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学生组——英译汉【原文】

There are certain principles of ordinary conversation that we expect ourselves and others to follow. These principles underlie all reasoning that occurs in the normal course of the day and we expect that if a person is honest and reasonable, these principles will be followed. The guiding principle of rational behavior is consistency. If you are consistently consistent, I trust that you are not trying to pull the wool over my eyes or slip one by me.

If yesterday you told me that you loved broccoli and today you claim to hate it, because I know you to be rational and honest, I will probably conclude that something has changed. If nothing has changed then you are holding inconsistent, contradictory positions. If you claim that you always look both ways before crossing the street and I see you one day carelessly ignoring the traffic as you cross, your behavior is contradicting your claim and you are being inconsistent.

These principles of consistency and noncontradiction were recognized very early on to be at the core of mathematical proof. In *The Topics*, one of his treatises on logical argument, Aristotle expresses his desire to set forth methods whereby we shall be able “to reason from generally accepted opinions about any problem set before us and shall ourselves, when sustaining an argument, avoid saying anything self-contradictory.” To that end, let’s consider both the *law of the excluded middle* and the *law of noncontradiction*—logical truisms and the most fundamental of axioms. Aristotle seems to accept them as general principles.

The law of the excluded middle requires that a thing must either possess a given attribute or must not possess it. A thing must be one way or the other; there is no middle. In other words, the middle ground is excluded. A shape either is a circle or is not a circle. A figure either is a square or is not a square. Two lines in a plane either intersect or do not intersect. A statement is either true or not true. However, we frequently see this principle misused.

How many times have you heard an argument (intentionally?) exclude the middle position when indeed there is a middle ground? Either you're with me or you're against me. Either you favor assisted suicide or you favor people suffering a lingering death. America, love it or leave it. These are not instances of the excluded middle; in a proper statement of the excluded middle, there is no in-between. Politicians frequently word their arguments as if the middle is excluded, forcing their opponents into positions they do not hold.

Interestingly enough, this black-and-white fallacy was common even among the politicians of ancient Greece. The Sophists, whom Plato and Aristotle dismissed with barely concealed contempt, attempted to use verbal maneuvering that sounded like the law of the excluded middle. For example, in Plato's *Euthydemus*, the Sophists convinced a young man to agree that he was either "wise or ignorant," offering no middle ground when indeed there should be.

Closely related to the law of the excluded middle is the law of noncontradiction. The law of noncontradiction requires that a thing cannot both be and not be at the same time. A shape cannot be both a circle and not a circle. A figure cannot be both a square and not a square. Two lines in a plane cannot both intersect and not intersect. A statement cannot be both true and not true. When he developed his rules for logic, Aristotle repeatedly justified a statement by saying that it is impossible that "the same thing both is and is not at the same time." Should you believe that a statement is both true and not true at the same time, then you find yourself mired in self-contradiction. A system of rules for proof would seek to prevent this. The Stoics, who developed further rules of logic in the third century B.C., acknowledged the law of the excluded middle and the law of noncontradiction in a single rule, "Either the first or not the first" - meaning always one or the other but never both.

The basic steps in any deductive proof, either mathematical or metaphysical, are the same. We begin with true (or agreed upon) statements, called *premises*, and concede at each step that the next statement or construction follows legitimately from the previous statements. When we arrive at the final statement, called our *conclusion*, we know it must necessarily be true due to our logical chain of reasoning.

Mathematics historian William Dunham asserts that although many other more ancient societies discovered mathematical properties through observation, the notion of proving a general mathematical result began with the Greeks. The earliest known mathematician is considered to be Thales who lived around 600 B.C.

A pseudo-mythical figure, Thales is described as the father of demonstrative mathematics whose legacy was his insistence that geometric results should not be accepted by virtue of their intuitive appeal, but rather must be "subjected to rigorous, logical proof." The members of the mystical, philosophical, mathematical order founded in the sixth century B.C. by another semi-mythical figure, Pythagoras, are credited with the discovery and systematic proof of a number of geometric properties and are praised for insisting that geometric reasoning proceed according to careful deduction from axioms, or postulates. There is little question that they knew the general ideas of a deductive system, as did the members of the Platonic Academy.

There are numerous examples of Socrates' use of a deductive system in his philosophical arguments, as detailed in Platos dialogues. Here we also bear witness to Socrates' use of the law of noncontradiction in his refutation of metaphysical arguments. Socrates accepts his opponent's premise as true, and by logical deduction, forces his opponent to accept a contradictory or absurd conclusion. What went wrong? If you concede the validity of the argument, then the initial premise must not have been true. This technique of refuting a hypothesis by baring its inconsistencies takes the following form: If statement ***P*** is true, then statement ***Q*** is true. But statement ***Q*** cannot be true. (***Q*** is absurd!) Therefore, statement ***P*** cannot be true. This form of argument by refutation is called *reductio ad absurdum*.

Although his mentor Socrates may have suggested this form of argument to Plato, Plato attributed it to Zeno of Elea (495-435 B.C.). Indeed, Aristotle gave Zeno credit for what is called *reductio ad impossible*—getting the other to admit an impossibility or contradiction. Zeno established argument by refutation in philosophy and used this method to confound everyone when he created several paradoxes of the time, such as the well-known paradox of Achilles and the tortoise. The form of Zeno's argument proceeded like this: If statement ***P*** is true then statement ***Q*** is true. In addition, it can be shown that if statement ***P*** is true then statement ***Q*** is not true. Inasmuch as it is impossible that statement ***Q*** is both true and not true at the same time (law of noncontradiction), it is therefore impossible that statement ***P*** is true.