Francis Bacon’s life can be characterized as a mercurial search for power. As the youngest son of Sir Nicholas Bacon, Lord Keeper of the Great Seal for Queen Elizabeth I, Francis’s early life was one of prestige and privilege. His uncle, Lord Burghley, was one of the most powerful men in the kingdom. His mother, Lady Bacon, was a woman of uncommon learning (and a committed Puritan). As a young man, Francis displayed remarkable intellect. He entered Trinity College, Cambridge, when he was only 12 years old. There he came to the conviction that the prevailing Aristotelian philosophy was hopelessly sterile. As a result, much of Bacon’s later work has a strong anti-scholastic cast. Upon graduating three years later, his intellectual gifts attracted the interest of the queen herself, and he was sent to France (at age 16) as part of the English ambassador’s staff.

Bacon’s shooting star came hurtling down two years later at the death of his father. Under the inheritance laws of the time, he found himself, as the youngest son, penniless at age 18. He took up law—a promising career for a man with connections and little money. In 1584 (at age 23), he won a seat in Parliament. For the next twenty-three years, he was prominent in public affairs—and, notoriously, in controversies. Once, he publicly opposed the queen and lost his high position. Subsequently, however, he supported the queen’s decision to hang his best friend. His motivations and his reasonings in this case have frequently been debated.

After the death of Queen Elizabeth I and the ascension of James I, Bacon’s star rose once more. He was made Solicitor-General in 1607 and six years later Attorney-General; in 1617, he was given his father’s former position, Lord Keeper of the Great Seal; the following year he was named Lord Chancellor and
the Baron Verulam. During the reign of James I, Bacon also wrote his two most important philosophical works. The first, *The Advancement of Learning* (1605), argued that scholars should be freed from the past and encouraged to seek new discoveries in science. The second, his *Novum Organum* (1620), explained the various ways scholars had been held in intellectual bondage and proposed an inductive method to escape such bondage.

Bacon’s career reached a peak in 1621 when he was named the Viscount St. Albans. But exactly one week after this last, and highest, investiture, Bacon was accused of bribery, to which he later pleaded guilty. He received a heavy fine (£40,000—about $8 million today) and was imprisoned in the Tower of London. Even though the king forgave the fine and Bacon spent only four days in the Tower, he was disqualified from public office for life. As he later cryptically wrote: “I was the justes judge that was in England these fifty years; but it was the justes censure in Parliament that was these two hundred years.” Although he followed his time’s practice of accepting gifts from litigants, he insisted that his judgment had never been swayed by a bribe. Again, his conduct has been the subject of much discussion. The last years of Bacon’s life were spent in research and writing.

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Bacon’s drive for power extended beyond politics. He saw knowledge, especially scientific knowledge, as a means to power. He was not interested in abstract “Truth,” but in “that knowledge whose dignity is maintained by works of utility and power.” He sought to make humans masters of the natural world. The goal of science is “the glory of the Creator and the relief of man’s estate.” To this end, he sought a “total reconstruction of the sciences, arts, and all human knowledge”—what he called “The Great Instauration.”

Bacon’s total reconstruction begins with dismantling all past errors. He argues that medieval philosophers, the Scholastics, were consumed with disputing questions but never approached knowledge of the real world. Renaissance humanists were not much better. They were obsessed with the eloquence of ancient Greeks and Romans but inclined to “hunt after words more than matter.” According to Bacon, all previous thinkers, and most thinkers of his own day as well, had developed bad mental habits or what he called “Idols of the Mind.” In the passage that follows, *Aphorisms Concerning the Interpretation of Nature and the Kingdom of Man* from his *Novum Organum*, Bacon explains how these idols have impeded real knowledge.

Having removed past errors and the Idols of the Mind, Bacon presents his positive program. Instead of the deductive methods of the Scholastics, Bacon claims that “Our only hope...lies in a true induction.” Bacon argues for a careful return to the empirical data in order to develop axioms and then derive experiments from those axioms. In a later passage (not included here), Bacon says that if one would know the cause of a phenomenon, one must begin by tirelessly collecting data and constructing three tables: (1) instances exhibiting the phenomenon, (2) instances not exhibiting the phenomenon, and (3) instances in which the phenomenon is present in different degrees. Using heat, for example, one would construct tables of “What’s Hot,” “What’s Not,” and “What’s Sort of Hot and Sort of Not.” From such tables, one could discover the “form” of heat. Contemporary philosophers of science point out that Bacon’s “scientific method” of “true induction” leaves out
both working hypotheses and mathematics. Moreover, simply listing phenomena
does not necessarily yield knowledge—after all, every phenomenon in the uni-
verse could be on at least one “What’s Hot” list! But Bacon is still appreciated for
encouraging the systematic empirical study of science.

