

INTRODUCTION.

Section 1. LOGIC is divided into two branches, namely--

(1) Inductive,

(2) Deductive.

Section 2. The problem of inductive logic is to determine the actual truth or falsity of propositions: the problem of deductive logic is to determine their relative truth or falsity, that is to say, given such and such propositions as true, what others will follow from them.

Section 3. Hence in the natural order of treatment inductive logic precedes deductive, since it is induction which supplies us with the general truths, from which we reason down in our deductive inferences.

Section 4. It is not, however, with logic as a whole that we are here concerned, but only with deductive logic, which may be defined as The Science of the Formal Laws of Thought.

Section 5. In order fully to understand this definition we must know exactly what is meant by 'thought,' by a 'law of thought,' by the term 'formal,' and by 'science.'

Section 6. Thought, as here used, is confined to the faculty of comparison. All thought involves comparison, that is to say, a recognition of likeness or unlikeness.

Section 7. The laws of thought are the conditions of correct thinking. The term 'law,' however, is so ambiguous that it will be well to determine more precisely in what sense it is here used.

Section 8. We talk of the 'laws of the land' and of the 'laws of nature,' and it is evident that we mean very different things by these expressions. By a law in the political sense is meant a command imposed by a superior upon an inferior and sanctioned by a penalty for disobedience. But by the 'laws of nature' are meant merely certain uniformities among natural phenomena; for instance, the 'law of gravitation' means that every particle of matter does invariably attract every other particle of matter in the universe.

Section 9. The word 'law' is transferred by a metaphor from one of these senses to the other. The effect of such a command as that described above is to produce a certain amount of uniformity in the conduct of men, and so, where we observe uniformity in nature, we assume that it

is the result of such a command, whereas the only thing really known to us is the fact of uniformity itself.

Section 10. Now in which of these two senses are we using the term 'laws of thought'? The laws of the land, it is plain, are often violated, whereas the laws of nature never can be so [Footnote: There is a sense in which people frequently speak of the laws of nature being violated, as when one says that intemperance or celibacy is a violation of the laws of nature, but here by 'nature' is meant an ideal perfection in the conditions of existence.]. Can the laws of thought be violated in like manner with the laws of the land? Or are they inviolable like the laws of nature?

Section 11. In appearance they can be, and manifestly often are violated-for how else could error be possible? But in reality they can not. No man ever accepts a contradiction when it presents itself to the mind as such: but when reasoning is at all complicated what does really involve a contradiction is not seen to do so; and this sort of error is further assisted by the infinite perplexities of language.

Section 12. The laws of thought then in their ultimate expression are certain uniformities which invariably hold among mental phenomena, and so far they resemble the laws of nature: but in their complex applications they may be violated owing to error, as the laws of the land may be violated by crime.

Section 13. We have now to determine the meaning of the expression 'formal laws of thought.'

Section 14. The distinction between form and matter is one which pervades all nature. We are familiar with it in the case of concrete things. A cup, for instance, with precisely the same form, may be composed of very different matter-gold, silver, pewter, horn or what not?

Section 15. Similarly in every act of thought we may distinguish two things--

- (1) the object thought about,
- (2) the way in which the mind thinks of it.

The first is called the Matter; the second the Form of Thought.

Section 16. Now Formal, which is another name for Deductive Logic, is concerned only with the way in which the mind thinks, and has nothing to do with the particular objects thought about.

Section 17. Since the form may be the same, whilst the matter is different, we may say that formal logic is concerned with the essential and necessary elements of thought as opposed to such as are accidental and contingent. By 'contingent' is meant what holds true in some cases, but not in others. For instance, in the particular case of equilateral triangles it is true to say, not only that 'all equilateral triangles are equiangular,' but also that 'all equiangular triangles are equilateral.' But the evidence for these two propositions is independent. The one is not a formal consequence of the other. If it were, we should be able to apply the same inference to all matter, and assert generally that if all A is B, all B is A, which it is notorious that we cannot do.

