

The Relationship of Science and Scientists with Society

The Public Understanding of Science or the Eclipse of Reason?

The relationship of science and scientists with society has been controversial throughout history. This includes the natural, physical, applied, and social sciences. Such tension changes according to the nature of each society and has a fundamental role in shaping it. This article is concerned with developments in modern industrial and post-industrial societies. It considers the professionalisation of science, its wider popularisation, and whether these have led to a greater public understanding of science or to an eclipse of reason affecting the normative relationship it should have with society.



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“The Origins of Modern Science 1300-1800” is a still valuable book by Herbert Butterfield, (Butterfield 1968). A model

of clarity and compression, it was written for the intelligent general reader by someone educated as an humanist. Butterfield writes: “Considering the part played by the sciences in the story of our Western civilisation, it is hardly possible to doubt the importance which the history of science will sooner or later acquire both in its own right and as the bridge which has been so long needed between the Arts and the Sciences” (Butterfield 1968, vii).

“The Sleepwalkers: A History of Man’s Changing Vision of the Universe” by Arthur Koestler is a similar work that focuses on the history of cosmology (Koestler 1964). Koestler, an Hungarian, with a degree in Engineering, was not an academic, but was an outstanding journalist, first in Weimar Germany where he was science editor of the “Vossische Zeitung”, Berlin, and science adviser to “Ullstein” newspaper publishers. He left Germany as a refugee and was later well-known for political novels, returning to often controversial yet popular books on science after the Second World War.

In a review of “The Sleepwalkers”, published in 1959, Stuart Hampshire wrote: “Standards of knowledge and of rational understanding have been no less variable, no less in need of historical explanation than the standards of beauty or of virtue. Why did men who had the necessary evidence for so long fail to draw

the conclusions, to accept the explanation which now seems to us obvious and unavoidable? Why did they cling to forms of explanation which now seem, judged by our standards, not to have been explanations at all? These are some of Mr. Koestler’s questions” (Hampshire 1977, p. 137).

Another example is Koestler’s “The Case of the Midwife Toad” (1971) an account of a bitter and ultimately tragic academic dispute, including the possibility of fraud, between followers of Paul Lamarck and the Neo-Darwinists over whether acquired characteristics could be inherited or were subject to chance mutations preserved by natural selection. Koestler was to be described by “The Guardian” newspaper in 1978 as the most adventurous, polymathic, and readable scientific populariser of the age.

Both Butterfield and Koestler wrote of one of the best-known controversies concerning scientific knowledge and its public dissemination: the trial by the Roman Catholic Inquisition in 1633 of Galileo Galilei, an Italian physicist and astronomer, in which he defended a theory of heliocentrism by which the Earth and neighbouring planets revolve around the Sun. Galileo was sentenced to house arrest, a favourable outcome in contemporary circumstances, until he died in 1642, aged 77. The trial was of interest to the educated classes of its time and is an early example of a public culture clash between rational science and obscurantist scholasticism.

In the 20th century, the issues raised by the trial were dramatized as political propaganda in “Life of Galileo”, by the communist Bertolt Brecht published first in German in 1938 (Brecht 2008). Such ideological perspectives have been common in the popularisation of science, especially and ironically from authoritarian and totalitarian regimes that wish to present themselves as rational modernisers. Indeed, Herbert Butterfield wrote, in an Introduction to Koesler’s book: “We are constantly finding that we have been reading too much modernity into a man like Copernicus ... or, in a similar manner, we have been anachronistic in our treatment of the mind and life of Galileo” (Butterfield 1964, p. 15).

What is Science?

But what is science? Since the 17th century, the debate about science, its methodology, methods, and findings, have been conducted through scholarly associations such as the Royal Society in England (1660), the Académie des Sciences in France (1666), the American Philosophical Society (1743) founded by Benjamin Franklin, and the Gesellschaft Deutscher Naturforscher und Ärzte e.V. (GDNÄ) (1822), with their meetings, lecture programmes, and journals of transactions. The question has long concerned scientists and to a lesser extent the educated public. The controversy raised by Charles Darwin’s “On the Origin of Species” in 1859 is a modern example of public engagement (Darwin 2008). It was published with such a public in mind and aroused great interest given the implications for received religion and the dominance of the Christian churches. It began a debate that has continued (Midgley 2002).

Such developments were enhanced by the growing presence of science and scientists, pure and applied, in European and North American universities and then elsewhere that grew throughout the 19th and 20th centuries. This was accompanied by increasingly dominant commercially sponsored and controlled programmes of scientific research and dissemination that were also major employers of scientists and technologists. A necessary consequence of a capitalist economic system, it has been challenged only during the state capitalism of the Soviet Union (1917 – 1999) and of the People’s Republic of China after Maoism.

Professionalisation and the Two Cultures

Scientific developments were the activities of an intellectual élite, but a steadily expanding one, itself stimulated by the growth of public education (Cipolla 1969). This accelerated in the 20th century and continues to do so formally and informally in this century, with exponential developments in Internet communication and Artificial Intelligence (AI) prominent examples. Again, in the 20th century, the history and philosophy of science became significant sub-disciplines. The differing perspectives of the Marxist and chemist J .D. Bernal (2010), Karl Popper (2002) published in German in 1934, Thomas Kuhn (1962), the anarchist Paul Feyerabend (1975), and Peter Winch (1990) are examples. The last considered the vexed place of the social sciences in intellectual enquiry. Mantzavinos and others also consider this concerning scientific practice (Mantzavinos 2009). Ironically, such debates, which continue to attract both academic and popular attention, often generate more heat than light.

