unknown to us. Either you are joking, or your friends must be advised to look after you.' But when the zoologist and the botanist go to the logician, and ask him how many forms of propositions there are, and are told by him that there are but four, they receive the statement with unquestioning submission. Aristotle said so; and if he said so, it must be so. In spite of their daily experience of cow propositions and horse propositions; in spite of their experience, in every house and garden, in every country walk, and on every occasion of human intercourse, of hundreds of propositions besides the A, E, I, and O of Traditional Logic; they accept the assurance of logicians with a faith, that it would be a libel on the intelligence of children to call child-like. It is the most astounding instance of the power of authority to blind the eyes and deafen the ears to plain, insistent, and clamorous fact, that the history of the world can show. Truly says Bacon, 'The mind . . . has become possessed with corrupted doctrines, and filled with the vainest idols. The art of Logic . . . has tended more to confirm errors, than to disclose truth.'

According to Traditional Logic, the combinations of propositions into triplets in the form of the syllogism, amount in all to sixty-four. In fact, if all quantities of both Subject- and Object-term, and all combinations of the negative in Ratio and Terms, are taken into account, the triple combinations run into thousands of millions. The proportion of sixty-four to thousands of millions represents, therefore, the degree of adequacy of Traditional Logic in its own small department of Inference alone, leaving out of account the vast field of Inference that it does not pretend to explore, and the still greater field of Induction and Analogy.

Of the vast field of Empirical reasoning; of the solution of Problems; of Hypothesis and Conjecture; Traditional Logic knows nothing. Inductive Logic confuses Empirical reasoning with Inference, with Generalisation, and with Analogy, and so does Modern Logic.

According to some of its exponents, Traditional Logic is the Art of Reasoning; but they lay down no general rules for the employment of this art. The only semblance of rules available are the Laws of Thought, the *Dictum de omni et nullo*, and the Canons of the Syllogism.

The Laws of Thought are not Laws of Thought. If they are laws at all, they are laws of Things, the objects of thought. As 'verbal' propositions, which they are, Logic tells us they convey no information, and that we learn nothing from them. It is a relief to find myself at last in agreement with Traditional Logic on one matter. The Laws of Thought tell us nothing. They convey to us no information. We learn nothing from them. They are bald truisms, that fail to attain to the dignity even of platitudes.

The Canons of the Syllogism are not general Canons of Reasoning. They are Canons of an insignificantly small part of reasoning; and even as applicable to this part, they are incorrect and misleading.

The Dictum de omni et nullo is a truism no less bald, no less empty, than the so-called Laws of Thought. It asserts, or it should assert, if properly stated, that what is predicated of every member of a class is predicated of each and any member of that class. Why, of course it is. The meanings of Every, Any, and Each, are so closely alike, that it requires some skill to distinguish them; and to say that what is true of every one is true of each and of any one, satisfies completely the description of a 'verbal' proposition. To say that what is true of every one is true of each one, is to say what is true; but to imagine that it can be erected into a general principle of reasoning, and be made the basis of any reasoning process that is more than the restatement, in other words, of part of a general proposition, is a notion too crazy to enter the mind of any one but a logician.

The Laws of Thought and the *Dictum* are acknowledged and proclaimed to be the foundation and substructure on which the whole fabric of Traditional Logic rests. They are worshipped with unquestioning reverence by all Logicians; and the best that can be said for them is that they are empty and silly truisms. These be thy Gods, O Israel!

The Immediate Inferences of Traditional Logic are four in number. Of these, one is, without doubt, illegitimate and erroneous.

The others are of doubtful validity, and of still more doubtful utility. Of the eight classes that actually exist of Immediate Inferences; of the indefinitely numerous multitude of Inferences that are included in these eight classes, all valid, and all in frequent use, Traditional Logic knows no more than I know of the configuration of the surface of the other side of the moon, or of the mental process by which logicians persuade themselves that the Laws of Thought and the *Dictum de omni* are of any importance. Traditional Logic can no more infer from 'She saw him do it' to 'She was there when he did it' than it can infer from 'He designed a sundial' to 'He was conversant with Astronomy and Geometry.' All that Traditional Logic can obtain from these postulates is 'Some person who saw him do it was she,' 'Some person who did not design a sundial was not he,' and 'It was not he that did not design a sundial.' Whether these inferences compare in elegance and value with the first two, the reader must judge.

