

### Section 3. The two logics (P)

(This section can be omitted without losing anything you will need later on in the book. It's here both to satisfy the advanced student's curiosity and to sell the approach of this book to prospective teachers who may question its emphasis on Aristotelian rather than symbolic logic, by justifying this choice philosophically.)

Almost four hundred years before Christ, Aristotle wrote the world's first logic textbook. Actually it was six short books, which collectively came to be known as the *Organon*, or "instrument." From then until 1913, when Bertrand Russell and Alfred North Whitehead published *Principia Mathematica*, the first

classic of mathematical or symbolic logic, all students learned Aristotelian logic, the logic taught in this book.

The only other "new logic" for twenty-four centuries was an improvement on the principles of *inductive* logic by Francis Bacon's *Novum Organum* ("New Organon"), in the 17th century, and another by John Stuart Mill, in the 19th century.

(Inductive reasoning could be very roughly and inadequately defined as reasoning from concrete particular instances, known by experience, while deduction reasons from general principles. Induction yields only probability, while deduction yields certainty. "Socrates, Plato and Aristotle are mortal, therefore probably all men are mortal" is an example of inductive reasoning; "All men are mortal, and Socrates is a man, therefore Socrates is mortal" is an example of deductive reasoning.)

Today nearly all logic textbooks use the new mathematical, or symbolic, logic as a kind of new language system for deductive logic. (It is not a new *logic*; logical principles are unchangeable, like the principles of algebra. It is more like changing from Roman numerals to Arabic numerals.) There are at least three reasons *for* this change:

(1) The first and most important one is that the new logic really is superior to the old in efficiency for expressing many long and complex arguments, as Arabic numerals are to Roman numerals, or a digital computer to an analog computer, or writing in shorthand to writing in longhand.

However, longhand is superior to shorthand in other ways: e.g. it has more beauty and elegance, it is intelligible to more people, and it gives a more personal touch. That is why most people prefer longhand most of the time – as most beginners prefer simpler computers (or even pens). It is somewhat similar in logic: most people "argue in longhand," i.e. ordinary language; and Aristotelian logic stays close to ordinary language. That is why Aristotelian logic is more practical for beginners.

Even though symbolic language is superior in sophistication, it depends on commonsense logic as its foundation and root. Thus you will have a firmer foundation for all advanced logics if you first master this most basic logic. Strong roots are the key to healthy branches and leaves for any tree. Any farmer knows that the way to get better fruit is to tend the roots, not the fruits. (This is only an analogy. Analogies do not *prove* anything – that is a common fallacy – they only illuminate and illustrate. But it is an illuminating analogy.)

Modern symbolic logic is *mathematical* logic. "Modern symbolic logic has been developed primarily by mathematicians with mathematical applications in mind." This from one of its defenders, not one of its critics (Henry C. Bayerly, in *A Primer of Logic*. N.Y.: Harper & Row, 1973, p.4).

Mathematics is a wonderful invention for saving time and empowering science, but it is not very useful in most ordinary conversations, especially philosophical conversations. The more important the subject matter, the less relevant

mathematics seems. Its forte is quantity, not quality. Mathematics is the only totally clear, utterly unambiguous language in the world; yet it cannot say anything very interesting about anything very important. Compare the exercises in a symbolic logic text with those in this text. How many are taken from the Great Books? How many are from conversations you could have had in real life?

(2) A second reason for the popularity of symbolic logic is probably its more scientific and exact form. The very artificiality of its language is a plus for its defenders. But it is a minus for ordinary people. In fact, Ludwig Wittgenstein, probably the most influential philosophical logician of the 20th century, admitted, in *Philosophical Investigations*, that "because of the basic differences between natural and artificial languages, often such translations [between natural-language sentences and artificial symbolic language] are not even possible in principle." "Many logicians now agree that the methods of symbolic logic are of little practical usefulness in dealing with much reasoning encountered in real-life situations" (Stephen N. Thomas, *Practical Reasoning in Natural Language*, Prentice-Hall, 1973).

— And in philosophy! "However helpful symbolic logic may be as a tool of the . . . sciences, it is [relatively] useless as a tool of philosophy. Philosophy aims at insight into principles and into the relationship of conclusions to the principles from which they are derived. Symbolic logic, however, does not aim at giving such insight" (Andrew Bachhuber, *Introduction to Logic* (New York: Appleton-Century Crofts, 1957), p. 318).