The professionalisation of higher education in the 20th century also stimulated awareness of the dangers inherent in mutual incomprehension between those educated in the natural sciences and the humanities. In the 1959 Rede Lecture, at the University of Cambridge, the English chemist and novelist Charles P. Snow stated the problem explicitly. The lecture was published as “The Two Cultures and the Scientific Revolution” in the same year and, four years later, Snow responded to comments in “The Two Cultures and a Second Look”. He argued that science and the humanities, which together comprised the intellectual life of Western society, had separated into ‘two cultures’ and that this limited the capacity to solve problems and maintain social integrity. Unfortunately, in an otherwise lucid and stimulating lecture, Snow mentions the social sciences only briefly concerning American sociology.

The Popularisation of Science

Parallel to the professionalisation of science, both pure and applied, there were developments in the popularisation of science that have blurred the distinction between education and understanding

on the one hand and recreation and entertainment on the other. The 19th and 20th centuries were noted for the widespread development of science museums, zoological gardens, public lectures, and adult education institutes. These were again consequences of mass education, including popular adult education, together with increased leisure time as general employment conditions and incomes improved.

In the United Kingdom, following the Great Exhibition (1851), the inspiration of Albert, Queen Victoria's Prince Consort, there came: the Victoria and Albert Museum of Applied Arts and Design (1852), the Science Museum (1857), and the Natural History Museum (1881). Imperial College, London, with its emphasis on pure and applied sciences, and technology, followed in 1907. Such institutions were not unique or even pioneering and had counterparts in Europe, notably Germany and France, and the United States. C.P. Snow noted, "... in Germany, in the 1830s and 1840s, long before serious industrialisation had started there, it was possible to get a good university education in applied science, better than anything England or the US could offer for a couple of generations" (Snow 1959, p. 23). Prince Albert, himself a German, would have been well aware of this.

Books and magazines on scientific topics accompanied such developments meeting a demand from a now much larger literate and numerate public yet again created by public education, and a vigorous part-time adult education that was both general and technical. A well-known commercial example of such public interest is the magazine "Popular Mechanics" founded in 1902 in Chicago, Illinois, by Henry Haven Windsor, that is still published. Windsor used the tagline "Written so you can understand it." Another example is that of Lancelot Hogben, an experimental zoologist and Fellow of the Royal Society and the Royal Society of Edinburgh. A socialist, Hogben was an enthusiastic populariser of science publishing among others "Mathematics for the Million" (1936), which is still in print, and "Science for the Citizen" (1938), which long anticipated the citizen science movement of recent decades.

These early examples were followed throughout the 20th and this century, utilising developments in

mass communications technology, such as radio, film, and television. The television documentaries of natural science by David Attenborough, and cosmology by Brian Cox are well-known recent examples. Popular books on science are now published extensively, often as by-products of such documentaries, Stephen Hawking's "A Brief History of Time" (1998) is a best-selling example.

A brief note on the vast and immensely popular subject of science fiction is necessary. Examples are too numerous and well-known to list here, other than to say that the development of the genre in print, radio, film, and television illustrates the public fascination with science, scientists, and their impact. Most are intended as pure entertainment, but some have a serious purpose in representing to humanity the possibilities of utopia or dystopia, especially the latter. Aldous Huxley's "Brave New World" (2024) and Yevgeny I. Zamyatin's "We" (2016) are famous examples. Both aspects of the genre have a long history and their effect on the public understanding of genuine science should be considered.

The Public Understanding of Science

The conduct of public education in mass and diverse societies continues to raise problems similar to those identified by C. P. Snow in 1959. In developed economies, there is concern about the quantity and quality of education in the STEM subjects (Science, Technology, Engineering, and Mathematics), that are seen as necessary to future prosperity and security. There has been a corresponding decline in the demand for and provision of the social sciences and the humanities, certainly in higher education. There are both employment and cultural consequences to this.

Again, there is the question of scientific experts and their possible control of society, which is also a staple of serious science fiction. As we have noted, the theory and practice of science have always been accompanied by normative and ethical issues that make its public understanding a matter of vital importance. The problems raised, especially in democracies, are seen graphically in the creation and use of atomic weapons by 1945, and more recently in international responses to the COVID-19

pandemic, debates about climate change and the volatile national attitudes to the related Paris Accords signed in 2016.

Public understanding is at risk from the promotion of both ideological and commercial interests through propaganda, persuasion, and misinformation. This is aggravated by the exponential development of communications technologies, privately owned networks, and social media platforms on the Internet. Knight (2006) and Bowler (2009) are valuable accounts of the communication of scientific ideas, but the issues indicated above continue to accelerate in impact and this should be of concern. The international scientific community has tried to address them, for example through the UNESCO, the American Association for the Advancement of Science, the Royal Society (Royal Society, 1985), and its national academy counterparts, and with university Chairs and relevant journals.

The Eclipse of Reason?

However admirable, such initiatives, which have continued and expanded, are essentially sermons to the converted. Internationally, both states and the private sector are limited and even hostile in their attitudes, despite vocal and sometimes law-breaking protests by an unpopular minority. What the average person, swamped by often dubious information, needs most is to understand and trust the scientific method and the social and ethical issues it raises. In 1947, Max Horkheimer argued, amid determined optimism about post-war reconstruction, that, in Western societies, scientific reason was now individual and pragmatic and not aimed at a truth which everyone recognized and was accountable (Horkheimer 2013). This condition, exploited by a 'cultural industry,' has been aggravated by the post-modernism of recent decades and the vulgar chaos of the Internet. We should remember Carlo Cipolla's wise remark: "Instructing a savage in advanced techniques does not change him into a civilized person; it just makes him a more efficient savage" (Cipolla 1969, p. 110).

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