As for Mediate Inference, the crowning achievement of Traditional Logic, to which this Logic owes its enormous prestige, it is applicable to a small proportion only of Compound propositions; from the small proportion to which it is applicable it can extract but one, or at most two, of the multitudes they may contain; it is not self-evidently valid, but needs, in most cases, an awkward, cumbrous, and complicated process of reduction to make it appear so; its rules are faulty; and it cannot be applied without a knowledge of the barbarous mnemonic verses. And this clumsy and inefficient process, of extremely limited application, and still more limited utility, is the crown and flower of Traditional Logic; its pride and its glory; its one title to the reverence and applause that mankind have, for two thousand years, so freely and lavishly bestowed upon it. Never, in the long history of man, has kudos been obtained so cheaply.

Of Analogy, in the strict Aristotelian sense, which is a valid, telling, useful, and frequently employed mode of reasoning, nothing is known by any system of Logic hitherto devised, though Spencer, who was not a logician, recognised its use and value. If logicians mention it at all, they either confuse it with Empirical Reasoning, or they fail to appreciate that it is a mode of reasoning at all.

The reasonings of Mathematics have no part or lot in any

scheme of Logic hitherto propounded; or, if they have, they are misappreciated, and taken to be examples of syllogistic reasoning, which they very seldom are. The understood doctrine that Mathematical reasoning is so different from other reasoning, that Logic need take no heed of it, seems to me merely another instance of the passion of logicians for hedging themselves about with conventional, unnecessary, and unreasoning restrictions, and for excluding from Logic what properly belongs to it.

Finally, the fallacies *in dictione* of Aristotle are not, strictly speaking, fallacies at all, and the fallacies *extra dictionem* are, in Traditional Logic, illogical excrescences. Logicians do not enumerate or recognise by any means all the fallacies that may be perpetrated. One whole class of Fallacies—the fallacies of confusion of the mode of argument—is almost confined to books on Logic, and is cherished by logicians as their own peculiar pet. Traditional Logic lays down no rules by which the fallacies that it does enumerate may be avoided, nor are its fallacies *extra dictionem* breaches of any of its rules. A more illogical position it would be difficult to invent. When a man has fallen into a pit, it does not help him much to tell him the name of the pit; but this is all the aid that Logic, whether Traditional, Inductive, or Modern, affords him. It seems to me that the least any one, who professes and calls himself a logician, can do for the wandering reasoner, is to stake out his route, and to put up notice boards, inscribed 'Danger! Beware of fallacy! Keep to the right.' But Logic, as hitherto taught, does nothing of this. All it does is to say to the unwary reasoner, who has fallen into a fallacy and broken his shins, 'My poor friend, it will comfort you to know that the fallacy into which you are fallen is called *ignoratio elenchi*. There are plenty more fallacies farther along your path. I cannot tell you how to avoid them; for this you must trust to your own natural acuteness; but I will not leave you altogether without assistance. Here, suffering stranger, is a list of their names, or at any rate, of the names of some of them. Whenever you find yourself an object of scorn from having fallen into another pit, it will console you to find, in this list, the name of the pit into which you have fallen.'

If, in the foregoing pages, I have paid less attention, and given less prominence, to the doctrines of Modern Logic than its votaries may think it deserves, the fault is their own. Supposing it to be

