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The Greeks Discover Logic

The Greeks were the first to investigate how the human mind works; earlier peoples seem to have taken it for granted. The city states of the Aegean in the fifth century B.C. were shaking off their tyrants and dictators and developing democracy. It was not the political system we know today, where every adult has a vote, but a kind of top-drawer democracy for free citizens only. As slaves constituted the great majority of the population, the voters were a relatively small elite group. Slaves did all the manual work, giving their masters plenty of time to think about thinking. The arrangement had its advantages, but also its defects. The voters did not often use their hands to check their thoughts; they tended to neglect first-hand observation, research, and experiment. They were saved, says James Harvey Robinson, "from fumbling with the everyday processes of life."

Citizens met in popular assemblies and forums to discuss civic problems. In Athens, not only political but legal issues were decided in public forums, and the arts of persuasion were increasingly in demand. A school of philosophers called the *Sophists* undertook to develop and standardize those arts. They established academies to teach young Greeks how to argue, win debates and legal cases, get elected to public office. Indeed, the Sophists concentrated so vigorously on techniques for selling an idea that a cloud hangs over their school today, as reflected in our word "sophistry." They might be

called the Madison Avenue boys of 400 B.C., specializing in the sixth area of logic, as listed on page 12.

Plato rebuked them. The Sophists, he said, were perfecting specious arguments just to win a case; they made "the worse appear the better reason." Plato seems to have been an early discoverer and exposer of logical fallacies, and once exclaimed, in *Protagoras*:

> . . . We must take care, my friend, that the Sophist does not deceive us when he praises what he sells, like the dealers . . . who sell the food of the body; for they praise indiscriminately all their goods. . . . In like manner those who carry about the wares of knowledge, and make the round of the cities, and sell them to any customer who is in want of them, praise them all alike. . . .

Socrates, meanwhile, had defined cross-examination, and stimulated the art of "dialectics," meaning the elaboration of ideas through keen, intelligent discussion. We encounter here two contrasting uses of logic as developed by Greek thinkers — uses still in sharp contrast today. The Sophists employed the new knowledge to win a case, and to "praise indiscriminately"; Socrates employed it to thresh out an issue and reach a dependable conclusion. The first was an attempt to advance somebody's power or position, the second to advance human knowledge.

ARISTOTLE'S FORMAL LOGIC

The Sophists, Socrates, Plato speculated widely and often deeply about the reasoning process, but it remained for Aristotle boldly to develop the laws of thought, with the syllogism as a supporting tool. He was born at Stagira, a Greek colonial city on the cost of Macedonia, in 384 B.C. His father, a doctor, may have aroused his interest in philosophy. At the age of seventeen he went to Athens to become a pupil of Plato, and remained there until the master's death twenty years later.

He then wandered about the Aegean, observing and teaching. For a time he acted as tutor to the young Alexander, son of King Philip of Macedon. When Alexander succeeded to the throne, Aristotle went back to Athens to organize and head his famous Lyceum. Some Greeks called it the "peripatetic" school, because Aristotle walked up and down as he talked with his pupils. Here, in the last dozen years of his life, he wrote the great treatises on politics, physics, ethics, and logic. Much of his work has been lost; what has come down to us shows the stature of his mind, and his consuming desire to know and understand.

THE LAWS OF THOUGHT

Words are slippery in any language. To prove a proposition absolutely by words alone has never been easy. Aristotle developed a method by which he hoped words could be kept in order, and proof made watertight.

He used the verb "to be" (in Greek, of course) to divide any subject, even the entire cosmos, into a region called "A," and a region called "not-A." In discussion, he said, we must distinguish carefully between these regions. This thesis was summarized by his disciples in three laws, which at first reading seem almost too simple to be important. They stem, however, from profound cogitation by perhaps the foremost philosopher of ancient Greece, and have influenced the culture and thought of all the Western world. Here they are:[1]

1. *The law of identity* affirms that A is A, or that every event and every judgment is identical with itself.

2. *The law of contradiction* affirms that A cannot both be A and not be A.

3. *The law of the excluded middle* affirms that everything must be either A or not-A.

"Aristotle," says Schiller, "explicitly recognizes the laws of

[1] Following F. C. S. Schiller, *Formal Logic.*

contradiction and excluded middle, and implicitly that of identity." The master clearly showed, however, that he was aware that these principles were not absolute but had some flexibility.

