Francis Bacon

ATTACK ON AUTHORITY
AND ADVOCACY OF
EXPERIMENTAL SCIENCE

Bacon was not himself a scientist; he made no discoveries and had no laboratory. Nevertheless, for his advocacy of the scientific method, Bacon is deservedly regarded as a prophet of modern science. In the first passage from *Redargutio Philosophiarum* (*The Refutation of Philosophies*), a treatise on the "idols of the theater"—fallacious ways of thinking based on given systems of philosophy—Bacon attacks the slavish reliance on Aristotle.

But even though Aristotle were the man he is thought to be I should still warn you against receiving as oracles the thoughts and opinions of one man. What justification can there be for this self-imposed servitude [that] ... you are content to repeat Aristotle's after two thousand [years]? ... But if you will be guided by me you will deny, not only to this man but to any mortal now living or who shall live hereafter, the right to dictate your opinions. ... You will never be sorry for trusting your own strength, if you but once make trial of it. You may be inferior to Aristotle on the whole, but not in everything. Finally, and this is the head and front of the whole matter, there is at least one thing in which you are far ahead of him—in precedents, in experience, in the lessons of time. Aristotle, it is said, wrote a book in which he gathered together the laws and institutions of two hundred and fifty-five cities; yet I have no doubt that the customs of Rome are worth more than all of them combined so far as military and political science are concerned. The position is the same in natural philosophy. Are you of a mind to cast aside not only your own endowments but the gifts of time? Assert yourselves before it is too late. Apply yourselves to the study of things themselves. Be not for ever the property of one man.

Bacon criticized contemporary methods used to inquire into nature. He expressed his ideas in the form of aphorisms—concise statements of principles or general truths.

I. Man, being the servant and interpreter of Nature, can do and understand so much and so much only as he has observed in fact or in thought of the course of nature: beyond this he neither knows anything nor can do anything.

VIII. ... The sciences we now possess are merely systems for the nice ordering and setting forth of things already invented; not methods of invention or directions for new works.

XII. The logic now in use serves rather to fix and give stability to the errors which have their foundation in commonly received notions than to help the search after truth. So it does more harm than good.

XIX. There are and can be only two ways of searching into and discovering truth. The one flies from the senses and particulars to the most general axioms, and from these principles, the truth of which it takes for settled and immoveable, proceeds to judgment and to the discovery of middle axioms. And this way is now in fashion. The other derives axioms from the senses and particulars, rising by a gradual and unbroken ascent, so that it arrives at the most general axioms last of all. This is the true way, but as yet untried.
XXIII. There is a great difference between...certain empty dogmas, and the true signatures and marks set upon the works of creation as they are found in nature.

XXIV. It cannot be that axioms established by argumentation should avail for the discovery of new works; since the subtlety of nature is greater many times over than the subtlety of argument. But axioms duly and orderly formed from particulars easily discover the way to new particulars, and thus render sciences active.

XXXI. It is idle to expect any great advancement in science from the superinducing [adding] and engraving of new things upon old. We must begin anew from the very foundations, unless we would revolve for ever in a circle with mean and contemptible progress.

CIX. There is therefore much ground for hoping that there are still laid up in the womb of nature many secrets of excellent use, having no affinity or parallelism with any thing that is now known, but lying entirely out of the beat of the imagination, which have not yet been found out. They too no doubt will some time or other, in the course and revolution of many ages, come to light of themselves, just as the others did; only by the method of which we are now treating they can be speedily and suddenly and simultaneously presented and anticipated.

Bacon describes those "idols" or false notions that hamper human understanding.

XXXVIII. The idols and false notions which are now in possession of the human understanding, and have taken deep root therein, not only so beset men's minds that truth can hardly find entrance, but even after entrance obtained, they will again in the very instauration [renewal] of the sciences meet and trouble us, unless men being forewarned of the danger fortify themselves as far as may be against their assaults.

XXXIX. There are four classes of Idols which beset men's minds. To these for distinction's sake I have assigned names,—calling the first class Idols of the Tribe; the second, Idols of the Cave; the third, Idols of the Market-place; the fourth, Idols of the Theatre.

XL. The Idols of the Tribe have their foundation in human nature itself, and in the tribe or race of men. For it is a false assertion that the sense of man is the measure of things. On the contrary, all perceptions as well of the sense as of the mind are according to the measure of the universe. And the human understanding is like a false mirror, which, receiving rays irregularly, distorts and discours the nature of things by mingling its own nature with it.

XLII. The Idols of the Cave are the idols of the individual man. For every one (besides the errors common to human nature in general) has a cave or den of his own, which refracts and discours the light of nature; owing either to his own proper and peculiar nature; or to his education and conversation with others; or to the reading of books, and the authority of those whom he esteem and admires; or to the differences of impressions, accordingly as they take place in a mind preoccupied and predisposed or in a mind indifferent and settled; or the like...

XLIII. There are also Idols formed by the intercourse and association of men with each other, which I call Idols of the Market-place, on account of the commerce and consort of men there. For it is by discourse that men associate; and words are imposed according to the apprehension of the vulgar. And therefore the ill and unfit choice of words wonderfully obstructs the understanding. Nor do the definitions or explanations wherewith in some things learned men are wont to guard and defend themselves, by any means set the matter right. But words plainly force and overrule the understanding, and throw all into confusion, and lead men away into numberless empty controversies and idle fancies.

XLIV. Lastly, there are Idols which have immigrated into men's minds from the various dogmas of philosophies, and also from wrong laws of demonstration. These I call Idols of the Theatre; because in my judgment all the
received systems are but so many stage-plays, representing worlds of their own creation after an unreal and scenic fashion. Nor is it only of the systems now in vogue, or only of the ancient sects and philosophies, that I speak; for many more plays of the same kind may yet be composed and in like artificial manner set forth; seeing that errors the most widely different have nevertheless causes for the most part alike. Neither again do I mean this only of entire systems, but also of many principles and axioms in science, which by tradition, credulity, and negligence have come to be received.

But of these several kinds of Idols I must speak more largely and exactly, that the understanding may be duly cautioned.