HI2D5-15 Science, Technology and Society, 1400 to Present

20/21

Department
History
Level
Undergraduate Level 2
Module leader
Michael Bycroft
Credit value
15
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Module web page

Module aims

Science is strange. It is accessible only to a small group of specialists, but it has an enormous impact on the lives of ordinary people across the globe. From climate change and pharmaceuticals to GM crops and the internet, we live in a society which places enormous trust in science and technology. But how did this come to be? And is it always for the best? To answer these questions, we tell the story of modern science through the eyes of the people who produced and consumed it. We cover major episodes in the history of knowledge from the military revolution of the sixteenth century to the digital revolution of the twentieth. We deal with household names such as Newton, Darwin and Einstein, but also with an array of lesser-known men and women who helped to shape modern science, including Jesuit missionaries, Arabic alchemists, Chinese astronomers, and African American astrophysicists. Along the way we gauge the public attitude to science through poems, paintings, photographs, films and newspaper articles. These sources allow us to see when and why science acquired its enormous authority in modern culture, and how this prestige has been challenged on the grounds that science is unreliable, unjust or inhuman. We bring the story up to the present day, when science and technology are a source of great optimism as well as great anxiety—optimism about nanotechnology, space exploration, and quantum computing, and anxiety about the injustice of algorithms, the flaws in the peer- review process, and the exclusion of women and ethnic minorities from scientific enterprise.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Term 1. Early modern science, 1400-1800

1. Introduction. Science, technology and society in history. (James Poskett and Michael Bycroft)
   What is science? How should we study it historically? And why does this matter today?

2. Theories of Everything, 1400-1700. Theories. (Michael Bycroft)
   Early modern theories of nature were all-encompassing. They covered everything from the movements of the planets to the causes of rain and snow to the function of the liver. In Christian Europe, in the Islamic world, and in Confucian China, these theories shaped peoples' lives in profound ways. But they began to change in the early modern period as scholars throughout Eurasia took a fresh look at ancient traditions. New theories were debated, old ones discarded, and the very idea of a Theory of Everything called into question.

3. Scholars and artisans, 1400-1700. Experiment. (Michael Bycroft)
   Sixteenth-century Europe saw an unprecedented convergence of mental and manual labour. Painters, gunners and surgeons argued for the intellectual value of their labour and wrote books about their crafts. Scholars entered their workshops and described what they found there. Practical learning also flourished in China and Japan. The result was a new form of experience and a new kind of expert—those who mediated between wealthy patrons and ordinary artisans and who drove a wedge between those two groups.

4. Merchants and missionaries, 1400-1700. Circulation. (Michael Bycroft)
   Merchants and missionaries criss-crossed the early modern world in search of materials to buy and souls to win. Spanish and Portuguese voyages of discovery brought Europeans into contact with vibrant cultures in China, Japan, India and the Americas. Encounters between Europeans and other cultures led to bemusement, disdain, anger, and admiration, on both sides. Voyagers returned home with materials and information that turned old theories on their head.

5. The mathematisation of the world, 1400-1700. Measurement. (Michael Bycroft)
   Scientists such as Galileo and Newton believed that the world was mathematical. They did so because mathematics was worldly. It was used to wage war, make art, and do business. It was a language shared by Catholic cosmographers, Protestant astronomers, and Confucian cartographers. But it was not universal. It was confounded by electricity, infinity, and charges of elitism and arrogance.

READING WEEK

1. Science in the public sphere, 1700-1800. Authority. (Michael Bycroft)
   Science became part of public culture in the eighteenth century. 'Experimental philosophers' showed the wonders of electricity in taverns and coffee-shops; plants and minerals filled the

cabinets of collectors; periodicals buzzed with the latest discoveries about polyps and planets. For many thinkers, science went hand-in-hand with moral and political progress. These thinkers often slighted the very people who made the new science possible—artisans, women, non-Europeans. But these groups found a large and sympathetic audience outside the scientific establishment. Science had won over the public, but scientists had not.

2. The science of human nature, 1700-1800. Mind. (Claudia Stein)
   'Human nature' and 'the science of man' were two buzzwords of the European Enlightenment. This lecture examines the philosophers and reformers who built a science of human nature on the model of the natural sciences. The science of man aimed to study humans with more rigour and accuracy than ever before. But it was shot through with assumptions about race, gender, and the nature of knowledge.