a new departure, a divergence from Traditional Logic, and an improvement on it, I was prepared to welcome Modern Logic with open arms; but I soon found reason to despise it; for its exponents are either incapable of expressing themselves intelligibly, or they deliberately seek to impart to their writings a spurious air of profundity, by the constant use of expressions that are unintelligible. The reason I have not attacked Modern Logic with the weapon of argument is the same reason that would prevent me from attacking a London fog with a small-sword. There is nothing tangible or palpable to attack. The only way to dissipate a fog is to produce such a change in the atmosphere as is incompatible with fog. If logicians can be induced to think clearly; to form crisp and definite notions in their minds; to express these notions in appropriate words, orderly arranged, and duly punctuated; and to refuse admission, as not pertaining to Logic, or as fallacious, to any expressions that are flagrant and wilful violations of these rules; Modern Logic will be dissipated, as fog is dissipated by sun and wind. It will die out, as men of lowly organised type die out in the presence of high civilisation; because it finds itself in an intellectual and moral atmosphere incompatible with its existence. When I observe the reverence and awe with which some of the recent exponents of Traditional Logic treat the lucubrations of Modern Logic, I am irresistibly reminded of the story of the Emperor's clothes. They were invisible, so said the clothiers who supplied them, to every one who was unfit for his place, or was very stupid; so every courtier, and official, and officer of State, made haste to out-do every other in the loudness and lavishness of his praises; and the whole populace followed suit. It was, at last, a little child who cried out 'Why, the Emperor has no clothes on!' At once the populace took up the cry, and at length even the courtiers, who were undoubtedly votaries of Traditional Logic, were obliged to admit that they could see no clothes upon their Sovereign. In Logic, I am a child; and when I see the exponents of Traditional Logic bowing down before Modern Logic, and doing homage to it, I am irresistibly impelled to cry out 'The Emperor has no clothes on!'

If there is any votary of Modern Logic who has sufficient faith in his own doctrines to break a lance in their defence, let him come out of the fog, and show himself and his doctrines in a clear

light, and I shall be pleased to oblige him; but I am under no obligation to choke myself and blind myself by following him into a region of obscurity and mystery, that I verily believe I could recognise, but for the fog, as a thoroughfare, or a blind alley, with which I have been familiar from childhood.

To the examination of logical doctrine contained in this book, I have brought no academic equipment. I pretend to no scholarship in Greek, to no scholastic learning. Any logician can trip me up on knowledge of the pure text of Aristotle. I could not, without the help of a text-book, reduce Bocardo to Barbara, or Fesapo to Ferio, even if I were so curiously constituted as to wish to perform the operation. The only qualifications I bring to the task are ordinary common sense and a plentiful lack of reverence for authority in general, and for Greek philosophy in particular. The only weapons I am armed with, are the sling of common sense, and a few smooth pebbles of fact from the brook of experience. There is, however, a mode of argument, hitherto unmentioned, that I may pray in aid of my attack upon Traditional Logic. Darwin's doctrines were fiercely opposed by theologians until it was found that, if Genesis is read aright, the doctrine of the Origin of Species by Natural Selection can be found therein. After that discovery, all went well with Darwin and his doctrines. I suggest that if Aristotle is read aright, and understood in the sense he intended, it will be found that my doctrines are in harmony with his, and are potentially contained in his Organon. In case there is any doctrine of mine that cannot be found in the Organon, I submit that it was contained in those of his books that have been lost, and have not come down to us; and I defy my critics to prove that it was not so contained. Moreover, if there is anything in Aristotle inconsistent with the doctrines I propound, then the passages in which these inconsistencies are found, are not to be attributed to Aristotle, but have been inserted by transcribers, either from carelessness, or for their own nefarious purposes. This mode of argument is not, indeed, taught in Aristotelian Logic; but it is freely employed by those who have been brought up in the Aristotelian atmosphere, and is an argument of great power and efficacy. It sometimes goes by the name of the Higher Criticism.

Here I terminate my review of the Logic of my predecessors, and my exposition of the New Logic. This New Logic may be