(3) But there is a third reason for the popularity of symbolic logic among philosophers, which is more substantial, for it involves a very important difference in philosophical belief. The old, Aristotelian logic was often scorned by 20th century philosophers because it rests on two commonsensical but unfashionable philosophical presuppositions. The technical names for them are "epistemological realism" and "metaphysical realism." These two positions were held by the vast majority of all philosophers for over 2000 years (roughly, from Socrates to the 18th century) and are still held by most ordinary people today, since they seem so commonsensical, but they were *not* held by many of the influential philosophers of the past three centuries.

(The following summary should not scare off beginners; it is much more abstract and theoretical than most of the rest of this book.)

The first of these two presuppositions, "epistemological realism," is the belief that the object of human reason, when reason is working naturally and rightly, is objective reality as it really is; that human reason can know objective reality, and can sometimes know it with certainty; that when we say "two apples plus two apples must always be four apples," or that "apples grow on trees," we are saying something true about the universe, not just about how we think or about how we choose to use symbols and words. Today many philosophers are

skeptical of this belief, and call it naïve, largely because of two 18th century "Enlightenment" philosophers, Hume and Kant.

Hume inherited from his predecessor Locke the fatal assumption that the immediate object of human knowledge is our own ideas rather than objective reality. Locke naïvely assumed that we could know that these ideas "corresponded" to objective reality, somewhat like photographs; but it is difficult to see how we can be sure any photograph accurately corresponds to the real object of which it is a photograph if the only things we can ever know directly are photographs and not real objects. Hume drew the logical conclusion of skepticism from Locke's premise.

Once he limited the objects of knowledge to our own ideas, Hume then distinguished two kinds of propositions expressing these ideas: what he called "matters of fact" and "relations of ideas."

What Hume called "relations of ideas" are essentially what Kant later called "analytic propositions" and what logicians now call "tautologies": propositions that are true by definition, true only because their predicate merely repeats all or part of their subject (e.g. "Trees are trees" or "Unicorns are not non-unicorns" or "Unmarried men are men").

What Hume called "matters of fact" are essentially what Kant called "synthetic propositions," propositions whose predicate adds some new information to the subject (like "No Englishman is 25 feet tall" or "Some trees never shed their leaves"); and these "matters of fact," according to Hume, could be known only by sense observation. Thus they were always particular (e.g. "These two men are bald") rather than universal (e.g. "All men are mortal"), for we do not *sense* universals (like "all men"), only particulars (like "these two men").

Common sense says that we can be certain of some universal truths, e.g., that all men are mortal, and therefore that Socrates is mortal because he is a man. But according to Hume we cannot be certain of universal truths like "all men are mortal" because the only way we can come to know them is by generalizing from particular sense experiences (this man is mortal, and that man is mortal, etc.); and we cannot sense all men, only some, so our generalization can only be probable. Hume argued that particular facts deduced from these only-probable general principles could never be known or predicted with certainty. If it is only probably true that all men are mortal, then it is only probably true that Socrates is mortal. The fact that we have seen the sun rise millions of times does not prove that it will necessarily rise tomorrow.

Hume's "bottom line" conclusion from this analysis is skepticism: there is no certain knowledge of objective reality ("matters of fact"), only of our own ideas ("relations of ideas"). We have only *probable* knowledge of objective reality. Even scientific knowledge, Hume thought, was only probable, not certain, because science assumes the principle of causality, and this principle, according to Hume, is only a subjective association of ideas in our minds. Because we have seen a "constant conjunction" of birds and eggs, because we have seen eggs

follow birds so often, we naturally assume that the bird is the *cause* of the egg. But we do not *see* causality itself, the causal relation itself between the bird and the egg. And we certainly do not *see* (with our eyes) the universal "principle of causality." So Hume concluded that we do not really have the knowledge of objective reality that we naturally think we have. We must be skeptics, if we are only Humean beings.

