*** EXERCISE #2: CASE STUDIES ***

This report will provide you with an opportunity to reconstruct the conceptual anatomy of a major transitional phase in the development of science or mathematics. Because philosophical perspectives on math, science, and scientific method require at least minimal acquaintance with the actual constructions, proofs, or experimental practices of working mathematicisns or scientists, you will find it valuable to have investigated some particular achievement in detail.

Although the written report should not exceed six (6) double-spaced pages, its format should be that of a case study, with a concentration on historical rather than theoretical matters. Examples of extended case studies are contained in the *Harvard Case Histories in Experimental Science,* Volumes 1 & 2 (ed. Conant, Cambridge, 1957). You are not asked to produce reports of the same length or detail as those in the *Harvard Histories,* but your research strategies should allow you to approximate these examples. Another excellent source of model studies would be James Burke's PBS television series, *The Day the Universe Changed.* Essentially, the report should portray science or math in process: it should depict the intertwining of tools and techniques, assumptions, experiment, observation, and theory at a particular time and in a particular context.

You may select as your topic any celebrated theorem, technique, proof, discovery, invention, or experiment which was, or was seen as, the impetus for major conceptual change in the fabric of a maturing science or mathematical discipline. Some possibilities are: Euclid's proof that there are infinitely many primes; Fermat's last theorem; Euler's Formula; the Michelson-Morley experiment; Galileo's experiments with falling bodies; Harvey's discovery of animal circulatory systems; Einstein's 'thought-experiments'; the Watson-Crick decoding of DNA.

For general purposes, note well that the major elements of a given episode in the history of science typically comprise: (a) the scientific content, (b) the context of justification, (c) the context of discovery, (d) intellectual biography, (e) psychological biography, (f) the sociological setting, (g) the cultural setting, (h) the logic of science, and (i) thematic presuppositions.

> Concepts which have proved useful for ordering things easily assume so great an authority over us that we forget their terrestrial origin and accept them as unalterable facts. They then become labeled as 'conceptual necessities,' 'a priori situations,' etc. The road to scientific progress is frequently blocked for long periods by such errors. It is therefore not just an idle game to exercise our ability to analyze familiar concepts, and to demonstrate the conditions on which their justification and usefulness depend, and the way in which these developed, little by little...
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> --Albert Einstein (1916)