right or wrong, and I may or may not have been able to commend it to the assent of my readers; but of this I am sure—that the Logic of Tradition can no longer stand before the world as a complete, an accurate, or a valid scheme of doctrine. Its hour is struck; its sentence is delivered; its doom is pronounced. The handwriting is on the wall; the enemy is at the gate; Aristotelian Logic is weighed in the balances, and found wanting; and its kingdom is to be taken away, and given to one more worthy. In vain will it struggle against the inevitable; in vain plead for a longer existence. If it consults its own dignity, it will follow the example of Socrates, and calmly lay down a life that is no longer serviceable, and no longer ministers to the uses of man. To sink into the position of Giant Pope and Giant Pagan in the immortal allegory; to sit unheeded by the wayside, threatening indifferent wayfarers with penalties that it is powerless to enforce; to cry 'Unless you reason by the syllogism, your arguments have no validity, your reasonings are unsound'; is a part unworthy of its splendid history; derogatory to its great traditions. Men and women will continue in the future, as in the past, to reason without employing the syllogism; and, so reasoning, they will continue in the future, as in the past, to survive, to prevail, to increase and multiply exceedingly; and they will justly adduce their success as proof beyond cavil that their reasonings, on the whole, are sound. Against fact, as against stupidity, even the gods themselves fight in vain. But Aristotelian Logic, on its deathbed, may look back on a life well spent. It has had a royal career. It has dominated the minds of men for sixty generations of the human race. It has received honour unprecedented, and homage unrivalled. It has outlived dynasties, nations, civilisations, and religions. It is older than the Papacy; older than Christianity itself. It is the oldest product of the human intellect that exists in Europe; and now it must submit to the inexorable doom that, soon or late, overtakes all earthly things.

That spell upon the minds of men
Breaks, never to unite again.

Pallida mors æquo pulsat pede pauperum tabernas, Regumque turres.
Its fight is fought; its race is run; may it rest for ever in peace!

APPENDIX

A CLASSIFICATION OF SCIENCES

A CHAPTER on the Classification of the Sciences is included in some books on Logic; and the reader is inclined to wonder how it got there, and what it is doing there. It appears to have no connection with Logic, except as an essay in classification and an example of classification; and classification is itself no integral part of Traditional Logic. The classification of the Sciences has, however, with Logic a connection that must, I suppose, have been inarticulately present to the minds of those logicians who have included a classification of sciences in their books on Logic; but a connection they neither explain nor refer to.

Early in this book it was asserted that words have been devised, or have grown, in response to the needs that have been felt to express mental states in words; and similarly, we may be sure that if there are different ways of reasoning about things, it is because things have presented themselves in different aspects, or as of different natures, which have elicited these different ways of reasoning about them. As Science is organised Knowledge, and as Knowledge is acquired largely by reasoning, there is a *primâ facie* likelihood that the different kinds of Science may correspond with the different kinds of reasoning; and on inquiry we find that this is so. We find that Sciences may be divided into three main kinds, which correspond with the three modes of reasoning, and correspond also with the three varieties of subject-matter of these modes of reasoning.

The subject-matter of Inductive Reasoning is observed fact, the fruit of experience: the subject-matter of Deductive Reasoning is postulated quasi-fact, the fruit of imagination: the subject-matter of Analogy is relation; and correspondingly we find that there are three main groups or classes of Sciences, similarly characterised.

The Inductive Sciences have for their subject-matter facts of experience; and treat these facts primarily and mainly by Inductive Reasoning.

The Deductive Sciences have for their subject-matter postulated quasi-fact; and treat this postulated matter primarily and mainly by Deductive Reasoning.

The Sciences of Relations have for their subject-matter relations; and treat these relations mainly by Analogical Reasoning.

Since, however, all knowledge is relative, it follows that relations, and reasoning about relations, cannot be excluded from the first two classes of Sciences. Since observation and knowledge of fact are frequently defective, it follows that they are often supplemented by postulation to fill the gaps, and that Inductive Science must often pray in aid the services of Deductive reasoning. The postulated quasi-facts of Deduction are derived from experience, in that they are experiences from which some factors are postulated away; and since knowledge of relations is gained from experience, it follows that Analogical reasoning is based ultimately on observed fact. The inter-relations of the different classes of Sciences are, therefore, numerous and close: but in spite of this, they are distinguishable in their main features, and constitute what our forefathers would have called Natural Kinds.

Inductive Sciences treat of facts observed; and these facts may be mental or non-mental, which gives us the first division of this group of Sciences.