In the hands of some of his followers the three principles have taken on a grim finality, inflexible and absolute. The law of identity, rigidly interpreted, does not allow for changes in A through time, or for the differing meanings which can be attached to A. "A rose is a rose," but a rose in June is not identical with the same rose in September, so far as color, scent, and structure go. Webster's recent college dictionary gives the word "science" six different meanings, ending up with Christian Science. To say that "science is science and let's have no more nonsense about it" is a nonsensical statement. To which meaning do you refer? The law of identity, inflexibly interpreted, runs head on into the "one proper meaning superstition," which modern students of communication and language most properly condemn.

The laws of contradiction and excluded middle, in the hands of some Aristotelians, have congealed into a mental fixation where an event must be either black or white, with no room for shades of gray. So interpreted, the law of contradiction says that nothing can be both "good" and "bad," both "poisonous" and "beneficial." But such drugs as arsenic, belladonna, curare, can be beneficial in small doses, though lethal in large. And what about a friend of mine who has an allergy for fresh eggs, and becomes deathly ill if he eats one?

The third law, that of the excluded middle, rigidly interpreted, supports the slogan that "those who are not with us are against us." Applied to American foreign policy today, such thinking would throw all the neutral nations, like India and Burma, into the Communist camp — a pretty disastrous line to take.[2]

[2] See Chapter 16 for an analysis of some dangers of two-valued thinking.

THE SYLLOGISM

Aristotle also developed a verbal device called the *syllogism*, hoping it could be used to demonstrate absolute proof. Experience has not borne him out. Used with a safety lock, however, the syllogism can be helpful. I shall use it, for example, in Chapter 17, to analyze the fallacious logic of "guilt by association."

A syllogism is a combination of three propositions called: (1) the major premise, (2) the minor premise, and (3) the conclusion. Applying these labels to the classic syllogism found in all textbooks:

All men are mortal — the major premise.
Socrates is a man — the minor premise.
Therefore Socrates is mortal — the conclusion.

Observe that both these premises are statements of fact, while the conclusion is the result of logic applied to the facts. The logic, moreover, is as automatic as a slot machine. "Mortal" is the so-called major term of the syllogism. (We must be careful not to confuse the major *term* with the major *premise*.) "Man" is the so-called middle term. "Socrates" is the minor term. When the button is pushed to get the conclusion, the middle term, "man," drops down the chute, leaving Socrates equated with mortality.

This is reasonably simple, but Aristotelians, starting with the mortality of Socrates, can take us over some pretty rough terrain. For these maneuvers we refer the reader to the special treatises on logic, some of which are listed in the Bibliography. To give an idea of the complications, there are four possible "figures" in the syllogism, while each figure is capable of sixty-four "moods." This produces a total of 256 possible forms which a syllogism may take. We are relieved to hear, however, that

the theoretical total is sharply curtailed by the application of eight rules. (The first rule, for instance, is that a syllogism must not contain more than three terms.)

TWO THOUSAND YEARS

The syllogism and the laws of thought were high points of the classical inquiry into the workings of the mind. The Greek Lyceum went on into Roman times, but its scholars were content to repeat, with a few marginal notes, the ideas of the master. Aristotle's formal logic became a "self-sealing" doctrine, beyond all criticism and amendment. Meanwhile, of course, common sense logic flourished as usual in the interest of survival. The Romans used the latter constantly in their many political problems of conquering and administering an empire. The Romans were not primarily philosophers, or much interest in the process of thinking as such. The Emperor Justinian closed the Lyceum in A.D. 529.

In the twelfth century, Aristotle was rediscovered in Europe through Arab translation, and presently received a towering reputation. He became *the* philosopher. Christian, Arab, and Jewish scholars strove to harmonize their respective theologies with his texts. Medieval scholasticism, a hybrid between Aristotelian logic and theology, erected a formidable apparatus to defend theological doctrines against the beliefs of pagan without and heretic within.

Not much new knowledge was discovered. The human brain of course was as good as ever, but it turned in upon itself. Knights in armor on the tournament field toppled one another from their chargers, while inside the universities dialecticians in another kind of tournament toppled one another from their logical positions. Lord Bacon says of them in a famous passage:

> Having sharp and strong wits, and abundance of leisure . . . their wits being shut up in the cells of a few authors, as their persons were shut up in the cells of monasteries and colleges, and knowing

little history either of nature or time, they did . . . spin out unto us those laborious webs of learning. . . .

