

Imperial College London
Science Communication Group
MSc Science Communication

Why is Sir Francis Bacon a candidate for the title
'Founder of Modern Science'?

Assignment 1 in Science and its social contexts

By Arko Olesk
Tutor Stephen Webster

10 November 2008

Science media rarely pays attention to Hollywood films. But earlier this year *Science Talk*, the podcast of the Scientific American magazine dedicated one episode to discuss science with the director of a recent movie called *The Happening*¹. The movie was highlighted as being scientifically credible and promoting the scientific way of thinking, while also exploring the limits of science.

I saw the movie recently. It indeed aspired to be scientifically sound, but artistically... the movie was terribly bad, to be honest. The reasons for its failure are not important here, let me just highlight a quote from the main character of the movie, a high school biology teacher played by Mark Wahlberg. Reminding his students to prepare for their science projects, he declares:

«What are the rules of scientific investigation?»

- *Identify variables*
- *Design the experiment*
- *Careful observation and measurement*
- *Interpretation of experimental data»*

This clearly illustrates how deeply the Baconian notion of science is rooted in our understanding. When we ask from a man on the street how science works, the description of Baconian method is most likely what we get as the answer. This improved method of discovery – the experimental method – is generally why Francis Bacon is considered the father of modern science. «Bacon appreciated that facts obtained from experiment would have little significance unless correlated, and that their proper interpretation was one of the chief aims of science,» Fulton (1931: 303) emphasized the importance of Bacon.

Bacon's ideal of scientific discovery, however, was soon disputed, and philosophers and sociologists have been constantly moving away from the idea that objective investigations produce scientific truths. As Crowther points out (1960: 5), even Bacon's contemporaries who believed to have adopted Bacon's scientific method actually adopted the method as modified by Galileo. «[Galileo's] method of discovery depends on the imagination as an essential link. /.../ This method of discovery depends pre-eminently on personal ability, and is individually only roughly predictable» (Crowther, 1960: 6-7). Bacon himself had imagined every step to

¹ Episode from June 12, 2008: <http://www.sciam.com/podcast/episode.cfm?id=7D143269-CDF5-97B4-8E87A33F3D39DA4B>

be conscious: «For my way of discovering sciences goes far to level men's wit and leaves but little to individual excellence, because it performs everything by the surest rules and demonstrations» (*Francis Bacon: Novum Organum*, CXXII). Therefore, it would in principle be possible to conceive a machine which could be operated to discover the laws governing any aspect of natural phenomena (Crowther, 1960: 7), a thought that is even in the days of computers a bit far-fetched.

Referring to the problems related with his method, Bacon's historical influence on the development of modern societies has also been disputed by some scientists, to the point of describing him as «a stimulating popularizer of new doctrines but not a true discoverer» (cited from Faulkner, 1993: 10). «These scientists tend to be «technicians,» and they fail to recognize how their outlook and work is shaped by Bacon's vision of the very education of which they are the present-day beneficiaries,» Faulkner replies to the depreciators of Bacon. It was Bacon who set us consciously on the road of modern science, he adds (*ibid.*). In this essay I try to look at some more aspects in which Francis Bacon, Lord Verulam can be considered the father of modern science. Especially concerning that this still popular Baconian ideal of scientific discovery does not reflect the way science really operates, it is important to look at his influence on the development of science as a social institution.

It is true that Bacon was not a great scientist himself, but it is great injustice to call him merely a popularizer. His ideas on the relationship between science and society have largely shaped the views about science for the past centuries. To use modern jargon, one can even say that he was the one who constructed the institution of science, both with his actions and his writings.

Bacon achieved a remarkable political power. Under James I he rose spectacularly to become the second or third most powerful person in the kingdom and his political ambition was vast (Faulkner, 1993). According to Crowther (1960, xi) the aspiration towards political power was not only to satisfy his personal ambitions. «He was the first to propose the continual improvement of human life by the systematic development and application of science, not as a utopian dream but a practical policy. He entered politics with the aim of securing the power necessary to carry it out,» he writes (*ibid.*).

Bacon's idea of using politics to guide the science and deliver the utilities was original at that time and was much influenced by the England of his day, i.e. was spurred by the social and cultural conditions he encountered. «It was an England in which the problem of poverty was constantly discussed; in which the menace of plague produced a periodic exodus from London of those in a position to move; in which demonology, magic, and alchemy found lodging in the minds of those in the highest offices of state. For such evils Bacon believed a remedy could be found in his philosophy of works,» writes Farrington (1964: 13).

His method would be instrumental in achieving his aims, Bacon argued. «The new method of science would provide for the 'real business and fortunes of the human race, and all power of operation.' The science of innovations would produce immense innovations, the most important of which was to be a new state of progressive civilization (Faulkner, 1993: 145).

Bacon conceived not only the planned development of science, but also the planned development of society, on the basis of material possibilities and the scientifically ascertained facts of the human mind and social life (Crowther, 1960: 1-2). This makes him, according to Crowther (*ibid.*, xi), first of the new type of man essential in a scientific age, the Statesman of Science, who is not primarily concerned in making scientific discoveries, but with the organization and utilization of science, and its proper integration in the rest of human life.

Bacon's firm belief that all science should be made for the benefit of mankind was also evident in his own scientific investigations. For example he made model windmills with paper sails, which he drove by artificial winds generated by a pair of bellows, in order to try to improve the design (Crowther, 1960: 130). «He said that research on the winds would lead to better weather forecasting, which was important not only to sailors in the shipping trade, but also for forecasting harvests and the spread of epidemics» (*ibid.*).

