Human knowledge and human power meet in one; for where the cause is not known the effect cannot be produced. Nature to be commanded must be obeyed; and that which in contemplation is as the cause is in operation as the rule.

Bacon was a politician, jurist, royal councillor, natural scientist and essay writer, who spent his entire life within the highest political, courtly and intellectual circles around Queen Elizabeth and King James I. His maternal uncle, Lord Burghley, was the most powerful statesman of his age. After Cambridge University and a period in France, he became a lawyer and Member of Parliament. Despite his earlier friendship with the charismatic Earl of Essex, he was active in the prosecution of Essex for treason – a deed which has inspired some, probably unfairly, to accuse Bacon of the worst sort of betrayal. Bacon was also involved in the prosecution of Sir Walter Raleigh, once an associate of Essex.

The first edition of Bacon's *Essays and Counsels* (1591) dates from his early career, and was eventually expanded into a third edition containing fifty-eight essays in 1625. Upon the succession of King James I in 1603, Bacon moved upward in the court hierarchy even more rapidly, eventually becoming, in 1618, Lord Chancellor and Baron Verulam. Bacon's writings during these politically active years reflect his many interests – in English Law, the Church of England and the ‘Advancement of Learning’, which offered a sweeping survey of the current state of knowledge in every field. In 1621, Bacon was created Viscount St Albans and finally published the *Novum Organum*, the first part of his vast systematic natural philosophy. But he had also made some serious enemies, who had him removed from office and convicted for taking bribes. Released from prison by King James, Bacon retired to his country home, where he could devote his undivided attention to carrying out many of his principal works. He died in April 1626 from pneumonia contracted while testing the preservative effects of snow on a chicken.

Perhaps no other person in the history of modern ideas has provoked such incompatible and one-sided assessments, towards which adherents maintain an almost sectarian zeal. One reason for this is that there is little agreement on what his actual intentions were or the scientific status of his achievements. The seventeenth century praised and imitated him, the eighteenth century glorified him as the precursor of Enlightenment, while the nineteenth century devoted effort to debunking him and making him the villain of the Jacobean period. The ‘Secretary of Nature and All Learning’ came to be despised as a charlatan, an enemy of real science, and quite recently was even described as a Satanist. In Mathews' summary of twentieth-century opinion, Bacon is dubbed an atheist and hailed as a religious thinker; acclaimed for his prophetic insights in natural history, his understanding of logic, his theory of

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forms, and his powerful imagination; while at the same time he is decried for his ignorance of natural history and logic, his absurd notion of forms, and his entire lack of imagination.  

One must resist the temptation to describe Bacon's life and works, let alone his attitude towards environmental issues, in cartoon terms. It is far too facile to condemn him for his comments about the merits of human domination and exploitation of nature. Bacon likened himself to a honey bee; the proper philosophical conduct is to work together in the accumulation of material in order to then transform it into something sweet and nutritious. The traditional thinkers, especially the medieval scholastics, were like spiders who spun intricate webs entirely from the inside and then imposed their structures on the world. The empirics, especially alchemists, astrologers and other pseudo-scientific dabblers, were like ants who merely collect curiosities and arcane lore, unable to articulate a coherent intellectual framework. Bacon described three defective methods in the pursuit of knowledge: the 'disputatious' erudition of scholastics; the 'delicate' learning which preserved the errors of revered authorities; and the 'fantastic' learning of the occultists and Hermeticists who catalogue dubious instances of isolated marvels.

Bacon attempted to address all these issues, and more, in the various parts of the *Instauratio Magna*, 'the Great Setting-Forth'. The first part appeared as a revision and expansion of *The Advancement of Learning*, while the second part, the *New Organon*, recasts Aristotle's *Organon* (the Logical Texts) in new terms and contains Bacon's most detailed though incomplete exposition of his criticisms of the false path of natural philosophy and his outline for a cooperative programme in the various natural sciences.

At the core of Bacon's notion of scientific knowledge are the doctrines of induction, hidden forms, and maker's knowledge. In his doctrine of hidden forms, Bacon resuscitated an old idea, that it is the form which gives a thing its true nature. Baconian forms are the simple constituents of matter and, though there are only a small number of them, they can be combined in an infinite number of arrangements, like the letters of an alphabet which can be combined to generate an infinite number of words. The aim of his whole project is, in his words, 'the inquisition of forms' which leads to works, the fruits of correct experimental procedures; he defines natural philosophy as 'the inquiry of causes and the production of effects'. The canon of basic physical properties is the discovery of those true forms which are 'nothing more than those laws and determinations of absolute actuality which govern and constitute any simple nature'. In Perez-Ramos' adroit words, the scientist as a human knower is first and foremost a maker or doer, and his warrant for claims to knowledge depends on his credentials as a maker: 'Bacon's idea of science ... establishes that to know something (a natural phenomenon) amounts to being able to (re)produce that very phenomenon on any material substratum susceptible of manifesting it.'

In order to fully comprehend the grandeur (or grandiosity) of Bacon's entire project one must realize that the doctrines of hidden forms and maker's knowledge are aspects of a scheme which concerns 'the advancement of ideas about moving and persuading things and human beings'. The overall scheme is embraced under Bacon's notion of rhetoric which combines psychological, economic and material dynamics. The very idea that one can persuade things seems, to modern readers, to be utterly strange, unless one bears in mind that for Bacon there are hidden spiritual forms which compose the nature of all things, including human beings. 'In the new learning, experiment is more than a method of discovery; it is an ordeal, a test of a subject's true nature. Ultimately, all experiments work upon the matter and spirit of the created world, including the minds and passions of human beings.'