Kant accepted most of Hume's analysis but said, in effect, "I Kant accept your skeptical conclusion." He avoided this conclusion by claiming that human knowledge does not fail to do its job because its job is not to conform to objective reality (or "things-in-themselves," as he called it), i.e. to correspond to it or copy it. Rather, knowledge constructs or forms reality as an artist constructs or forms a work of art. The knowing subject determines the known object rather than vice versa. Human knowledge does its job very well, but its job is not to learn what is, but to make what is, to form it and structure it and impose meanings on it. (Kant distinguished three such levels of imposed meanings: the two "forms of apperception": time and space; twelve abstract logical "categories" such as causality, necessity, and relation; and the three "ideas of pure reason": God, self, and world.) Thus the world of experience is formed by our knowing it rather than our knowledge being formed by the world. Kant called this idea his "Copernican Revolution in philosophy." It is sometimes called "epistemological idealism" or "Kantian idealism," to distinguish it from epistemological realism. \*

("Epistemology" is that division of philosophy which studies human knowing. The term "epistemological idealism" is sometimes used in a different way, to mean the belief that ideas rather than objective reality are the objects of our knowledge; in that sense, Locke and Hume are epistemological idealists too. But if we use "epistemological idealism" to mean the belief that the human idea (or knowing, or consciousness) determines its object rather than being determined by it, then Kant is the first epistemological idealist.) \*

The "bottom line" for logic is that if you agree with either Hume or Kant, logic becomes the mere manipulation of our symbols, not the principles for a true orderly knowledge of an ordered world. For instance, according to epistemological idealism, general "categories" like "relation" or "quality" or "cause" or "time" are only mental classifications we make, not real features of the world that we discover.

In such a logic, "genus" and "species" mean something very different than in Aristotelian logic: they mean only any larger class and smaller sub-class that we mentally construct. But for Aristotle a "genus" is the general or common part of a thing's real essential nature (e.g. "animal" is man's *genus*), and a "species" is the whole essence (e.g. "rational animal" is man's *species*). (See Chapter III, Sections 2 and 3.)

Another place where modern symbolic logic merely manipulates mental symbols while traditional Aristotelian logic expresses insight into objective reality is the interpretation of a conditional (or "hypothetical") proposition such as

"If it rains, I will get wet." Aristotelian logic, like common sense, interprets this proposition as an insight into real causality: the rain causes me to get wet. I am predicting the effect from the cause. But symbolic logic does not allow this commonsensical, realistic interpretation. It is skeptical of the "naïve" assumption of epistemological realism, that we can know real things like real causality; and this produces the radically anti-commonsensical (or, as they say so euphemistically, "counter-intuitive") "problem of material implication" (see page 23).

Besides epistemological realism, Aristotelian logic also implicitly assumes metaphysical realism. (Metaphysics is that division of philosophy which investigates what reality is; epistemology is that division of philosophy which investigates what knowing is.) Epistemological realism contends that the object of intelligence is reality. Metaphysical realism contends that reality is intelligible; that it includes a real order; that when we say "man is a rational animal," e.g., we are not imposing an order on a reality that is really random or chaotic or unknowable; that we are expressing our *discovery* of order, not our *creation* of order; that "categories" like "man" or "animal" or "thing" or "attribute" are taken from reality into our language and thought, not imposed on reality from our language and thought.

Metaphysical realism naturally goes with epistemological realism. Technically, metaphysical realism is the belief that universal concepts correspond to reality; that things really have common natures; that "universals" such as "human nature" are real and that we can know them.

There are two forms of metaphysical realism: Plato thought that these universals were real *things* in themselves, while Aristotle thought, more commonsensically, that they were real *aspects* of things which we mentally abstracted from things. (See Chapter II, Section 3, "The Problem of Universals.")

The opposite of realism is "nominalism," the belief that universals are only man-made *nomini* (names). William of Ockham (1285–1349) is the philosopher who is usually credited (or debited) with being the founder of nominalism.

Aristotelian logic assumes both epistemological realism and metaphysical realism because it begins with the "first act of the mind," the act of understanding a universal, or a nature, or an essence (such as the nature of "apple" or "man"). These universals, or essences, are known by concepts and expressed by what logic calls "terms." Then two of these universal terms are related as subjects and predicates of propositions (e.g. "Apples are fruits," or "Man is mortal").