Section 18. It remains now for the full elucidation of our definition to determine what is meant by 'science.'

Section 19. The question has often been discussed whether logic is a science or an art. The answer to it must depend upon the meaning we assign to these terms.

Section 20. Broadly speaking, there is the same difference between Science and Art as there is between knowing and doing.

Science is systematized knowledge;
Art is systematized action.
Science is acquired by study;
Art is acquired by practice.

Section 21. Now logic is manifestly a branch of knowledge, and does not necessarily confer any practical skill. It is only the right use of its rules in thinking which can make men think better. It is therefore, in the broad sense of the terms, wholly a science and not at all an art.

Section 22. But this word 'art,' like most others, is ambiguous, and is often used, not for skill displayed in practice, but for the knowledge necessary thereto. This meaning is better conveyed by the term 'practical science.'

Section 23. Science is either speculative or practical. In the first case we study merely that we may know; in the latter that we may do.

Anatomy is a speculative science;
Surgery is a practical science.

In the first case we study the human frame in order that we may understand its structure; in the second that we may assist its needs. Whether logic is a speculative or a practical science depends entirely upon the way in which it is treated. If we study the laws of thought merely that we may know what they are, we are making it a speculative science; if we study the same laws with a view to deducing rules for the guidance of thought, we are making it a practical science.

Section 24. Hence logic may be declared to be both the science and the art of thinking. It is the art of thinking in the same sense in which grammar is the art of speaking. Grammar is not in itself the right use of words, but a knowledge of it enables men to use words correctly. In the same way a knowledge of logic enables men to think correctly, or at least to avoid incorrect thoughts. As an art logic may be called the navigation of the sea of thought.

Section 25. The laws of thought are all reducible to the three following axioms, which are known as The Three Fundamental Laws of Thought.

(1) The Law of Identity--

Whatever is, is;

or, in a more precise form,

Every A is A.

(2) The Law of Contradiction--

Nothing can both be and not be;

Nothing can be A and not A.

(3) The Law of Excluded Middle--

Everything must either be or not be;

Everything is either A or not A.

Section 26. Each of these principles is independent and self-evident.

Section 27. If it were possible for the law of identity to be violated, no violation of the law of contradiction would necessarily ensue: for a thing might then be something else, without being itself at the same time, which latter is what the law of contradiction militates against. Neither would the law of excluded middle be infringed. For, on the supposition, a thing would be something else, whereas all that

the law of excluded middle demands is that it should either be itself or not. A would in this case adopt the alternative of being not A.

Section 28. Again, the violation of the law of contradiction does not involve any violation of the law of identity: for a thing might in that case be still itself, so that the law of identity would be observed, even though, owing to the law of contradiction not holding, it were not itself at the same time. Neither would the law of excluded middle be infringed. For a thing would, on the supposition, be both itself and not itself, which is the very reverse of being neither.

Section 29. Lastly, the law of excluded middle might be violated without a violation of the law of contradiction: for we should then have a thing which was neither A nor not A, but not a thing which was both at the same time. Neither would the law of identity be infringed. For we should in this case have a thing which neither was nor was not, so that the conditions of the law of identity could not exist to be broken. That law postulates that whatever is, is: here we have a thing which never was to begin with.

Section 30. These principles are of so simple a character that the discussion of them is apt to be regarded as puerile. Especially is this the case with regard to the law of identity. This principle in fact is one of those things which are more honoured in the breach than in the observance. Suppose for a moment that this law did not hold--then what would become of all our reasoning? Where would be the use of establishing conclusions about things, if they were liable to evade us by a Protean change of identity?

Section 31. The remaining two laws supplement each other in the following way. The law of contradiction enables us to affirm of two exhaustive and mutually exclusive alternatives, that it is impossible for both to be true; the law of excluded middle entitles us to add, that it is equally impossible for both to be false. Or, to put the same thing in a different form, the law of contradiction lays down that one of two such alternatives must be false; the law of excluded middle adds that one must be true.

