

History of Science (2016)

Course timings: Monday 2:00 PM to 4:00 PM

Classes start: August 22, 2016

This course aims at developing an appreciation of history as a tool that can enhance science education. In this course we will first try to understand the nature of history. Then by using case studies we shall try to understand how history helps us to understand the nature of science and its dynamics.

The course would include the following:

1) Understanding the process of history: What goes into making of a history (list of facts of past as recollected or documented by some, narratives by historians, and interpretations in a certain framework). We will write some histories and then analyze histories written by us and others. We will also discuss the debates of history writing being similar to scientific process versus history being a completely unscientific discipline.

Reference: E. H. Carr (1961), What is History? Penguin Books.

2) Relevance of history in science education: We shall discuss the use of history in conceptual understanding, critical evaluation, contextualization, alternative theories and arguments for their support, and ideas of historical evolution being similar to individual cognition. We shall try to understand some developments which led to organization of science content in the form we see in today's textbooks.

Reference: Michael R. Mathews (2015). Science Teaching, The contribution of History and Philosophy of Science. Routledge, New York.

3) Nature of historical materials: Original writings of scientists, contemporary writings/literature of that era, recollected and recreated writings by historians of a later age. Other modern forms also include animations, plays, recreated experimental videos, creative writing around history of science, popular science writings.

References: The chemical History of a candle. Lectures by Michael Faraday,
Matt Ridely (1999). Genome: The autobiography of a species in 23 chapters. Fourth Estate, London.
Michael Frayn, The play "Copenhagen".
Galileo Galilei (1610). Siderus Nuncius.

4) Case studies:

- a) Theories of Vision and Celestial Mechanics: In these we shall discuss various theories that tried to explain our vision and dynamics of celestial objects and eventually laid foundation for what we know today as physics.

Reference: G. J. Holton and S. G. Brush (2001). Physics- A human Adventure. 3rd Ed. Rutgers University Press, New Brunswick.

- b) The phlogiston Theory (***Rise and Fall of a theory***): This will show an alternate theory of matter which persisted for quite some time and explained many phenomena. We shall discuss how it can help students with a better understanding of the atomic theory.

Reference: Aaron J Idhe (1984), The Development of Modern Chemistry. Dover, New York.

Jaimie Wisniak (2004), Phlogiston: the rise and fall of a theory, Indian Journal of Chemical Technology, 11, 732-743.

- c) Royal Botanical Gardens and development of agricultural science (***Institutionalization of modern science***). This example will reflect the political and economic forces that shaped the growth of scientific institutions in several regions of the world.

Reference: Lucile Brockway (1979), Science and colonial expansion, the role of the British Botanical Gardens. American Ethnologist, 6(3), Interdisciplinary Anthropology, 449-465.

Sir Albert Howard (1940). An Agricultural Testament, London.

- d) Memory and Chemicals (***The nature of scientific research***): In this we shall we will discuss a series of developments that tried to establish memory as a molecular phenomenon in the 20th century. This description will highlight insights about the actual science practice and show that sometimes celebrated research conclusions may not be unambiguous.

Reference: H. Collins and T. Pinch (2002). The Golem: What you should know about science. Cambridge University Press, Cambridge, UK.

- e) Development of Biology and Medicine. (Readings to be decided)

- f) Indian, Chinese and Islamic Science (Readings to be decided)

Assignment and Evaluation:

There will be weekly writing and reading assignments, one mid-semester and one end-semester exam.