"Aristotle never intended his logic to be a merely formal calculus [like mathematics]. He tied logic to his ontology [metaphysics]: thinking in concepts presupposes that the world is formed of stable species" (J. Lenoble, *La notion de l'expérience*, Paris, 1930, p. 35).

Symbolic logic is a set of symbols and rules for manipulating them, without needing to know their meaning and content, or their relationship to the real world, their "truth" in the traditional, commonsensical sense of "truth." A

computer can do symbolic logic. It is quantitative (digital), not qualitative. It is reducible to mathematics.

The new logic is sometimes called “propositional logic” as well as “mathematical logic” or “symbolic logic” because it *begins with propositions, not terms*. For terms (like “man” or “apple”) express universals, or essences, or natures; and this implicitly assumes metaphysical realism (that universals are real) and epistemological realism (that we can know them as they really are).

Typically modern philosophers criticize this assumption as naïve, but it seems to me that this is a very reasonable assumption, and not naïve at all. Is it too naïve to assume that we know what an apple is? The new logic has no means of saying, and even prevents us from saying, *what* anything is!

And if we cease to say it, we will soon cease to think it, for there will be no holding-places in our language for the thought. Language is the house of thought, and homelessness is as life-threatening for thoughts as it is for people. If we should begin to speak and think only in nominalist terms, this would be a monumental historic change. It would reverse the evolutionary event by which man rose above the animal in gaining the ability to know abstract universals. It would be the mental equivalent of going naked on all fours, living in trees, and eating bugs and bananas. (Could monkeys have evolved by natural selection from nominalists?)

While it may be “extremist” to suggest it, such a mental “devolution” is not intrinsically impossible. And changes in logic are not wholly unrelated to it. Already, “internet logic,” or the logic of spontaneous association by “keywords,” is replacing “genus and species logic,” or the logic of an ordered hierarchy of objectively real categories. To most modern minds, those last seven words sound almost as archaic as alchemy or feudalism. Many criticize them as ideologically dangerous. These critics dislike categories because they “feel that” (that phrase is a category confusion, by the way) classifications, and universal statements about classes such as “Hittites could not read Hebrew,” constitute “prejudice,” “judgmentalism,” “oppression,” or even “hate speech.”

Logic and social change are not unrelated. Not only our logicians but also our society no longer thinks primarily about the fundamental metaphysical question, the question of *what things are*, the question of the nature of things. Instead, we think about how we feel about things, about how we can use them, how we see them behave, how they work, how we can change them, or how we can predict and control their behavior by technology. But all this does not raise us above the animal level in kind, only in degree. The higher animals too have feelings, and things to use, and sight, and action, and even a kind of technology of behavior prediction and control. For the art of hunting is an art of predicting and controlling the behavior of other animals. What do we have that no mere animal has? The thing that many modern philosophers vilify: abstraction. We have the power to abstract and understand universals. This is the thing traditional logic is founded on, and this is the thing symbolic logic ignores or denies.

Logic is deeply related to moral and ethical changes in both thought and practice. All previous societies had a strong, nearly universal, and rarely questioned consensus about at least some basic aspects of a "natural moral law," about what was "natural" and what was "unnatural." There may not have been a greater *obedience* to this law, but there was a much greater *knowledge* of it, or agreement about it. Today, especially in the realm of sex (by far the most radically changed area of human life in both belief and practice), our more "advanced" minds find the old language about "unnatural acts" not only "politically incorrect" but literally incomprehensible, because they no longer accept the legitimacy of the very question of the "nature" of a thing. Issues like homosexuality, contraception, masturbation, pedophilia, incest, divorce, adultery, abortion, and even bestiality are increasingly debated in other terms than the "nature" of sexuality, or the "nature" of femininity and masculinity. It is not an unthinkable suspicion that one of the most powerful forces driving the new logic is more social than philosophical, and more sexual than logical.

Symbolic logic naturally fosters *utilitarian ethics*, which is essentially an ethic of consequences. The fundamental principle of utilitarianism is that an act is good if its probable consequences result in "the greatest happiness for the greatest number" of people. It is an "if . . . then . . ." ethics of calculating consequences – essentially, "the end justifies the means" (though that formula is somewhat ambiguous). Symbolic logic fits this perfectly because it is essentially an "if . . . then . . ." logic, a calculation of logical consequences. Its basic unit is the proposition ( $p$  or  $q$ ) and its basic judgment is "if  $p$  then  $q$ ." In contrast, Aristotelian logic naturally fosters a "natural law ethic," an ethic of universal principles, based on the nature of things, especially the nature of man. For its basic unit is the term, a subject ( $S$ ) or a predicate ( $P$ ) *within* a proposition ( $p$ ); and its basic judgment is "all  $S$  is  $P$ " – a statement of universal truth about the *nature* of  $S$  and  $P$ .

