



The Scientific Revolution: Its Classical and Christian History with Dr. Ted Davis

Lecture 23.2: New
Sources of Knowledge
and New Attitudes
about Acquiring It:
New View of How to
Obtain Knowledge

Outline:

New Views of How to Obtain Knowledge: Empiricism and Mathematics

- There is a new emphasis on mathematics and observation of nature, as opposed to reading classical texts.
- Observations and experiments took on greater importance, and began to supplant ancient authors as authorities.
- Empiricism, which is the direct observation of nature and the active experimentation with nature, is the best source of information about nature.
- What Francis Bacon and others gave us “was not a method of experiment, but a new rhetoric of experiment, coupled with full exploitation of the possibilities of experiment in programs of scientific investigation” – David Lindberg, *The Beginnings of Western Science*, 2nd edition (2007), p. 364
 - Classically, experimentation was sometimes done, though it wasn’t a predominant method.
 - Today, in some sciences, experimentation cannot always be done, like in astronomy.
 - Andries van Wesel of Brussels, known as Andreas Vesalius (1514-1564), revolutionizes anatomy with *De fabrica corporis humani* (1543).
 - This is a thick full page book in order to convey information in beautiful illustrations.
 - The human body itself is the text.
 - Vesalius, himself, is doing all the work.
 - Vesalius stressed reading “this true book of ours – the human body – man himself.” Although he always greatly respected Galen, he slowly came to see that Galen was “deluded by his apes” – he had erred by inferring too much about human anatomy from dissecting Barbary Apes.
 - Vesalius uses a theater for observers to see a dissection.
- Natural philosophers of the scientific revolution put new emphasis on reading the “book of nature,” instead of merely human books by Galen, Aristotle, and other ancient authors. William Harvey: “the book of Nature lies so open and is so easy of consultation.” “The works of nature bow to no antiquity; for indeed there is nothing either more ancient or of higher authority than nature.”



- The motto of the Royal Society in England (from the second charter in 1663): *Nullius in verba*, "a phrase borrowed from the Roman poet Horace. "Take no one's word for it – see for yourself" (loose translation).
 - We are going to see for ourselves what is true, this is the spirit of empiricism.
 - William Petty, a founding member of the Royal Society, expressed a preference to hold the annual meeting on St Thomas' day: "for he would not believe till he had seen and put his fingers into the holes, according to the motto, '*Nullius in verba*'."
- In addition to empiricism, the use of **mathematics** was greatly expanded. For Tartaglia, Euclid guards the gate to knowledge. Inside, the next door to Philosophia is guarded by Arithmetica, Geometria, Musica, and Perspectiva, among others.
 - Mathematics took on greater significance, applied carefully to the details in many aspects of nature. Truth could be derived from axioms and then compared to measurements. Descartes' detailed, highly accurate, quantitative explanation of the rainbow is justly famous. Rene Descartes, *On the Meteors*.
 - Descartes begins with the observational fact that rainbows are there and the law of refraction (empirically demonstrated), and he goes on from there with purely mathematical analysis.
 - Newton, *Principia mathematica* (1687), *The Mathematical Principles of Natural Philosophy*
 - He used Archimedean geometry and applied it to heavenly motion.
 - Michael Maier, *Atalanta fugiens* (1618): To Learn Nature's secrets, the alchemist follows in her footsteps. Nature is the guide, reason the staff, experience the eyeglasses, and reading the lamp. All are necessary for success.