FOREWORD TO LOGIC

We should first consider the matter, end, form and fathers of logic. By the matter, we mean what logic is about. By end, we mean the purpose, that for the sake of which logic is studied. By form, we mean both the order in which the matter is considered and how it is considered. And by fathers, we mean those who first found this art.

The remote matter of logic is three acts of our reason. The first of these is understanding what a thing is; as understanding what a man is or what a triangle is. The second act is understanding the true or the false: when I understand man is an animal, I understand the true; but when I understand man is a stone, I understand something that is false. The third act is the one most characteristic of reason as its name indicates - reasoning. In reasoning, we come to know or guess a statement from other statements already known or accepted.

But in a proximate way, we can say that the matter of logic is the tools that are necessary for the above three acts. If we do not understand what something is, we have need of the tool called definition. A definition is speech making known what a thing is. If you did not understand, for example, what a rhombus is, you could be helped to understanding what it is by the definition of rhombus (an equilateral quadrilateral that is not right-angled).

One cannot understand the true or the false without forming a statement. Truth and falsity are found only in statements. A statement is speech signifying the true or the false. Man, by itself, is neither true nor false. But when one affirms or denies something of man, then there is something true or false. For example, man is an animal and man is not a stone are both true. But man is not an animal and man is a stone are both false. Since truth and falsity are found only in statements, statement is a necessary tool for understanding the true or the false. (But a statement does not tell reason whether it is true or false. One knows that a statement is true or false by sense, as I know that you are sitting; or by knowing or defining its parts, as I know that no odd number is even; or by reasoning as I know theorems in geometry.)

One cannot reason without forming some kind of argument. An argument is speech bringing together the statements from which or by which we reason to another statement. Obviously, if we cannot bring these statements together in an argument, we cannot reason. Argument then is the tool necessary for reasoning.

The proximate matter, then, of logic is these three tools: definition, statement and argument. Logic is immediately about these although one can say, in a more remote way, that it is about the three acts of reason for which these tools are necessary. Sometimes, however, we say more briefly that logic is the art of reasoning or the art about arguments since reasoning includes or presupposes the other two acts and, likewise, the tool called argument includes or presupposes the other two tools.

The end or purpose of logic is to help us proceed orderly, easily and without error in the above three acts of reason. This is why we study the above three tools in logic.

One could also say that the chief purpose of logic is reasoned-out knowledge. Reasoned-out knowledge begins with definitions (and divisions) and from these some statements can be seen to be true. For example, after having defined obtuse angle and acute angle, we can see that it is true that an obtuse angle is greater than an acute angle. And after we have defined odd number and even number, we can see that it is true that no odd number is even. And from these statements, we reason out conclusions by syllogisms. A syllogism is the most perfect kind of argument. It is an argument, in which some statements laid down, another follows necessarily because of those laid down. Every theorem in geometry, for example, is reasoned-out by one or more syllogisms. Logic then considers the common road of reasoned-out knowledge when it considers definition, statement and syllogism.

Although the chief or highest purpose of logic is reasoned-out knowledge, it is not always possible for man to achieve reasoned-out knowledge. Geometry and the reasoned-out knowledge of numbers (both are found in Euclid's Elements) are perhaps the clearest examples of reasoned-out knowledge. Logic itself is an example of reasoned-out knowledge. It is even possible to get some reasoned-out knowledge of natural things in general. And we can reason-out some knowledge about the purpose of human life and how it is to be achieved in a very general way. But most things, especially when considered in particular, seem to escape being known by man. And even the things which can be known by man are easier guessed than known. Hence, if logic is to be the tool of human reason, it must not only direct us towards reasoned-out knowledge, but also in making reasonable guesses (where knowledge is not possible or before it is possible).

The ultimate purpose of logic, then, is reasoned-out knowledge; and, where this is not possible or before it is possible, a reasonable guess. And since a mistake is opposed to knowledge, logic also helps us to recognize and hence avoid the common kinds of mistake in reasoning.

The form of logic is the order in which its matter is considered and how it is considered. The order of logic as a whole is already clear from our consideration of its matter. The logic of the first act of reason (understanding what a thing is) and of its tool, definition, naturally comes before the logic of the second act of reason (understanding the true or the false) or of statement. Unless one understood (in some way) what a man is and what an animal is and what a stone is one could not understand that man is an animal and that man is not a stone. Likewise, since one reasons from statements and to a statement and arguments are composed of statements, a consideration of statement should come before a consideration of reasoning and argument. Hence, reasoning is called the third act of reason. Thus logic has three parts in order: the art about definition, the art about statement, and the art about argument.