Mental facts may be regarded *simpliciter*, in and for themselves, and without further reference: so regarded they are the subject-matter of Psychology. Or they may be regarded, not *simpliciter*, but with reference to extra-mental facts, real or postulated, with which they correspond. If the mental fact thus regarded is the process of establishing mental relations, the Science is Logic; if the mental fact is not the process of establishing mental relations, but the established relations, then the Science is Epistemology.

Non-mental facts of observation are divisible into two broadly distinguished classes—Material bodies and Modes of Motion. Each of these forms the subject-matter of a large group of Sciences.

Material bodies are divisible into Living and not-Living; the former being the subject-matter of the Biological sciences, the latter of the first group of Physical sciences. The Biological sciences are well characterised, and their limits are not often confused; but the term Physical Science is by no means well defined. It includes, in fact, three different groups of Sciences that are well

distinguished from one another, of which the Sciences having not-living natural material bodies for their subject-matter, constitute the first. This group of Sciences includes Astronomy, Geology, Oceanology, Mineralogy, Metallurgy, Crystallology, Chemistry, and so forth, all easily distinguished from the next group of Physical Sciences, which includes:—

Sciences whose subject-matter consists of Modes of Motion as observed facts. They are divisible primarily according as the motion is Molar, Molecular, or Ethereal. To the first sub-group belong Ballistics and Hydraulics; to the second Molecular Physics; and to the third the Sciences of Gravitation, Heat, Light, Electricity and Magnetism, as ascertained from observation and experiment.

This outline of the Inductive Sciences will scarcely be complete without a further expansion of the Biological Sciences. The obvious primary division is into Phytology and *Z*oology. Whether Anthropology is included under *Z*oology, or forms a third class of co-ordinate rank, is a matter of taste; but in either case Anthropology is the fruitful mother of a large family of Sciences. Individual man may be investigated, and knowledge gained and systematised, as to his properties, his kinds, his constituents, his relations, and so forth. He may be investigated as to his diseases, his conduct, his history, and in many other respects. He may also be regarded as massed together in communities, and then becomes the subject-matter of Sociology in all its branches. Finally man is a maker, and every one of the things he makes may be the subject-matter of a science, and many products of man are in fact subject-matters of several sciences each. He makes things material, such as bridges and houses, subject-matters respectively of the sciences of Engineering and Architecture; and he makes things immaterial, such as laws and propositions, the subject-matters, respectively, of the sciences of Jurisprudence and Logic.

Deductive Sciences, like Deductive Reasoning, which they mainly employ, have for their subject-matter, not observed facts, but quasi-facts, postulated for the purpose of argument. These quasi-facts are derived from observed facts by abstracting certain qualities, and then postulating away the remainder, and thereupon treating the abstracted qualities as if they existed in isolation from their associates, with which, in experience, they are invariably

combined. The things thus treated may be mental facts or material facts; and in the latter case may be material bodies, living or not living, or modes of motion, molar, molecular, or ethereal. Thus, we may postulate away from the complete mental equipment of man, all mental qualities but desire for gain, industry, honesty, and intelligence; and it is this abstract that forms the human subject-matter of the deductive aspect of Political Economy. From water we may postulate away all qualities but equi-pressure and weight, and so form the subject-matter of hydrostatics and hydrodynamics. From light we may postulate away all qualities but those of radiating in straight lines, reflection, and refraction, and so form the subject-matter of Geometrical Optics; Statics treats of levers postulated to be without weight or flexibility; of pulleys from which friction has been postulated away, and so on. These form a third group of Physical Sciences, often called Mathematical Physics, since their treatment is mainly numerically quantitative.

The third primary group of Sciences are those which treat, for the most part by Analogical reasoning, neither of mental facts nor of material bodies, nor of modes of motion; neither of observed facts nor of postulated quasi-facts, but of relations; and not of relations between mental facts, material bodies or modes of motion, but of relations alone, considered abstractedly. They are divisible according to the relations of which they treat, and are three in number. Space-relations form the subject-matter of the Science of Geometry. Numerical relations form the subject-matter of the Science of Mathematics. But since numbers are known to us primarily in sequence—since when we count, we must count serially—it is clear that numerical relations originate as time-relations; and Mathematics has its foundations in relations of Time, as Geometry is the Science of relations of Space. A third Science of relations has for its subject-matter the relations between Subject and Object; and this is Metaphysics.