The very nature of reason itself is understood differently by the new symbolic logic than it was by the traditional Aristotelian logic. "Reason" used to mean essentially "all that distinguishes man from the beasts," including intuition, understanding, wisdom, moral conscience, and aesthetic appreciation, as well as calculation. "Reason" now usually means only the last of those powers. That is why many thinkers today who seem at first quite sane in other ways actually believe that there is no fundamental difference between "natural intelligence" and "artificial intelligence" – in other words, you are nothing but a computer plus an ape. (Having met some of these people at MIT, I must admit that their self-description sometimes seems quite accurate.)

Aristotelian logic is not exact enough for the nominalistic mathematical logician, and it is too exact for the pop psychology subjectivist or New Age mystic. Out at sea there between Scylla and Charybdis, it reveals by contrast the double tragedy of modern thought in its alienation between form and matter, structure



and content, validity and meaning. This alienated mind was described memorably by C.S. Lewis: "the two hemispheres of my brain stood in sharpest contrast. On the one hand, a glib and shallow rationalism. On the other, a many-islanded sea of myth and poetry. Nearly all that I loved, I believed subjective. Nearly all that was real, I thought grim and meaningless" (*Surprised by Joy*). Neither mathematical logic nor "experience" can heal this gap; but Aristotelian logic can. It is thought's soul and body together, yet not confused. Mathematical logic alone is abstract and "angelistic," and sense experience and feeling alone is concrete and "animalistic," but Aristotelian logic is a human instrument for human beings.

Aristotelian logic is also easier, simpler, and therefore time-saving. For example, in a logic text book misleadingly entitled *Practical Reasoning in Natural Language*, the author takes six full pages of symbolic logic to analyze a simple syllogism from Plato's *Republic* that proves that justice is not rightly defined as "telling the truth and paying back what is owed" because returning a weapon to a madman is *not* justice but it *is* telling the truth and paying back what is owed. (pp. 224–30). Another single syllogism of Hume's takes *eight* pages to analyze (pp. 278–86).

I have found that students who are well trained in Aristotelian logic are much better at arguing, and at understanding arguments, than students who are trained only in symbolic logic. For Aristotelian logic is the logic of the four most basic verbal communication arts: reading, writing, listening, and speaking. It is the logic of Socrates. If you want to be a Socrates, this is the logic you should begin with.

The old logic is like the old classic movies: strong on substance rather than sophistication. The new logic is like typically modern movies: strong on "special effects" but weak on substance (theme, character, plot); strong on the technological "bells and whistles" but weak on the human side. But logic should be a human instrument; logic was made for man, not man for logic.

### The Problem of "Material Implication"

The following issue is quite abstract and difficult, though I shall try to make it as simple as possible. It is included because I believe it shows that "something is rotten in the state of Denmark" at the very heart of the new logic. (For a fuller treatment of the new logic see the Appendix, p. 364.)

Logic is most especially about reasoning, or inference: the process of thinking by which we draw conclusions from evidence, moving from one proposition to another. The proposition we begin with is called a "premise", and the proposition we move to, or infer, or reason to, is called a "conclusion."

The simplest and most straightforward kind of reasoning is to move from a true premise (or, more usually, from a number of true premises together) to a

true conclusion. But we can also use *false* propositions in good reasoning. Since a false conclusion cannot be logically proved from true premises, we can know that if the conclusion is false then one of the premises must also be false, in a logically valid argument.

A logically valid argument is one in which the conclusion necessarily follows from its premises. In a logically valid argument, if the premises are true, then the conclusion must be true. In an invalid argument this is not so. "All men are mortal, and Socrates is a man, therefore Socrates is mortal" is a valid argument. "Dogs have four legs, and Lassie has four legs, therefore Lassie is a dog" is not a valid argument. The conclusion ("Lassie is a dog") may be true, but it has not been proved by this argument. It does not "follow" from the premises.

