

Summary of Bacon Lecture.

Novum Organum, 1620 (New Instruments). Meant as a successor to Aristotle's works on Logic (*The Organon* or instruments for obtaining scientific knowledge)

Intended as a radical departure from aristotelian methods of scientific inquiry.
Part of a grand plan to reorganize the sciences.

Book I of the NO.

Critique of aristotleian approach to grounding knowledge in

- 1) direct, unaided, unregulated experience, followed by
- 2) pure deductive reasoning from first principles.

Aristotle's idea of induction from experience of singular things to Universal Concepts and First Principles is extremely naïve, and exposes one to endless errors resulting from biases in the very experiences on which our knowledge is supposed to be based.

Because aristotelian science assumes that the first principles of natural science can be known in one step from experience of singular things, it necessarily results in a conception of science that enable one to understand only those things that can be deduced from facts that are already known, i.e. first principles. Aristotelian science assumes that the mind is like a mirror held up to nature. Direct, uninterpreted experience presents the very natures (Forms) of the things we perceive in the world.

Because (according to Aristotle) we grasp the very forms of things by means of experience alone, we can also perceive necessary connections between a thing's nature and its properties. The property of warming belongs to the very nature of fire. The property of heaviness belongs to the very nature of earth, and so on. All Such first principles are self-evident and need no proof by means of reasoning that would establish their truth. Every science rests on its own set of first principles. These are the foundations of each science.

Science consists of demonstrating the causes of facts that are not self-evident. Such demonstrations involve deducing these facts from others, the others being either facts which are not evident in themselves or deduced from first principles. All facts that are not self-evident can be linked by deductive reasoning eventually to the first principles on which the science of those facts is based.

Logical as all this seems, Bacon argued, the result has been a science in which there has been no progress for more than 2000 years. The reason is clear. All that this conception of science could ever allow us to do is to explain *facts we already know*. It is absolutely impossible for science conceived in this way to ever discover anything completely new, i. e., something that no one had ever suspected before might be true. By its very design, Aristotelian science can do no more than explain matters of common knowledge. It cannot advance a single step beyond that knowledge.

Science, Bacon said, must be able to do more than that. It must be an instrument of *discovery*, not only an instrument of explanation.

The most serious problem with aristotelian science however stems from its uncritical, naïve faith in the powers of unregulated human sense perception to identify the true natures of the things we perceive . Aristotle assumed that everything had a natural function (final cause). This includes the powers of sense perception. The natural function of sense perception must be to provide us with the information we need in order to acquire knowledge and understanding of the world in which we live. It would make no sense to suppose that a creature might possess healthy normal senses but that these healthy, normal, properly functioning senses very often and commonly lead all of us to believe things that are just false.

Bacon notes that sense perception, even when our sense organs are functioning properly is prone to make us believe many false things unless steps are taken to guard against the errors that result from common biases that can influence every person's judgement. For example, there are things that are too small for anyone to perceive but, in many cases, it is these very things that contain the true cause of the phenomenon we perceive. Some causally relevant phenomena happen too quickly for us to perceive. Some happen too slowly. Some phenomena are due to relationships (like relative position) between observers and other things and those relationships are not directly observable. These are sources of error that are due to limitations of our senses.

Other sources of error result from certain natural tendencies of the mind itself: These are prejudices or biases that affect the very judgements we make concerning the things we perceive. Bacon called these "Idols". Some of these idols are part of human nature itself. These are **Idols of the Tribe**. Everyone has a tendency to assume that their own ways of thinking, opinions, values, assumptions, tastes, etc. are right and that any that contradicts these must be wrong. We are very reluctant

to accept the possibility that we might be in error. We are very reluctant to look for evidence that would prove us wrong or to critically examine our own opinions, etc. So, we tend to look for, and be much more impressed with, evidence that confirms what we already think we know. Aristotelian science is thoroughly infected with this Idol.

Idols of the Cave are tendencies toward biased or incomplete judgement that are peculiar to each individual. Often these arise from the special interests that each individual has. These interests influence one to judge everything in relation to serving and protecting that special set of interests and opinions. ("To one who has a new hammer, everything looks like a nail"). The cobbler who thinks that most problems result from poorly fitting shoes. The politician who thinks that the ills of the world result from people with political beliefs opposed to his own. The Astrologer who thinks that all human problems could be fixed if only people would properly attend to the meaning of the stars' and planets' motions and positions.

Idols of the Marketplace : false ideas resulting from the deceptions of language. (Vagueness, ambiguity, obscurity of meaning, poorly defined words, pompous but meaningless jargon used by pretentious authorities, etc.). People commonly use some words just as they are supposed to use them without having any coherent idea of what they mean. So, words that really have no coherent idea attached to them can be widely used according to accepted standards without anyone suspecting that they really express no coherent idea. This is mostly likely to happen when great authorities regularly use such words.

Idols of the Theatre: false ideas imposed by devotees of some Philosophical system, e. g. natural magic, astrology, scholastic science, abstruse theology, numerology, etc.

Book II of the Novum Organum.

Sense experience requires certain correctives and assistance. By itself it is too limited and subject to bias. One must seek the true form of a phenomenon, as Aristotle said, but not in the way he said. This is Bacon's new form of Induction ("True Induction") or Experimental Reasoning. He presents it as involving the gathering of observations and organizing them in definite ways that will show us relationships that are not self-evident in naïve experience. He called these Tables of Instances. From these comparisons we will be able to discover the cause of a phenomenon. Such a table has a Column of **Presence**, a Column or **Absence** and a Column of **Varying degrees**