3. The expert state, 1700-1800. Expertise (Claudia Stein)
   Eighteenth-century states drew on a new breed of experts to help with the business of government, from controlling populations to digging mines. Between 1600 and 1800, these scientific and technical experts and transformed the government of citizens across the world, from Europe to Asia.

4. Science in the age of revolution, 1780-1850. Disciplines. (James Poskett)
   Science and technology underwent another fundamental shift in the wake of the French and American Revolutions. This lecture explores the connection between the Age of Revolution and the rise of new disciplines and sites for knowledge production.

Term 2. Modern science and technology, 1800 to Present

1. Workshop of the world, 1780-1900. Technology. (James Poskett)
   New technologies transformed the Victorian world. Steam-engines roared in the factories of Lancashire, railways followed the expansion of colonialism in India, and engineering projects expanded the American frontier.

2. The origins of evolution, 1760-1900. Life. (James Poskett)
   In the Victorian age, science and religion came together in new debates about the origin of life. This lecture explores the complex and controversial history of evolutionary theory, from radical France to the Ottoman Empire. We also examine how Darwin's theory could be used to reinforce and challenge gender stereotypes, as well as the crucial role that women played in the development and circulation of evolution across the world.

3. Anthropology and empire, 1800-1900. Race. (James Poskett)
   Throughout the nineteenth century, anthropologists travelled across the colonial world, studying the mind, body and culture of the peoples they met. In studying the history of race, this lecture links science and technology to the politics of empire. We explore the work of early colonial ethnologists, such as James Cowles Prichard, as well as later twentieth-century anthropologists, such as Margaret Mead.

4. DNA and the secret of life, 1850-1950. Laboratories. (James Poskett)
   Modern biology is done in the laboratory. How did this come to be? This lecture explores the surprising story of how life moved from the field to the laboratory, and how this transformed the way people understood themselves. We also examine the ways in which new

understandings of life impacted upon notions of sex and gender far beyond the laboratory walls.

5. From economics to eugenics. Social Science. (Michael Bycroft)
   Can we study society scientifically? Over the course of the nineteenth and twentieth centuries, various practitioners tried to answer these questions. From the birth of sociology to the development of modern economics, the social sciences were at the heart of new definitions of what it meant to be scientific.

READING WEEK

1. A Brief History of Time. Universe. (James Poskett)
   New theories of space and time transformed how both physicists and ordinary people understood their place in the cosmos. This lecture explores these developments from the Einsteinian revolution to Stephen Hawking's Brief History of Time.

2. Cold War science and technology, 1945-1991. Ideology. (Claire Shaw)
   This lecture explores how the ideologies of the Cold War were reflected in the science and technology of the twentieth century. From laboratories in the USSR to the Space Race, science had never been more political.

3. The computer revolution, 1945-2000. Data. (Katayoun Shafiee)
   We live in a digital age. In the last 50 years, computers have transformed every aspect of daily life, including the world of science and technology. This lecture explores the global history of computing, from the Enigma machine to the Internet in China.

4. Energy and empire, 1900-2000. Infrastructure. (Katayoun Shafiee)
   The twentieth witnessed technological expansion on a global scale. Oil pipelines, nuclear reactors and solar farms were sites of political contest, between the old European empires and the new postcolonial nations.

Term 3

1. Conclusion: science, technology and society today (Michael Bycroft and James Poskett)
   How can the history of science help us today? In this lecture we consider how the history we have covered can inform politics, policy and even scientific research in the present.

2. Revision

3. Revision

Learning outcomes

By the end of the module, students should be able to:

- Understand and critically apply the methods of the history of science and technology to early modern and modern examples.
- Understand the connections between the history of science and society at large.
- Enhance their experience with different primary sources: texts, images, objects, films.
- Develop essay-writing skills.