Now in Aristotelian logic, a true conclusion logically follows from, or is proved by, or is "implied" by, or is validly inferred from, only *some* premises and not others. The above argument about Lassie is *not* a valid argument according to Aristotelian logic. Its premises do not prove its conclusion. And common sense, or our innate logical sense, agrees. However, modern symbolic logic disagrees. One of its principles is that "if a statement is true, then that statement is implied by any statement whatever." Since it is true that Lassie is a dog, "dogs have four legs" implies that Lassie is a dog. In fact, "dogs do *not* have four legs" also implies that Lassie is a dog! Even false statements, even statements that are self-contradictory, like "Grass is not grass," validly imply any true conclusion in symbolic logic. And a second strange principle is that "if a statement is false, then it implies any statement whatever." "Dogs do not have four legs" implies that Lassie is a dog, and also that Lassie is not a dog, and that 2 plus 2 are 4, and that 2 plus 2 are not 4.

This principle is often called "the paradox of material implication." Ironically, "material implication" means exactly the opposite of what it seems to mean. It means that the matter, or content, of a statement is totally irrelevant to its logically implying or being implied by other statements. Common sense says that Lassie being a dog or not being a dog has nothing to do with 2+2 being 4 or not being 4, but that Lassie being a collie and collies being dogs does have something to do with Lassie being a dog. But not in the new logic, which departs from common sense here by totally sundering the rules for logical implication from the matter, or content, of the propositions involved. Thus, the paradox ought to be called "the paradox of *non*-material implication."

The paradox can be seen in the following imaginary conversation:

Logician: So, class, you see, if you begin with a false premise, anything follows.

Student: I just can't understand that.

Logician: Are you sure you don't understand that?

Student: If I understand that, I'm a monkey's uncle.

Logician: My point exactly. (Snickers.)

Student: What's so funny?

Logician: You just can't understand that.

The relationship between a premise and a conclusion is called "implication," and the process of reasoning from the premise to the conclusion is called "inference." In symbolic logic, the relation of implication is called "a truth-functional connective," which means that the only factor that makes the inference valid or invalid, the only thing that makes it true or false to say that the premise or premises validly imply the conclusion, is not at all dependent on the content or matter of any of those propositions, but only whether the premise or premises are true or false and whether the conclusion is true or false.

That last paragraph was cruelly abstract. Let's try to be a little more specific. In symbolic logic,

- (1) If the premise or premises (let's just say "the premise" for short) are true and the conclusion is true, then the "if . . . then" proposition summarizing the implication is true. If  $p$  is true and  $q$  is true, then "if  $p$  then  $q$ " is true. So "if grass is green, then Mars is red" is true.
- (2) If the premise is true and the conclusion is false, then the "if . . . then" proposition summarizing the implication is false. If  $p$  is true and  $q$  is false, then "if  $p$  then  $q$ " is false. So "if grass is green, then Mars is not red" is false.
- (3) If the premise is false and the conclusion is true, then the "if . . . then" proposition summarizing the implication is true. If  $p$  is false and  $q$  is true, then "if  $p$  then  $q$ " is true. So "if grass is purple, then Mars is red" is true.
- (4) If the premise is false and the conclusion is false, then the "if . . . then" proposition summarizing the implication is true. If  $p$  is false and  $q$  is false, then "if  $p$  then  $q$ " is true. So "if grass is purple, then Mars is purple" is also true!

In this logic, if the premise and the conclusion are both false, the premise implies the conclusion (this is #4), and if the premise is false and the conclusion is true, the premise also implies the conclusion (this is #3). So if the moon is blue, then the moon is red (#4); and if the moon is blue, then the moon is not blue (#3)! This may make some defensible sense mathematically, but it certainly does not make sense commonsensically, for it does not seem to make sense in the real world.

Logicians have an answer to the above charge, and the answer is perfectly tight and logically consistent. That is part of the problem! Consistency is not enough. Logic should be not just a mathematically consistent system but a human instrument for understanding reality, for dealing with real people and things and real arguments about the real world. That is the basic assumption of the old logic. If that assumption is naïve and uncritical, unfashionable and unintelligent – well, welcome to Logic for Dummies.