Postulation is not limited to material bodies or to modes of motion. It may be applied to relations of quantity also; and such postulated relations form the subject-matter of the Integral and other Calculi. These are so connate with Mathematics that they are usually, and no doubt rightly, considered branches or sub-sciences of Mathematics; though it is clear that, as their subject-matter is postulated, they are, strictly speaking, Deductive Sciences. It

is merely a question of relative importance for the purpose in hand. If the fact that the subject-matter consists of abstract relations is, for any purpose, more important, then they are Mathematical sciences. If the postulation of the subject-matter is, for any purpose, more important than its nature as abstract relations, then for that purpose they are Deductive Sciences. They are, in fact, both Mathematical and Deductive.

To whichever class a Science may be relegated, it does not long remain purely Inductive, purely Deductive, or purely Analogical in its methods. As long as Inductive Science is content to observe, to describe, to analyse, and to classify, it remains pure; but the mind of man is not long content with mere knowledge. It demands explanation also; and explanation, by which is meant knowledge of causes, is not often to be had without the aid of Deduction from hypothesis, that is to say from a postulate. Moreover, as soon as Inductive science becomes accurate, it must become quantitative; that is to say, it must speak in numbers, and so pray in aid the science of relations. And further, whenever investigation is pushed to its limit, it brings up against some problem of Metaphysics, and so becomes involved with another science of relations.

Deductive Science is the science of postulates; but postulates are themselves but fragments drawn from the stores of Experience. A lever that is without weight is derived from levers actually used in experience. The weight that is postulated away from it, is weight that it has been found in experience to possess. The conclusions of Deduction are no sooner made than they are carried across to Induction. They are compared with fact, and are made the occasion of new investigation, which often results in the revelation of facts previously unsuspected.

In general outline, the suggested classification is as follows:—

- Inductive Sciences. Sciences of the observed facts of
  - Mental Experiences — The Mental Sciences.
  - Material Bodies
    - Living — The Biological Sciences.
    - Not living — Physical Sciences (1st group).
  - Modes of Motion — Physical Sciences (2nd group). Experimental Physics.

Deductive Sciences. Sciences of postulated quasi-fact concerning	Material Bodies.—Physical Sciences (3rd group).	
	Modes of Motion.—Mathematical Physics.	
	Relations—Integral and other Calculi.	
Analogical Sciences. Sciences of Relations	Of Number—Mathematics.	
	Of Space—Geometry.	
	Of Subject and Object—Metaphysics.	

The soundness of a classification, provided the rules of classification are observed, depends on the purpose for which the classification is required. For the purpose of a mere arrangement, setting forth resemblances and differences, placing together those that are, on the whole, most alike, and separating those that, on the whole, are most unlike, this classification is submitted to be sound; but for the practical purposes of actual study, it is not necessarily the best. In practice, Photology is studied as observed fact and as postulated quasi-fact. Photometry is almost a pure Inductive Science. Catoptrics is almost purely Deductive. Still, Photology is always regarded as consisting of two sciences, and Experimental Photology and Mathematical Photology are distinguished in all University curricula. The same is the case with the Sciences of which Heat, Electricity, and Magnetism form the subject-matter. Chemistry also has its Deductive as well as its Inductive aspect; but as the Inductive science preponderates greatly over the Deductive, the two Sciences have not hitherto been separately considered. The time is at hand, however, when Experimental Chemistry will be as completely separated from Deductive Chemistry as Experimental Mechanics is separated from Statics and Dynamics.

As treating of postulated relations, the Calculi are Deductive Sciences. As treating of relations mainly by Analogical reasoning, they are Analogical Sciences. Under which class they shall be placed depends on the purpose of the classification; and since this purpose is usually that of determining their place in a curriculum of study, they are usually relegated to Mathematics, to which also their mode of treatment is most appropriate.

THE END.

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