Besides The Advancement of Learning and Novum Organum, Bacon’s major
works include Essays (1597—expanded by him in 1612 and 1625) and New
Atlantis (1624). In addition, he planned, but never completed, a much larger
work, The Great Instauration, of which the Novum Organum was to be but one
small part. (At various times, Bacon has been credited with writing Shakespeare’s
plays by those who found it inconceivable that Shakespeare himself, a mere actor,
could have written them.)

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For a complete biography with a sympathetic discussion of Bacon’s political con-
troversies, see Fulton H. Anderson, Francis Bacon: His Career and His Thought
(Los Angeles: University of Southern California Press, 1962). For overviews of
Bacon’s thought, see the short classic, C.D. Broad, The Philosophy of Francis
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NOVUM ORGANUM (selections)

APHORISMS CONCERNING THE INTERPRETATION
OF NATURE AND THE KINGDOM OF MAN

PREFACE

. . . Now my method, though hard to practice, is easy to explain; and it is this. I propose
to establish progressive stages of certainty. The evidence of the sense, helped and
guarded by a certain process of correction, I retain. But the mental operation which fol-
lows the act of sense I for the most part reject; and instead of it I open and lay out a new
and certain path for the mind to proceed in, starting directly from the simple sensuous
perception. The necessity of this was felt, no doubt, by those who attributed so much
importance to logic, showing thereby that they were in search of helps for the under-
standing, and had no confidence in the native and spontaneous process of the mind. But
this remedy comes too late to do any good, when the mind is already, through the daily
intercourse and conversation of life, occupied with unsound doctrines and beset on all
sides by vain imaginations. And therefore that art of logic, coming (as I said) too late to
the rescue, and no way able to set matters right again, has had the effect of fixing errors
rather than disclosing truth. There remains but one course for the recovery of a sound and
healthy condition—namely, that the entire work of the understanding be commenced
afresh, and the mind itself be from the very outset not left to take its own course, but
guided at every step; and the business be done as if by machinery. Certainly if in things
mechanical men had set to work with their naked hands, without help or force of instru-
ments, just as in things intellectual they have set to work with little else than the naked
forces of the understanding, very small would the matters have been which, even with
their best efforts applied in conjunction, they could have attempted or accomplished.

APHORISMS, BOOK ONE

3. 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.

4. Toward the effecting of works, all that man can do is to put together or put
asunder natural bodies. The rest is done by nature working within.

7. The productions of the mind and hand seem very numerous in books and manu-
factures. But all this variety lies in an exquisite subtlety and derivations from a few
things already known, not in the number of axioms.

8. Moreover, the works already known are due to chance and experiment rather
than to sciences; for the sciences we now possess are merely systems for the nice order-
ing and setting forth of things already invented, not methods of invention or directions
for new works.

11. As the sciences which we now have do not help us in finding out new works,
so neither does the logic which we now have help us in finding out new sciences.

12. 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.

14. The syllogism consists of propositions, propositions consist of words, words
are symbols of notions. Therefore if the notions themselves (which is the root of the
matter) are confused and overhastily abstracted from the facts, there can be no firmness
in the superstructure. Our only hope therefore lies in a true induction.

19. 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 immovable, 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.

22. Both ways set out from the senses and particulars, and rest in the highest gener-
alities; but the difference between them is infinite. For the one just glances at experiment
and particulars in passing, the other dwells duly and orderly among them. The one,
again, begins at once by establishing certain abstract and useless generalities, the other
rises by gradual steps to that which is prior and better known in the order of nature.

24. It cannot be that axioms established by argumentation should avail for the dis-
covery 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 dis-
cover the way to new particulars, and thus render sciences active.

25. The axioms now in use, having been suggested by a scanty and manipular
experience and a few particulars of most general occurrence, are made for the most part
just large enough to fit and take these in; and therefore it is no wonder if they do not lead
to new particulars. And if some opposite instance, not observed or not known before, chance to come in the way, the axiom is rescued and preserved by some frivolous distinction; whereas the truer course would be to correct the axiom itself.

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

36. One method of delivery alone remains to us which is simply this: we must lead men to the particulars themselves, and their series and order; while men on their side must force themselves for a while to lay their notions by and begin to familiarize themselves with facts.

38. 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 is obtained, they will again in the very instauration of the sciences meet and trouble us, unless men being forewarned of the danger fortify themselves as far as may be against their assaults.

39. 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 Theater.

40. The formation of ideas and axioms by true induction is no doubt the proper remedy to be applied for the keeping off and clearing away of idols. To point them out, however, is of great use, for the doctrine of idols is to the interpretation of nature what the doctrine of the refutation of sophisms is to common logic.

41. 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 individual and not according to the measure of the universe. And the human understanding is like a false mirror, which, receiving rays irregularly, distorts and discolors the nature of things by mingling its own nature with it.

42. The Idols of the Cave are the idols of the individual man. For everyone (besides the errors common to human nature in general) has a cave or den of his own, which refracts and discolors 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 esteems 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. So that the spirit of man (according as it is meted out to different individuals) is in fact a thing variable and full of perturbation, and governed as it were by chance. Whence it was well observed by Heraclitus that men look for sciences in their own lesser worlds, and not in the greater or common world.