Since man is an animal with reason, the natural road in our knowledge is from the senses into reason. Hence, although one could speak of a definition, statement and argument in thoughts as well as in words (the latter signifying and being for the sake of the former) the logician must directly talk about the definition, statement and argument in words since these are sensible. He must get at what is in thoughts through what is in words. Otherwise, he would proceed in a way contrary to the nature of what he is - an animal with reason. Indeed a man hardly knows what he thinks until he can put it in words and he or we cannot discuss what he thinks until he has put it into words. Moreover, since definition, statement and argument are tools and man, being an animal, cannot use a tool that is not sensible, we need tools that are sensible. However, words and speech can be tools for knowing things only insofar as they signify things through thoughts. Words and speech, considered merely as sounds, could hardly be a tool for coming to know anything.

Logic was the last part of philosophy to be found. Socrates, Plato and especially Aristotle may be considered the fathers of logic. In the Phaedo, Socrates says that we need an art about arguments when he and his friends are examining the arguments for and against the immortality of the human soul. Aristotle also remarks in the Metaphysics that Socrates was trying to syllogize because he was trying to define and definition is especially the beginning of syllogism (the most perfect kind of argument). Plato's *Dialogues* often raise questions of logic and bring out parts of logic. But it is Aristotle who is especially called the "father of logic" for he first thought out the basic parts of logic. The collection of his logical works *The Organon* (or *The Tool*) along with his *Rhetoric* contain all the basic parts of logic.

****

PROEMIUM TO LOGIC

The chief end or purpose of logic is reasoned out knowledge. Logic is for the sake of reasoned out knowledge. The first and clearest example of reasoned out knowledge is geometry. But it is possible to have reasoned out knowledge of many other things.

Hence, logic is about the way to reasoned out knowledge or the road to reasoned out knowledge. What is this road?

Since we reason out conclusions by the syllogism, the syllogism is the chief subject of logic. A syllogism is speech in which some statements laid down, another follows necessarily, because of those laid down. If reason lays down the statements *no odd number is even* and *every three is an odd number*, another statement (*no three is even*) follows necessarily because of those laid down.

Since the syllogism is composed of statements and the conclusion of s syllogism is also a statement, the logician must consider statement before syllogism. A statement is speech signifying the true or the false.

But how does reason know whether a statement is true or false? Many times reason knows that a statement is true because it is a necessary conclusion from other statements known to be true. But all statements cannot be known in his way. One could not *begin* to know in this way unless he already had some statements to lay down. Reasoned out knowledge of conclusions depends ultimately upon some statements that are known through themselves and not through other statements. But how is the truth of some statements known through themselves?

The statements which are known through themselves are known to be true by their parts. We know that a whole is greater than its part by knowing what a whole is and what a part Is. But if one doe not know what the parts are, one has need of a definition or speech making known what a thing is. Thus, in the above statement *no odd number is even*, one must have defined odd number and even number before it is obvious that no odd number is even. Hence, the logician must consider definition before statement; for many statements cannot be known without a definition. Thus Euclid defines right angle before making the statement that *all right angles are equal* (from which he will later reason out a number of conclusions).

The main steps then along the road to reasoned-out knowledge are definition, statement and syllogism. Logic then has three main part corresponding to definition, statement and syllogism - in that order.

PROEMIUM TO LOGIC

We can begin to approach the subject of logic or what it is about, and our need for it, by recalling a more general truth about man: man is the tool-making animal. That man is a tool-making animal is sufficiently clear from common experience. Why he is a tool-making animal involves many things. Man has need of tools which nature has not and cannot supply him with, but which man can make for himself. Perhaps the root of all this is that man is an animal with reason and reason is in some way unlimited. Hence, there is no limit to the tools which man may need. Nature cannot supply the human body with all these tools. But nature has supplied us with reason and hands and voice whereby man can design and make and use the tools that he needs.

