**Francis Bacon**

Source: Stanford Encyclopedia of Philosophy

Francis Bacon (1561–1626) was one of the leading figures in natural philosophy and in the field of scientific methodology in the period of transition from the Renaissance to the early modern era. As a lawyer, member of Parliament, and Queen's Counsel, Bacon wrote on questions of law, state and religion, as well as on contemporary politics; but he also published texts in which he speculated on possible conceptions of society, and he pondered questions of ethics (*Essays*) even in his works on natural philosophy (*The Advancement of Learning*).

After his studies at Trinity College, Cambridge and Gray's Inn, London, Bacon did not take up a post at a university, but instead tried to start a political career. Although his efforts were not crowned with success during the era of Queen Elizabeth, under James I he rose to the highest political office, Lord Chancellor. Bacon's international fame and influence spread during his last years, when he was able to focus his energies exclusively on his philosophical work, and even more so after his death, when English scientists of the Boyle circle (*Invisible College*) took up his idea of a cooperative research institution in their plans and preparations for establishing the Royal Society.

To the present day Bacon is well known for his treatises on empiricist natural philosophy (*The Advancement of Learning*, *Novum Organum Scientiarum*) and for his doctrine of the idols, which he put forward in his early writings, as well as for the idea of a modern research institute, which he described in *Nova Atlantis*.

**Excerpts from the *Novum Organum*:**

40. The formation of notions and axioms on the foundation of true induction is the only fitting remedy, by which we can ward off and expel these idols. It is, however, of great service to point them out. For the doctrine of idols bears the same relation to the interpretation of nature, as that of confutation of sophisms does to common logic.

41. The idols of the tribe are inherent in human nature, and the very tribe or race of man. For man's sense is falsely asserted to be the standard of things. On the contrary, all the perceptions, both of the senses and the mind, bear reference to man, and not to the universe, and the human mind resembles those uneven mirrors, which impart their own properties to different objects, from which rays are emitted, and distort and disfigure them.

42. The idols of the den are those of each individual. For everybody (in addition to the errors common to the race of man) has his own individual den or cavern, which intercepts and corrupts the light of nature; either from his own peculiar and singular disposition, or from his education and intercourse with others, or from his reading, and the authority acquired by those whom he reverences and admires, or from the different impressions produced on the mind, as it happens to be preoccupied and predisposed, or equable and tranquil, and the like: so that the spirit of man (according to its several dispositions) is variable, confused, and as it were actuated by chance; and Heraclitus said well that men search for knowledge in lesser worlds, and not in the greater or common world.

43. There are also idols formed by the reciprocal intercourse and society of man with man, which we call idols of the market, from the commerce and association of men with each other. For men converse by means of language; but words are formed at the will of the generality; and there arises from a bad and unapt formation of words a wonderful obstruction to the mind. Nor can the definitions and explanations, with which learned men are wont to guard and protect themselves in some instances, afford a complete remedy: words still manifestly force the understanding, throw every thing into confusion, and lead mankind into vain and innumerable controversies and fallacies.

44. Lastly, there are idols which have crept into men’s minds from the various dogmas of peculiar systems of philosophy, and also from the perverted rules of demonstration, and these we denominate idols of the theatre. For we regard all the systems of philosophy hitherto received or imagined, as so many plays brought out and performed, creating fictitious and theatrical worlds. Nor do we speak only of the present systems, or of the philosophy and sects of the ancients, since numerous other plays of a similar nature can be still composed and made to agree with each other, the causes of the most opposite errors being generally the same. Nor, again, do we allude merely to general systems, but also to many elements and axioms of sciences, which have become inveterate by tradition, implicit credence, and neglect. We must, however, discuss each species of idols more fully and distinctly, in order to guard the human understanding against them.

45. The human understanding, from its peculiar nature, easily supposes a greater degree of order and equality in things than it really finds; and although many things in nature be sui generis, and most irregular, will yet invent parallels and conjugates, and relatives where no such thing is. Hence the fiction, that all celestial bodies were in perfect circles, thus rejecting entirely spiral and serpentine lines, (except as explanatory terms.) Hence, also, the element of fire is introduced with its peculiar orbit, to keep square with those other three which are objects of our senses. The relative rarity of the elements (as they are called) is arbitrarily made to vary in tenfold progression, with many other dreams of the like nature. Nor is this folly confined to theories, but it is to be met with even in simple notions.

50. But by far the greatest impediment and aberration of the human understanding proceeds from the dulness, incompetency, and errors of the senses: since whatever strikes the senses preponderates over every thing, however superior, which does not immediately strike them. Hence contemplation mostly ceases with sight; and a very scanty, or perhaps no regard is paid to invisible objects. The entire operation, therefore, of spirits enclosed in tangible bodies is concealed and escapes us. All that more delicate change of formation in the parts of coarser substances (vulgarly called alteration, but in fact a change of position in the smallest particles) is equally unknown; and yet, unless the two matters we have mentioned be explored and brought to light, no great effect can be produced in nature. Again, the very nature of common air, and all bodies of less density (of which there are many) is almost unknown. For the senses are weak and erring, nor can instruments be of great use in extending their sphere or acuteness; all the better interpretations of nature are worked out by instances, and fit and apt experiments, where the senses only judge of the experiment, the experiment of nature and the thing itself.

81. There is another powerful and great cause of the little advancement of the sciences, which is this: it is impossible to advance properly in the course when the goal is not properly fixed. But the real and legitimate goal of the sciences is the endowment of human life with new inventions and riches. The great crowd of teachers know nothing of this, but consist of dictatorial hirelings: unless it so happen that some artisan of an acute genius and ambitious of fame gives up his time to a new discovery, which is generally attended with a loss of property. The majority, so far from proposing to themselves the augmentation of the mass of arts and sciences, make no other use of an inquiry into the mass already before them, than is afforded by the conversion of it to some use in their lectures, or to gain, or to the acquirement of a name and the like. But if one out of the multitude be found, who courts science from real zeal and on its own account, even he will be seen rather to follow contemplation and the variety of theories than a severe and strict investigation of truth. Again, if there even be an unusually strict investigator of truth, yet will he propose to himself as the test of truth the satisfaction of his mind and understanding, as to the causes of things long since known, and not such a test as to lead to some new earnest of effects, and a new light in axioms. If, therefore, no one have laid down the real end of science, we cannot wonder that there should be error in points subordinate to that end.

105. In forming axioms, we must invent a different form of induction from that hitherto in use; not only for the proof and discovery of principles, (as they are called,) but also of minor intermediate, and in short every kind of axioms. The induction which proceeds by simple enumeration is puerile, leads to uncertain conclusions, and is exposed to danger from one contradictory instance, deciding generally from too small a number of facts, and those only the most obvious. But a really useful induction for the discovery and demonstration of the arts and sciences should separate nature by proper rejections and exclusions, and then conclude for the affirmative, after collecting a sufficient number of negatives. Now, this has not been done, or even attempted, except perhaps by Plato, who certainly uses this form of induction in some measure, to sift definitions and ideas. But much of what has never yet entered the thoughts of man, must necessarily be employed in order to exhibit a good and legitimate mode of induction, or demonstration; so as even to render it essential for us to bestow more pains upon it than have hitherto been bestowed on syllogisms. The assistance of induction is to serve us not only in the discovery of axioms, but also in defining our notions. Much indeed is to be hoped from such an induction as has been described.