43. 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.

44. 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 Theater; because in my judgment all the received systems are but so many stageplays, 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.

45. The human understanding is of its own nature prone to suppose the existence of more order and regularity in the world than it finds. And though there be many things in nature which are singular and unmatched, yet it devises for them parallels and conjugates and relations which do not exist. Hence the fiction that all celestial bodies move in perfect circles; spirals and dragons being (except in name) utterly rejected. Hence too the element of fire with its orb is brought in, to make up the square with the other three which the sense perceives. Hence also the ratio of density of the so-called elements is arbitrarily fixed at ten to one. And so on of other dreams. And these fancies affect not dogmas only, but simple notions also.

46. The human understanding when it has once adopted an opinion (either as being the received opinion or as being agreeable to itself) draws all things else to support and agree with it. And though there be a greater number and weight of instances to be found on the other side, yet these it either neglects and despises, or else by some distinction sets aside and rejects; in order that by this great and pernicious predetermination the authority of its former conclusions may remain inviolate. And therefore it was a good answer that was made by one who when they showed him hanging in a temple a picture of those who had paid their vows as having escaped shipwreck, and would have him say whether he did not now acknowledge the power of the gods,—"Aye," asked he again, "but where are they painted that were drowned after their vows?" And such is the way of all superstition, whether in astrology, dreams, omens, divine judgments, or the like; wherein men, having a delight in such vanities, mark the events where they are fulfilled, but where they fail, though this happen much oftener, neglect and pass them by. But with far more subtlety does this mischief insinuate itself into philosophy and the sciences; in which the first conclusion colors and brings into conformity with itself all that come after, though far sounder and better. Besides, independently of that delight and vanity which I have described, it is the peculiar and perpetual error of the human intellect to be more moved and excited by affirmatives than by negatives; whereas it ought properly to hold itself indifferently disposed towards both alike. Indeed in the establishment of any true axiom, the negative instance is the more forcible of the two.

100. But not only is a greater abundance of experiments to be sought for and procured, and that too of a different kind from those hitherto tried; an entirely different
method, order, and process for carrying on and advancing experience must also be introduced. For experience, when it wanders in its own track, is, as I have already remarked, mere groping in the dark, and confounds men rather than instructs them. But when it shall proceed in accordance with a fixed law, in regular order, and without interruption, then may better things be hoped of knowledge.

104. The understanding must not, however, be allowed to jump and fly from particulars to axioms remote and of almost the highest generality (such as the first principles, as they are called, of arts and things), and taking stand upon them as truths that cannot be shaken, proceed to prove and frame the middle axioms by reference to them; which has been the practice hitherto, the understanding being not only carried that way by a natural impulse, but also by the use of syllogistic demonstration trained and inured to it. But then, and then only, may we hope well of the sciences when in a just scale of ascent, and by successive steps not interrupted or broken, we rise from particulars to lesser axioms; and then to middle axioms, one above the other; and last of all to the most general. For the lowest axioms differ but slightly from bare experience, while the highest and most general (which we now have) are notional and abstract and without solidity. But the middle are the true and solid and living axioms, on which depend the affairs and fortunes of men; and above them again, last of all, those which are indeed the most general; such, I mean, as are not abstract, but of which those intermediate axioms are really limitations.

The understanding must not therefore be supplied with wings, but rather hung with weights, to keep it from leaping and flying. Now this has never yet been done; when it is done, we may entertain better hopes of the sciences.

105. In establishing axioms, another form of induction must be devised than has hitherto been employed, and it must be used for proving and discovering not first principles (as they are called) only, but also the lesser axioms, and the middle, and indeed all. For the induction which proceeds by simple enumeration is childish; its conclusions are precarious and exposed to peril from a contradictory instance; and it generally decides on too small a number of facts, and on those only which are at hand. But the induction which is to be available for the discovery and demonstration of sciences and arts, must analyze nature by proper rejections and exclusions; and then, after a sufficient number of negatives, come to a conclusion on the affirmative instances—which has not yet been done or even attempted, save only by Plato, who does indeed employ this form of induction to a certain extent for the purpose of discussing definitions and ideas. But in order to furnish this induction or demonstration well and duly for its work, very many things are to be provided which no mortal has yet thought of; insomuch that greater labor will have to be spent in it than has hitherto been spent on the syllogism. And this induction must be used not only to discover axioms, but also in the formation of notions. And it is in this induction that our chief hope lies.

106. But in establishing axioms by this kind of induction, we must also examine and try whether the axiom so established be framed to the measure of those particulars only from which it is derived, or whether it be larger and wider. And if it be larger and wider, we must observe whether by indicating to us new particulars it confirm that wideness and largeness as by a collateral security, that we may not either stick fast in things already known, or loosely grasp at shadows and abstract forms, not at things solid and realized in matter. And when this process shall have come into use, then at last shall we see the dawn of a solid hope.