Logic is about tools which we need and nature has not supplied us with them. But before we look at these tools, we might consider the tools which are most like them. There are things which out eyes cannot see, or see distinctly, without certain tools, such as the magnifying glass and microscope and the telescope and glasses. Likewise, there are things which our reason cannot see (that is, understand) or cannot see well or distinctly without some tool. Logic is about the tools that reason needs to understand and reason, but which nature has not provided us with. Nature however has provided us with the means whereby we can make the tools that our reason needs to understand and reason.

There are two kinds of understanding for each of which reason needs a tool: understanding what a thing is and understanding the true or the false.

When Abraham Lincoln said that democracy is government of the people, by the people, for the people, he helped us to understand better what democracy is. He gave us a definition of democracy. Definition is a tool for understanding what a thing is or for understanding distinctly what it is. When we are told in the science of numbers that six and twenty-eight are *perfect* numbers, but that none of the numbers before six or between six and twenty-eight are perfect numbers, we do not understand what a perfect number is. But when Euclid defines a perfect number as a *number equal to the sum of everything which measures it (evenly)*, we can come to understand what a

perfect number is and why only six and twenty-eight are perfect numbers before 496 (the next after that is 8128). Definition resembles in some way a magnifying glass.

The tool for understanding the true or the false is quite different from the tool for understanding what a thing is. *What a thing is* is found more in the thing than in the definition. *What a dog is* is found chiefly in the dog, not in our definition of dog. (Just as the craters on the moon are found chiefly in the moon and not in our telescope or eye). But truth or falsity are not found in the earth or in the water or in the air. Rather they are found in statements although measured by things. Hence, reason cannot see the true or the false without making a statement.

But reason not only wants to make statements that are either true or false; it also wants to know which are true and which are false. And if reason cannot know for sure which statement is true and which false, it wants to make a reasonable guess about them.

How do we judge statements; that is, how do we separate the true from he false? We judge statements by some beginning in our knowledge. Judging is separating the true from the false by some beginning in human knowledge.

How do we judge whether you are or are not standing? We judge this by our senses which are the first beginning in our knowledge.

How do we judge between the statements *No odd number is even* and *Some odd number is even*? By the definitions of odd and even number. Definitions are beginnings of reasoned out knowledge, as can be seen in geometry.

But when we cannot separate the true from the false by sense or by definition(s) (or by these alone), we need to reason. Reasoning is coming to know or guess a statement from other statements and because of them. These other statements must be known already or, at least, accepted as probable.

Reasoning is also an act that requires a tool. This tool is called *argument.* An argument brings together the statements from which we reason. Without putting together those statements, we cannot reason.

Logic is about the aforesaid three tools which reason needs to understand and reason: definition , statement, and argument.

It is not by chance that these three tools are studied together. For arguments are composed of statements and help us to come to know or guess another statement. And many statements include, or are based on, definitions. The postulate in geometry that all right angles are equal (but not all acute or obtuse angles) is based on the definition of right angle. Moreover we reason from and to definitions. Hence, the study of these three tools belongs to one art or science. This art of science is called *logic*.

FOREWORD TO LOGIC

Logic is named from the Greek word *logos* meaning reason or argument. Logic is the art of reasoning, or the art about arguments, as Socrates calls it in the *Phaedo*. Socrates, Plato, and Aristotle are the fathers of logic.

Reasoning and argument are not the same thing. Reasoning is the most characteristic act of reason while an argument is a speech, in which. or by which, we reason. An argument is a tool which helps us to reason. This is why the art of reasoning and the art about arguments are the same art.

Reasoning is a movement of reason from some statements to another where the former are the cause of reason coming to the latter. Hence, every argument is composed of statements.

Since an argument is composed of statements, the logician must study statements before arguments. A statement is speech signifying the true or the false. Likewise, before the act of reasoning comes another act which is the understanding of the true or the false..

But one cannot understand a statement, or its truth or falsity, without first understanding the things about which one is making a statement. One must also understand what is being affirmed or denied, or what in the statement. I cannot, for example, understand the statement *man is an animal* and the statement *man is not a stone* unless I first understand, to some extent, what is a man and what is an animal, and what is a stone. Hence before the act of understanding the true or the false comes the act of understanding what a thing is.

But reason cannot understand well what things are without the help of definitions. A definition is speech signifying what a thing is, or speech making

known what a thing is. Hence, just as the logician must consider statement before argument, so likewise he must consider definition before statement.