But Bacon was not a skilful experimenter and, lacking political charisma, did also not find many collaborators on his political project and after three years in office, had to retire from the position of Lord Chancellor. Having not achieved much this way, he returned to philosophy and envisaged a utopian society which relies crucially on products from methodical research. The result is known as *New Atlantis*, an unfinished story of a mythical country called Bensalem, where a foundation called Salomon's House carries out scientific research for the benefit of the citizens and «to establish and extend the power and dominion of

the human race itself over the universe,» as he had put it before in *Novum Organum* (CXXIX). «The end of our foundation is the knowledge of causes, and secret motions of things; and the enlarging of the bounds of human empire, to the effecting of all things possible,» the father of Salomon's House explains to the European travellers stranded in Bensalem (*The New Atlantis by Francis Bacon*).

The fictional future-orientated Bensalem organizes science and society to satisfy desires for health, subsistence, security, and compassionate care. The people of Bensalem are satisfied, and the scientists of Salomon's House are popular because they are the agents of satisfaction (Faulkner, 1993: 11).

Fulton (1931) credits Bacon for realizing that progress could be made only through co-operation and organization. Indeed, the model of Salomon's House much reminds a modern research institute, where experimenters are divided into research groups in different laboratories assigned to specific subjects, and some scientists performing experiments, others formulating theories. In *New Atlantis* Bacon constructs a scientific institution that is collaborative, systematic and communicating, in contrast to how science was previously done: privately. «No longer was science to exist merely for the pleasure and illumination of a few minds,» Eamon (1985: 340) declares. Also, by defining the scientist's role as a collaborative worker who produces benefits for the society, Bacon bestows them a new social status, constructs the image of a scientist as we now know it, not as the guardian of secret knowledge, but as the purveyor of new truths bearing the authority of experimental evidence (*ibid.*, 346).

The effect of *New Atlantis* on the development of scientific institutions is well documented. By the mid-seventeenth century, Bacon's programme had inspired a host of informal study clubs in England and France (Eamon, 1985: 342), one of which was the precursor of the Royal Society of London. Bacon and his Salomon's House are often cited to have been the inspiration for the Royal Society, founded in 1645, and its founders readily admitted the influence of Bacon. The *Record* of the Royal Society of London opens with the statement that «the foundation of the Royal Society was one of the earliest practical fruits of the philosophical labours of Francis Bacon» (Crowther, 1960: 2). These associations, allowing informal communication and disseminating research results, were also important because the institution we now most often associate with scientific research, namely universities,

continued conservatively on the Aristotelian course that had disgusted Bacon. «The assimilation by the Universities of scientific ideals has occurred almost entirely within the last 50 years,» Fulton said in 1930 (1931: 319). «The growth of scientific institutions outside the Universities was necessary in the seventeenth and eighteenth centuries if science were to exist at all» (*ibid.*: 320)

However, as with the experimental method, the Royal Society did not completely adopt Bacon's ideas. In *New Atlantis* Bacon had sketched a new social order, but without accepting Bacon's greater scheme, the Royal Society only adopted the notion of planned research by scientists banded together in a corporate body (Crowther, 1960: 3). Paradoxically, Royal Society helped to cement one important aspect of modern science by ignoring one suggestion devised by Bacon in *New Atlantis*. While encouraging open communication among scientists, Bacon preferred secrecy when dealing with the rest of society. He writes: «We have consultations, which of the inventions and experiences which we have discovered shall be published, and which not; and take all an oath of secrecy for the concealing of those which we think fit to keep secret; though some of those we do reveal sometime to the State, and some not» (*The New Atlantis by Francis Bacon*). The Royal Society chose not to pursue this path of secrecy towards the society and in 1664 started to publish *Philosophical Transactions*, the oldest scientific journal in the world. And it was the reputation of the Royal Society that encouraged scientists finally to abandon their attachment to secrecy and to submit their work to the judgement of its fellows (Eamon, 1985: 344). This concluded the development of the idea of public knowledge in science and also led to the publication of French Encyclopaedia.

Bacon has also helped to create the modern manner of writing textbooks and research papers, with concise and orderly representation, distinguishing clearly between theory, data, results of experiments and conclusions (Crowther, 1960: 132).

These examples hopefully demonstrate the significant influence of Francis Bacon on the development of science as an institution and the practises of science, allowing us justly to call him the father of modern science. He was the first to combine science with statesmanship. His ideal that science should benefit mankind has been the guiding principle in several later periods throughout modern history. He introduced many important characteristics we now associate with science – among others experimental method, scientific collaboration and open communication. Although some of his ideas were not adopted the way he envisaged them and

today we might not consider them valid any more, it is the influence of these ideas on his contemporaries that counts. Bacon inspired many scientists both in England and in continental Europe to share their research with fellows, giving scientists a new social role and laying the foundation to the institutionalization of science. And if you think of it, getting your ideas presented in a Hollywood movie is no mean feat either.

Bibliography:

Crowther, J. G., *Francis Bacon : the first statesman of science* (Cresset Press, 1960).

Eamon, W., 'From the Secrets of Nature to Public Knowledge: The Origins of the Concept of Openness in Science' *Minerva* vol 23, 3 (1985) pp. 321-347.

Farrington, B., *The New Atlantis of Francis Bacon* (New Atlantis Foundation, 1964).

Faulkner, R. K., *Francis Bacon and the project of progress* (Rowman & Littlefield, 1993).

'Francis Bacon: Novum Organum (1620)', http://www.constitution.org/bacon/nov_org.htm, accessed 10 November 2008.

Fulton, J. F., *The rise of the experimental method : Bacon and the Royal society of London* (s.n., 1931).

'The New Atlantis by Francis Bacon', <http://oregonstate.edu/instruct/phl302/texts/bacon/atlantia.html>, accessed 10 November 2008.