

History of Science

(Aug-Nov 2015, 2 credits, Instructor: Ankush Gupta)

This course aims at developing an appreciation of history of science as a tool that can enhance science education. First, we will try to understand the nature of history. Then by using case studies we shall try to understand the nature of science, its dynamics and its uses.

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) Use 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.

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 Ridley (1999). Genome: The autobiography of a species in 23 chapters. Fourth Estate, London.

Michael Frayn, The play "Copenhagen".

Tod O. (1977), The Joy of Handweaving, Dover, New York.

4) Then we shall discuss **case studies** to highlight certain specific elements in history of science:

a) Royal Botanical Gardens and development of agricultural science (***The nature of institutions that shaped modern science***). This example will reflect the political motivations that shaped the growth of scientific research in some areas. We shall also discuss the case of establishment of Pusa Institute, India and the Indore process of composting.

Reference: Albert Howard, The Agricultural Testament

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

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 give 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) 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 phenomena in t he 20th century. This description will highlight various processes that go on in the scientific community which shed light on nature of actual scientific phenomena.

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

- d) One or two more case studies (will be decided during the course)

5) Contributions of Greek science and mathematics - scientific achievements and shaping of philosophy of science.

6) The role of experiments in science - the Indian context.

7) Science in China and in the Islamic world.

Assignment and Evaluation:

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