Logic then is about three acts of reason: understanding what a thing is, understanding the true or the false, and reasoning. But more precisely it is about three tools or speeches of looking reason which help us in those acts: definition, statement, and argument.

Although logic is about all three of these acts of reason or about all three of these tools or speeches, it can nevertheless be said to be the art of reasoning or the art about arguments.. For the first act, Understanding what a thing is, is ordered to the second act, understanding the true or the false and this second act is order to the third ct which is reasoning.

Likewise, definition is ordered to statements, and statement is ordered to argument or syllogism. Hence, logic is called the art of reasoning or the art about arguments, not because it is about these alone, but because the other things it considers are ordered at last to the above.

Logic then has three parts. The first part is about definition; the second, about statements; and the third, about argument.

Since logic is about definition statement and argument; and these are called *speeches*, we must ask what is a speech when said of them. A speech is vocal sound signifying by custom, having parts that signify by themselves.

LOGIC

Logic is about the tools necessary for three ordered acts of our reason.

The first of these acts is understanding what a thing is; such as understanding *what a man is* or *what an animal is* or *what a stone is*.

The second of these acts is understanding the true or the false. When we understand, for example, that *man is an animal* or that *man is not a stone*, we understand something true. When we understand that *man is not an animal* or that *man is a stone*, we are understanding something false. It can be seen in these examples that we understand the true or the false by putting together or separating what we have understood in the first act.

If it is clear that something is true or false, our reason can rest. But most of the time, it is not clear that something is true or false. Then a third act is needed - reasoning. We might reason, for example, that money is not the best thing in life because the best thing in life is not given up for other things, but money is given up for other things.. It can be seen in this example that we reason from things understood in the second act.

Thus the first act is ordered to the second act and the second act, to the third act. Hence, logic is sometimes called the art of reasoning since whoever considers this act must also consider the acts which are ordered to it.

We have said above that logic is about the tools which are necessary for three acts of our reason. And having distinguished those three acts and seen their order, we must now speak of the proximate matter of logic - the tools necessary for those acts.

Definition is the main tool necessary for understanding what a thing is, For example, if you did not understand what a prime number is, it would be necessary to define it as *a number measured only by the unit*, such as two or three or five or seven.

Statement is the tool necessary for understanding the true or the false. Truth or falsity are found only in statements where we have put together or separated what we have understood in the first act. *Man*, *animal, and* stone *by themselves are neither true nor false. But when we combine or separate them in statements (such as* man is an animal *or* man is no an animal *or man is a stone* or *man is not a stone*), then we have something true or false.

Argument is the tool necessary for reasoning. An argument is speech bringing together the statements from which we reason. We cannot reason without bringing together the statements from which we reason.

There is the same order among the tools as among the acts to which they correspond. Hence, logic is sometimes called the art about arguments since whoever considers arguments must also consider statements and definitions which are ordered to arguments. Indeed, the first statement of the need for logic was made by Socrates in the *Phaedo* where he says that we have need of an art about arguments (tecnh peri touß logouß).

Logic has three parts corresponding to the above three tools. One part is about definition; another about statement; and the third about argument.

The order of these three parts also corresponds to the order of these three tools and ultimately to the order of the three acts for which those tools are necessary. Hence, we shall first study definition; then, statement; and last, argument.

The name *logic* comes form the Greek word *logos. Logos in* Greek has many ordered or connected meanings. But two senses are especially important for understanding why this art is called *logic*. *Logos* can mean *reason* or *argument*. Since the first call for logic was made by Socrates who said we need an art about arguments, this art is properly called *logic* from *logos* in the sense of argument.

Logos can also mean reason. Since logic is the art which directs us in the above three ordered acts of reason, this art can also be called *logic* from *logos* in the sense of reason.

Socrates, Plato and Aristotle can be considered the fathers of logic. Plato represented Socrates as defining and reasoning in the *Dialogues* and sometimes as discussing the nature of definition and argument and even as speaking of the need for an art about arguments. Aristotle who studied almost twenty years in the school of Plato, wrote the basic books in the three parts of logic. His collected works in logic that have come down to us are called the *Organon* in Greek. *Organon* is the Greek word for tool. Logic is a tool useful and necessary for reasoned out knowledge, for reasonable guesses, and for avoiding may mistakes in our thinking.