Section 32. There are three processes of thought

- (1) Conception.
- (2) Judgement.
- (3) Inference or Reasoning.

Section 33. Conception, which is otherwise known as Simple Apprehension, is the act of forming in the mind the idea of anything, e.g. when we form in the mind the idea of a cup, we are performing the process of conception.

Section 34. Judgement, in the sense in which it is here used [Footnote: Sometimes the term 'judgement' is extended to the comparison of nameless sense-impressions, which underlies the formation of concepts. But this amounts to identifying judgement with thought in general.] may be resolved into putting two ideas together in the mind, and pronouncing as to their agreement or disagreement, e.g. we have in our minds the idea of a cup and the idea of a thing made of porcelain, and we combine them in the judgement--'This cup is made of porcelain.'

Section 35. Inference, or Reasoning, is the passage of the mind from one or more judgements to another, e.g. from the two judgements 'Whatever is made of porcelain is brittle,' and 'This cup is made of porcelain,' we elicit a third judgement, 'This cup is brittle.'

Section 36. Corresponding to these three processes there are three products of thought, viz.

- (1) The Concept.
- (2) The Judgement.
- (3) The Inference.

Section 37. Since our language has a tendency to confuse the distinction between processes and products, [Footnote: E.g. We have to speak quite indiscriminately of Sensation, Imagination, Reflexion, Sight, Thought, Division, Definition, and so on, whether we mean in any case a process or a product.] it is the more necessary to keep them distinct in thought. Strictly we ought to speak of conceiving, judging and inferring on the one hand, and, on the other, of the concept, the judgement and the inference.

The direct object of logic is the study of the products rather than of the processes of thought. But, at the same time, in studying the products we are studying the processes in the only way in which it is possible to do so. For the human mind cannot be both actor and spectator at once; we must wait until a thought is formed in our minds before we can examine it. Thought must be already dead in order to be dissected: there is no vivisection of consciousness. Thus we can never know more of the processes of thought than what is revealed to us in

their products.

Section 38. When the three products of thought are expressed in language, they are called respectively

(1) The Term.

(2) The Proposition.

(3) The Inference.

Section 39. Such is the ambiguity of language that we have already used the term 'inference' in three different senses--first, for the act or process of inferring; secondly, for the result of that act as it exists in the mind; and, thirdly, for the same thing as expressed in language. Later on we shall have to notice a further ambiguity in its use.

Section 40. It has been declared that thought in general is the faculty of comparison, and we have now seen that there are three products of thought. It follows that each of these products of thought must be the result of a comparison of some kind or other.

The concept is the result of comparing attributes.

The judgement is the result of comparing concepts.

The inference is the result of comparing judgements.

Section 41. In what follows we shall, for convenience, adopt the phraseology which regards the products of thought as clothed in language in preference to that which regards the same products as they exist in the mind of the individual. For although the object of logic is to examine thought pure and simple, it is obviously impossible to discuss it except as clothed in language. Accordingly the three statements above made may be expressed as follows--

The term is the result of comparing attributes.

The proposition is the result of comparing terms.

The inference is the result of comparing propositions.

Section 42. There is an advantage attending the change of language in the fact that the word 'concept' is not an adequate expression for the first of the three products of thought, whereas the word 'term' is. By a concept is meant a general notion, or the idea of a class, which corresponds only to a common term. Now not only are common terms the results of comparison, but singular terms, or the names of individuals, are so too.