- Develop seminar participation skills including presentations

Indicative reading list

Primary Sources
Scientific treatises in English, such as Galileo Galilei's Dialogue on the Two Chief World Systems and Charles Darwin's Origin of Species.
Scientific articles such as those available in the online archive of the Philosophical Transactions of the Royal Society of London
Digitised manuscript collections, such those on the webpages of the Board of Longitude Project (18th-century astronomy and navigation), the Darwin Correspondence Project (19th-century natural history), the Newton Project (17-18th-century astronomy and alchemy), and the Casebooks Project (16th-century medicine and magic).
Works of film and literature, such as Jonathan Swift's Gulliver's Travels, Mary Shelly's Frankenstein, and Stanley Kubrick's Dr. Strangelove.
Popular periodicals, such as the Gentleman's Magazine (18th century), the Penny Magazine (19th century), and Scientific American (20th century)
Archival material at the Modern Records Centre, such as the holdings on 19th- and 20th-century brewing and on 20th-century operations research.
Rare books held at the Warwick Library, such as the collection of early modern dictionaries and encyclopaedias.
Demonstrations of historical experiments and operations carried out by Poskett and Bycroft on their own equipment, eg. demonstrations of 18th-century electrical experiments and early 20th-century printing technology.
Secondary Sources:
Adas, Michael, Machines as the Measure of Men: Science, Technology and Ideologies of Western Dominance (Ithica: Cornell University Press, 1989)
Agar, Jon, Science in the Twentieth Century and Beyond (Cambridge: Polity, 2012)
Agar, Jon, The Government Machine: A Revolutionary History of the Computer (Cambridge, MA: Massachusetts Institute of Technology Press, 2003)
Arnold, David, Science, Technology and Medicine in Colonial India (Cambridge: Cambridge University Press, 2000)
Bowler, Peter and Iwan Morus, Making Modern Science: A Historical Survey (Chicago: Chicago University Press, 2005)
Bynum, William, Science and the Practice of Medicine in the Nineteenth Century (Cambridge: Cambridge University Press, 1994)
Chadarevian, Soraya de, Designs for Life: Molecular Biology after World War II (Cambridge University Press 2002)
Chelma, Karine, The History of Mathematical Proof in Ancient Traditions (Cambridge: Cambridge University Press, 2015)
Clark, William, Jan Golinski and Simon Schaffer (eds), The Sciences in Enlightened Europe (Chicago: University of Chicago Press, 1999)
Cohen, H. Floris, The Scientific Revolution: A Historiographical Inquiry (Chicago: University of Chicago, 1994)
Cohen, H. Floris. How Modern Science Came Into the World: Four Civilizations, One 17th-Century Breakthrough (Amsterdam University Press, 2010)

Cooter, Roger, The Cultural Meaning of Popular Science: Phrenology and the Organization of Consent in the Nineteenth Century (Cambridge: Cambridge University Press, 1984) Cuomo, Serafina, Technology and Culture in Greek and Roman Antiquity (Cambridge: Cambridge University Press, 2007)
Cunningham, Andrew, The Anatomical Renaissance: the Resurrection of the Anatomical Projects of the Ancients (Aldershot, 1997)
Daston, Lorraine, Classical Probability in the Enlightenment (Princeton, N.J: Princeton University Press, 1988)
Daston, Lorraine, and Katharine Park, Wonders and the Order of Nature, 1150-1750 (New York: Zone Books, 1998)
Dear, Peter, Revolutionizing the Sciences (Basingstoke: Palgrave, 2001)
Edgerton, David, The Shock of the Old: Technology and Global History since 1900 (London: Profile, 2006)
Elman, Benjamin, On Their Own Terms: Science in China, 1550-1900 (Harvard, MA, 2009)
Frängsmyr, Tore, J. L Heilbron, and Robin E Rider, eds., The Quantifying Spirit in the 18th Century (Berkeley: University of California Press, 1990)
Fyfe, Aileen, Science and Salvation: Evangelical Popular Publishing in the Nineteenth Century (Chicago: Chicago University Press, 2004)
Galison, Peter and Lorraine Daston, Objectivity (New York: Zone Books, 2007)
Golinski, Jan, Making Natural Knowledge: Constructivism and the History of Science (Chicago: University of Chicago Press, 1998)
Gordin, Micahel et al (eds), How Reason Almost Lost its Mind: The Strange Career of Cold War Rationality (Chicago: Chicago University Press, 2013)
Gordin, Michael, Karl Hall and Alexei Kojevnikov, Intelligentsia Science: The Russian Century, 1860-1960 (Chicago: Chicago University Press, 2008)
Heilbron, John. Elements of Early Modern Physics (Berkeley: University of California Press, 1992)
Heilbron, John. The Oxford Companion to the History of Modern Science (Oxford University Press, 2003)
Henry, John. The Scientific Revolution and the Origins of Modern Science (New York: St Martin's Press, 1997)
Jardine, Nick, James Secord and Emma Spary (eds), Cultures of Natural History (Cambridge: Cambridge University Press, 1995)
Kuhn, Thomas, The Copernican Revolution: Planetary Astronomy in the Development of Western Thought (Cambridge, MA: Harvard University Press, 1985)
Kusukawa, Sachiko, Picturing the Book of Nature: Image, Text, and Argument in Sixteenth-Century
Human Anatomy and Medical Botany (Chicago: University of Chicago Press, 2011) Latour, Bruno, The Pasteurization of France (Harvard: Harvard University Press, 1993) Lightman, Bernard (ed.), Victorian Science in Context (Chicago: Chicago University Press, 1997) Lindberg, David, and Ronald Numbers (eds), The Cambridge History of Science (Cambridge: Cambridge University Press, 2013), vols 1-7
Lloyd, G. E. R., and Nathan Sivin, The Way and the Word: Science and Medicine in Early China and Greece (New Haven: Yale University Press, 2002)
Long, Pamela. Artisan/Practitioners and the Rise of the New Science, 1400-1600 (Oregon State University Press, 2011)
Marks, Lara, Sexual Chemistry: A History of the Contraceptive Pill (Yale: Yale University Press, 2001)

