

Introductory Course on Science and Technology Studies

Credits: 4

Duration: October 21-25, November 14-22, 2019 (daily 9:30-13:30 pm)

Visiting Professor: Prof. Anita Rampal

This introductory course aims to develop an understanding of the processes of science and technology and their relationship with society and the environment. A selection of videos and readings, on the work of historians, scientists, sociologists and anthropologists, helps us to see how ideas and artefacts have developed, through contestations or collaborations, shaped by social, historical, political and cultural influences. We also look at the emergence of modern science in India, influenced by colonialism and the struggle for independence, and the role of citizen science and people's science movements for social transformation. Issues of equity and diversity are addressed, through multicultural and feminist perspectives, leading to a review of the contemporary global discourse on 'scientific and mathematical literacy'.

Unit 1 - The Processes of Science and Technology

- Is there a 'scientific method'? How is science done? Reflecting on one's own initiation into science; auto/biographical writings of scientists doing science;
- How have social, historical, political and cultural influences shaped scientists' work?
- What is technology? How did technicians and artisans contribute to modern science?
- What do we learn from major debates in science – Heliocentric theory; Evolution, social Darwinism; Continental drift; IQ and the 'mismeasure' of humans?

Unit 2 - Modern Science: Development and Discontents

- The institutionalisation of natural philosophy; the professionalisation of science; distancing 'pure, academic science' from technology; scientists for social responsibility;
- The emergence of modern science in India; review of the Green Revolution; citizen science, people's science movements.
- Multicultural science, empathy and respect; modes of production, participation and exclusion; knowledge commons; global measures of 'scientific and mathematical literacy'

Readings and Resources

Derry, G.N. (1999). *What Science is and How it Works*. Princeton University Press. Chapters 1-8.

Bronowski, J. (1981). *The Ascent of Man*. London: Macdonald Futura, Chapters 6 & 9 and film episodes

Hellman, H. (1998) *Great Feuds in Science: Ten of the liveliest disputes ever*. John Wiley. ('Urban VIII vs Galileo' p.1-20; 'Evolution Wars' p. 81-103; 'Wegener vs Everybody' p. 141-158).

Smith, R.E (2018) *Rage Inside the Machine* Talks at Google, <https://www.youtube.com/watch?v=EMUEuMV112E>

Gould, S.J. (1964). *The Mismeasure of Man*. W.W. Norton. Chapter 5.

Kourany, J. (2010) *Philosophy of Science after Feminism*. Oxford University Press. p 3-20

Kuhn, T. (1964). *The Structure of Scientific Revolutions*. University of Chicago Press. Chap 4, 6 -9

Carey, J. Ed. (2003) *The Faber Book of Science*. Penguin Books India and Faber & Faber. Selection: 'The colour of radium', Eve Curie (p.191-201); 'The secret of the mosquito's stomach', Ronald Ross (204-210); 'The discovery of X-rays', W. Roentgen (p 181-187)

Bryson, B. (Ed.) (2010). *Seeing Further: The Story of Science, Discovery and the Genius of the Royal Society*, Harper Collins Publishers. Introduction p 4-10; Schaeffer p 60-73; Ferry p116-127;

Aikenhead, G.S. (2006) *Science Education for Everyday Life*. New York: Teachers College Press, Chapters 1&2 (p 1-23).

Wyer, M. et al (2001) *Women, Science, and Technology: A Reader in Feminist Science Studies*, London: Routledge; Introduction p xiii-xxiii; Ruth Hubbard p148-154

Maddox, B. (2002) *Rosalind Franklin: The Dark Lady of DNA*. Harper Collins, p165-213; Film; Also : India Today (July 17, 2017) article <https://www.indiatoday.in/education-today/gk-current-affairs/story/rosalind-franklin-took-first-photo-of-dna-1026233-2017-07-25>

Arnold, D. (2004) *Science, Technology and Medicine in Colonial India*. The New Cambridge History of India Vol. V, Cambridge University Press. Chapter 4

Roberts, L., Schaffer, S. & Dear, P. (2007) *The Mindful Hand: Inquiry and invention from the late Renaissance to early industrialisation*. Royal Netherlands Academy of Arts and Sciences.

Chakrabarti, P. (2010) 'Science and *Swadeshi*: The Establishment and Growth of the Bengal Chemical & Pharmaceutical Works', in Uma Das Gupta (Ed), [*Science and Modern India: An Institutional History c.1784-1947*](#), Pearson Education, New Delhi.

Shiva, V. Making Peace with the Earth (2010) Sydney Peace Foundation Lecture http://sydneypeacefoundation.org.au/wp-content/uploads/2012/02/2010SPP_Vandana_Shiva1.pdf

Varma, R. (2001) People's Science Movements and Science Wars? *Economic and Political Weekly*, Dec 29. p 4796- 4802

Rampal, A. & Mander, H. (2013) Lessons on Food and Hunger: Pedagogy of Empathy for Democracy. *Economic & Political Weekly*, 48(28), 51–57.

Slaton, A. & Calabrese Barton, A. (2011) 'Respect and Learning'. In B. Fraser, K.G. Tobin & C.J. McRobbie, (Eds.) *The Second International Handbook of Science Education*, Springer. p513-526

Assignments: 1) Plan for a unit for school internship or a critical review of a theme in school textbooks; 2) Write up on a theme based on the course readings

Further viewing: to be collectively extended

Boudanis, D. (2000) *E=mc²: A biography of the world's most famous equation*. Pan Books. Film

Part I <https://www.youtube.com/watch?v=jqiRoKy0Gyo>

Part II <https://www.youtube.com/watch?v=jbmFcGhTnS0>

The Voyage of Charles Darwin BBC Documentary (Parts 1-7, each accessed separately)

Part I <https://www.youtube.com/watch?v=1hoDaxVIVPE&t=15s>

Part II https://www.youtube.com/watch?v=qG_PsHFHGDQ

Bhaarat Ki Chhaap: A series of films on the history of science and technology in India, Comet Media Foundation, Mumbai.

Films: *Rosalind Franklin: The Dark Lady of the DNA* (TV film 2003; forthcoming movie); *Hidden Figures* (2016) - African American women mathematicians face discrimination at NASA; *The Man Who Knew Infinity* (2016) - on Ramanujam; *Imitation Game* (2014) - on Alan Turing; *First Man* (2019) - on Neil Armstrong, a humanistic history of US space missions