Section 43. The earliest result of thought is the recognition of an individual object as such, that is to say as distinguished and marked off from the mass of its surroundings. No doubt the first impression produced Upon the nascent intelligence of an infant is that of a confused whole. It requires much exercise of thought to distinguish this whole into its parts. The completeness of the recognition of an individual object is announced by attaching a name to it. Hence even an individual name, or singular term, implies thought or comparison. Before the child can attach a meaning to the word 'mother,' which to it is a singular term, it must have distinguished between the set of impressions produced in it by one object from those which are produced in it by others. Thus, when Vergil says

Incipe, parve puer, risu cognoscere matrem,

he is exhorting the beatific infant to the exercise of the faculty of comparison.

Section 44. That a common term implies comparison does not need to be insisted upon. It is because things resemble each other in certain of their attributes that we call them by a common name, and this resemblance could not be ascertained except by comparison, at some time and by some one. Thus a common term, or concept, is the compressed result of an indefinite number of comparisons, which lie wrapped up in it like so many fossils, witnessing to prior ages of thought.

Section 45. In the next product of thought, namely, the proposition, we have the result of a single act of comparison between two terms; and this is why the proposition is called the unit of thought, as being the simplest and most direct result of comparison.

Section 46. In the third product of thought, namely, the inference, we have a comparison of propositions either directly or by means of a third. This will be explained later on. For the present we return to the first product of thought.

Section 47. The nature of singular terms has not given rise to much dispute; but the nature of common terms has been the great battle-ground of logicians. What corresponds to a singular term is easy to determine, for the thing of which it is a name is there to point to: but the meaning of a common term, like 'man' or 'horse,' is not so obvious as people are apt to think on first hearing of the question.

Section 48. A common term or class-name was known to mediæval logicians under the title of a Universal; and it was on the question 'What is a Universal?' that they split into the three schools of Realists, Nominalists, and Conceptualists. Here are the answers of the three schools to this question in their most exaggerated form--

Section 49. Universals, said the Realists, are substances having an independent existence in nature.

Section 50. Universals, said the Nominalists, are a mere matter of words, the members of what we call a class having nothing in common but the name.

Section 51. Universals, said the Conceptualists, exist in the mind alone. They are the conceptions under which the mind regards external objects.

Section 52. The origin of pure Realism is due to Plato and his doctrine of 'ideas'; for Idealism, in this sense, is not opposed to Realism, but identical with it. Plato seems to have imagined that, as there was a really existing thing corresponding to a singular term, such as Socrates, so there must be a really existing thing corresponding to the common term 'man.' But when once the existence of these general objects is admitted, they swamp all other existences. For individual men are fleeting and transitory--subject to growth, decay and death--whereas the idea of man is imperishable and eternal. It is only by partaking in the nature of these ideas that individual objects exist at all.

Section 53. Pure Nominalism was the swing of the pendulum of thought to the very opposite extreme; while Conceptualism was an attempt to hit the happy mean between the two.

Section 54. Roughly it may be said that the Realists sought for the answer to the question 'What is a Universal?' in the matter of thought, the Conceptualists in the form, and the Nominalists in the expression.

Section 55. A full answer to the question 'What is a Universal?' will bring in something of the three views above given, while avoiding the exaggeration of each. A Universal is a number of things that are called by the same name; but they would not be called by the same name unless they fell under the same conception in the mind; nor would they fall under the same conception in the mind unless there actually existed similar attributes in the several members of a class, causing us to regard them under the same conception and to give them the same name. Universals therefore do exist in nature, and not merely in the

mind of man: but their existence is dependent upon individual objects, instead of individual objects depending for their existence upon them. Aristotle saw this very clearly, and marked the distinction between the objects corresponding to the singular and to the common term by calling the former Primary and the latter Secondary Existences. Rosinante and Excalibur are primary, but 'horse' and 'sword' secondary existences.

Section 56. We have seen that the three products of thought are each one stage in advance of the other, the inference being built upon the proposition, as the proposition is built upon the term. Logic therefore naturally divides itself into three parts.

The First Part of Logic deals with the Term;
The Second Part deals with the Proposition;
The Third Part deals with the Inference.