Marsden, Ben, and Crosbie Smith, Engineering Empires: A Cultural History of Technology in Nineteenth-Century Britain (Basingstoke: Palgrave, 2005)
Mitchell, Timothy, Carbon Democracy: Political Power in the Age of Oil (London: Verso, 2011)
Needham, Joseph. Science and Civilization in China (Cambridge University Press, 1954-)
Pickstone, John, Ways of Knowing: A New History of Science, Technology and Medicine (Manchester: Manchester University Press, 2000)
Pomata, Gianna and Nancy G. Siraisi, eds, Historia: Empiricism and Erudition in Early Modern Europe (Cambridge, MA: MIT Press, 2005)
Qureshi, Sadiah, Peoples on Parade: Exhibitions, Empire and Anthropology in Nineteenth-Century Britain (Chicago: University of Chicago Press, 2011)
Raj, Kapil, Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650-1900 (Basingstoke: Palgrave, 2007)
Rashed, Rosdi, Encyclopedia of the History of Arabic Science (Taylor and Francis, 1996) Roberts, Lissa, Simon Schaffer, and Peter Dear, eds., The Mindful Hand: Inquiry and Invention from the Late Renaissance to Early Industrialisation (Amsterdam: Koninkliijke Nederlandse Akademie van Wetenschappen, 2007)
Robson, Eleanor, Mathematics in Ancient Iraq (Princeton: Princeton University Press, 2008) Rose, Nikolas, Governing the Soul: The Shaping of the Private Self (London: Free Association Books, 1989)
Schaffer, Simon and Steven Shapin, Leviathan and the Air Pump: Hobbes, Boyle and the Experimental Life (Princeton: Princeton University Press, 1989)
Selin, Helaine, ed. Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures. Third edition (Dordrecht: Springer Reference, 2016)
Shapin, Steven, A Social History of Truth: Civility and Science in Seventeenth-Century England (Chicago: University of Chicago Press, 1994)
Shapin, Steven, The Scientific Revolution (Chicago: University of Chicago Press, 1996)
Wolfe, Audra, Competing with the Soviets: Science, Technology and the State in Cold War America (Baltimore: John Hopkins University Press, 2013)
Wootton, David, The Invention of Science: A New History of the Scientific Revolution (London: Penguin, 2015)
Worboys, Michael, Spreading Germs: Disease Theories and Medical Practice in Britain, 1865–1900 (Cambridge, 2000)

Subject specific skills

No subject specific skills defined for this module.

Transferable skills

No transferable skills defined for this module.

Study

Study time

Type	Required
Lectures	9 sessions of 1 hour (6%)
Seminars	9 sessions of 1 hour (6%)
Tutorials	1 session of 1 hour (1%)
Private study	131 hours (87%)
Total	150 hours

Private study description

No private study requirements defined for this module.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Assignment 1: Oral participation	10%		Yes (extension)
Reassessment component is the same			
Assessment component			
Assignment 2: Essay plan	40%		Yes (extension)
Reassessment component is the same			
Assessment component			
Assignment 3: Essay	50%		Yes (extension)

	Weighting	Study time	Eligible for self-certification
Reassessment component is the same			

Feedback on assessment

- written feedback on essay and exam cover sheets\r\n- student/tutor dialogues in one-to-one tutorials\r\n

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Availability

There is currently no information about the courses for which this module is core or optional.