The laborious webs of learning could also be put to grim uses. In A.D. 1300, unless one manipulated his dialectics carefully, he might be mistaken for a "materialist," and argue himself into a pot of boiling oil. George Moore, in *Héloise and Abélard*, gives some frightening examples of Medieval logic-chopping.

Not all of the output of the "sharp and strong wits" has been translated for modern inspection, and perhaps it is unjust to accuse the Schoolmen of only regurgitating knowledge without advancing it. One thing they did of great value to our study: they worked out and named the classical list of logical fallacies.[3] Some of the Latin names like *ad hominem* and *post hoc* are still in lively use today.

WORD TROUBLE

The logic of the Greeks as well as that of the Schoolmen suffered from the confusion of words with things. It had no proper conception of the function of abstract terms, as worked out by modern linguists and semanticists. The classicists do not seem to have been much interested in finding the referents to which their words referred; they began their powerful reasoning with the term itself.

When they used the word "goodness" they apparently believed there was an essence, an entity, out in the world somewhere, a veritable package of goodness which gave meaning to the word. Today we know that "goodness" is an abstraction in our heads. Each one of us, as we view events, labels some of them good, and some not so good, with wide areas of disagreement. Consider, for instance, the differing images in people's minds of Franklin D. Roosevelt, and the resulting estimates of his "goodness."

[3] See Appendix.

Plato, after taking the Sophists sternly to task, got into serious difficulty by confusing words with things. In one of his loftiest flights, says Schiller, Plato "conceived the grandiose fancy of a supreme 'Idea of the Good' from which all other 'Ideas' were to be deduced, thereby rendering all knowledge accessible at one stroke. In other words, all the Laws of Nature were to be 'explained' by being derived from a single law, which was to be the Universal Key to the whole intelligible world."

There were very few in the Greek world to devise the practical apparatus by which, in combination with reason, knowledge grows. The lens had not been invented, and no telescopes or microscopes were available to verify hypotheses — as the Royal Society today can verify Einstein's hypotheses. There were no clocks, thermometers, barometers, cameras, mariner's compasses, spectroscopes, stethoscopes. Worse still, there was no suitable numerical system with which to take readings. The Arabs did not present the world with the decimal system and its priceless zero for another fifteen hundred years. Archimedes, to be sure, was a rare man with his hands, but he disdained to make any records of his ingenious devices, says James Harvey Robinson, "as being unworthy of the noble profession of a philosopher."

FOUR REASONS FOR THE DEAD END

Why did the study of how we think, begun so brilliantly by the philosophers of Greece, stay pretty much on dead center for two thousand years? One reason was certainly the lack of physical experiments and proper instruments to check conclusions. Another was the confusion of words with things, the belief that if a word was there, a corresponding essence or entity must be there, too.

John Dewey emphasizes a third and allied reason when he says: "The ultimate premises of all knowledge were assumed to be already in possession of the mind." The classicists did not

appreciate that the human mind is a blank page on which experience is written and evaluated, and that words are meaningless unless they can be related to the experience of the speaker and the hearer. They apparently believed that a rational perception of axioms and self-evident truths was all that was needed to acquire knowledge. If the thinker only *thought* hard enough in the proper categories, truth would stand revealed.

A serious difficulty was that the logic developed by Aristotle's followers had little use for conclusions which were not inevitable and absolute — the slot machine idea. The concept, let alone the mathematics, of *probabilities* had not been invented. The idea of truth as relative, as probable, as approaching complete certainty but never quite reaching it, seems to have been outside the horizon of the classicists. Yet it is on this foundation that modern science rests, with no limit to its creative progress yet in sight.

Finally it should be emphasized that scholars are still disputing what Aristotle meant in the fragments of his writings which have come down to us,[4] what solid contributions, if any, his followers made, and what precisely was the role of the Schoolmen in developing new ideas. This chapter has had to thread its way with some caution among these disputes and uncertainties.

We can, however, be reasonably sure of three broad conclusions: The Greeks began the objective study of how we think, for which no praise is too high. These studies, however, made little progress for another two thousand years. Modern science, beginning with Galileo's experiments as a convenient date, marked another great surge forward.

[4] A discovery of his complete works would probably outrival the finding of the Dead Sea Scrolls.