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In Bacon's theistic picture, the Creator moves the created world in a cryptic manner; the surface language of the perceptible properties of animals, vegetables and minerals conceals a secret code, which the scientist must decipher in order to interpret the latent or deeper language. This notion helps to explain Bacon's repeated references to ciphers and codes, encryption and decryption. The New Learning endorses secrecy, an adept's privileged knowledge, and this is most appropriately expressed through aphorisms and riddles: 'God's encryption of the world is an enigma, and its maker is hidden to all but those who can discover the signs of God's wisdom by suffering the scourging of their vanities in the sweet ordeal of Solomonic inquiry.' This aphoristic and riddling format is featured most prominently in the Essays. But if one grasps the twofold power of Bacon's rhetoric, then one can appreciate that the recommendations addressed to civil servants and power-brokers, for instance, in regard to domination of natural forces and the production of works beneficial to humankind, are designed both to persuade them in terms of their own self-interests and (more secretly) to obey the commands of nature hidden at the deepest levels:

*Each essay stands by itself as a separate counsel fitted to move those peculiarly susceptible to its appeal ... Together they are a paradigm of enlightenment. They are perhaps the classic example of the art behind the light ... 'which gradually, by imperceptible degrees, would illuminate the world'.*

This artful light is the philosophical force behind the statement that 'Nature to be commanded must be obeyed; and that which in contemplation is as the cause is in operation as the rule'. One can only command natural material and forces in order to shape them into works insofar as one has already understood the deeper inalterable structure of hidden forms; and further, that the 'object' of theoretical insight has its own causal dynamics which must be strictly followed in practical terms in order to (re)make the object for one's own purposes. To violate this fundamental principle, to attempt to alter nature's hidden laws and work against its intrinsic dynamics, is a dangerous enterprise. In the *Wisdom of the Ancients*, Bacon meditated on the fable of Daedalus to draw the lesson that careless fooling with mechanical techniques can have malicious and even deadly consequences. But one should be wary of an overly optimistic reinterpretation of his attitude towards scientific progress, for 'Bacon's works are various mirrors of one another, some darker than the rest' – the darkness often concealed beneath the advocacy of a philanthropic practice.

Despite Bacon's awareness of the dangers of even carefully controlled experiments, he was willing to risk these for the material improvement of human life. If some of his pronouncements on these issues are obscure and ambiguous, his vision of a scientific utopia in *New Atlantis* is both unambiguous and frightening. European travellers in the South Seas are blown off course and arrive at the island of Bensalem. They are provided with the benefits of this strange welfare state – food, shelter and medical care – shown the island's indigenous customs and rituals, and given a guided tour of Solomon's House, the realization of Bacon's scientific research institute. The guide shows them through many rooms where various 'research and design' programmes are being carried out, such as the transformation of birds, beasts and plants into new, barren or super-fertile, kinds, the manufacture of more violent weapons and munitions, and 'houses of deceits of the senses'. The catalogue of twenty-four 'improvements' in scientific knowledge presages some of the most dreadful nightmares of human reason: genetic modification of living things, drug trials on animals, nuclear armaments, powerful machines for the pursuit of luxury or idleness, the ideological apparatus for the control of human behaviour, and more. Equal weight is given to the trivial and the profound, the beneficent and
malevolent, reflecting Bacon's ideal of experimental inquiry focused on 'nature under constraint and vexed; that is to say, when by art and the hand of man she is forced out of her natural state, and squeezed and molded'. This utopian vision is the culmination of Bacon's twofold strategy: a physical science capable of dealing with powerful natural motions and a rhetorical 'science' capable of dealing with human emotions.

Bacon's influence on natural science and politics has been pervasive and paradoxical. An epic poem at the front of Thomas Sprat's *History of the Royal Society* (1663) treats Bacon as nearly godlike in the breadth of his vision, one whose instructions could be substituted for divine commandments. At the height of the French Enlightenment, D'Alembert thought that Bacon's grand plan was like the light after the dark, that he was 'the greatest, the most universal, and the most eloquent of philosophers'; his Great Setting-Forth was the model for the *Encyclopédie, ou Dictionnaire Raisonée*. But in Britain about the same time, Bacon's grand scheme was the object of vicious satire and ridicule in Jonathan Swift's *Gulliver's Travels*, where Solomon's House is turned into an asylum for crackpot inventors.

Under the impact of the early nineteenth century's revaluation of the history of scientific ideas, Bacon was accorded a more dubious honour, having failed to realize the importance of mathematics in an understanding of physical laws. Lord Macaulay's once famous eulogy of Bacon's philosophy praised this beneficent promoter of human advancement but damned him for moral turpitude in his betrayal of close friends and pandering after honours and riches. In the twentieth century, the Frankfurt School theorists Horkheimer and Adorno denounced Bacon as the initiator of the worst forms of human domination and oppression under the aegis of an instrumental rationality in the service of a capitalist state. Perhaps one can attain a measured balance between these two extremes by considering the arguments of the eminent biologist Loren Eiseley, who arrives at an ambivalent assessment of Bacon, an Elizabethan scientist-magician who promised so much for the good of the human species, but was willing to destroy or distort at least as much to achieve this end.

**See also in this book**

Aristotle

**Bacon's major writings**


**Further reading**

- Briggs, J. C., Francis Bacon and the Rhetoric of Nature, Harvard University Press Cambridge MA,
1989.
- Eiseley, Loren, Francis Bacon and the Modern Dilemma, University of Nebraska Press Lincoln NE, 1962.

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Briggs, J. C., Francis Bacon and the Rhetoric of Nature, p. 3.

5
Ibid., p. 9.

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Faulkner, R. K., Francis Bacon and the Project of Progress, p. 29.

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