

## APHORISMS ON THE INTERPRETATION OF NATURE AND THE EMPIRE OF MAN

Francis Bacon

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This text comes from Francis Bacon, *The Works of Francis Bacon*, 3 vols., edited and translated by Basil Montague (Philadelphia: Parry & MacMillan, 1854) Vol. 3, pp. 345-371 (vol. 2: 1852). The *Novum Organum, or, Five Suggestions for the Interpretation of Nature* is part two of Bacon's *Instauratio Magna* (Great Renewal), published in 1620. The *Novum Organum* begins with "Summary of the Second Part, digested in Aphorisms," and the text reprinted here is the first set of these aphorisms (followed by a set of aphorisms entitled "Aphorisms on the Interpretation of Nature, or the Reign of Man").

1. MAN, as the minister and interpreter of nature, does and understands as much as his observations on the order of nature, either with regard to things or the mind, permit him, and neither knows nor is capable of more.
2. The unassisted hand, and the understanding left to itself, possess but little power. Effects are produced by the means of instruments and helps, which the understanding requires no less than the hand. And as instruments either promote or regulate the motion of the hand, so those that are applied to the mind prompt or protect the understanding.
3. Knowledge and human power are synonymous, since the ignorance of the cause frustrates the effect. For nature is only subdued by submission, and that which in contemplative philosophy corresponds with the cause, in practical science becomes the rule.
4. Man, whilst operating, can only apply or withdraw natural bodies; nature, internally, performs the rest.
5. Those who become practically versed in nature, are the mechanic, the mathematician, the physician, the alchemist, and the magician; but all (as matters now stand) with faint efforts and meager success.
6. It would be madness, and inconsistency, to suppose that things which have never yet been performed, can be performed without employing some hitherto untried means.
7. The creations of the mind and hand appear very numerous, if we judge by books and manufactures: but all that variety consists of an excessive refinement, and of deductions from a few well known matters; not of a number of axioms.
8. Even the effects already discovered are due to chance and experiment, rather than to the sciences. For our present sciences are nothing more than peculiar arrangements of matters already discovered, and not methods for discovery, or plans for new operations.
9. The sole cause and root of almost every defect in the sciences is this; that whilst we falsely admire and extol the powers of the human mind, we do not search for its real helps.
10. The subtlety of nature is far beyond that of sense or of the understanding: so that the specious meditations, speculations, and theories of mankind, are but a kind of insanity, only there is no one to stand by and observe it.
11. As the present sciences are useless for the discovery of effects, so the present system of logic is useless for the discovery of the sciences.
12. The present system of logic rather assists in confirming and rendering inveterate the errors founded on vulgar notions, than in searching after truth; and is therefore more hurtful than useful.
13. The syllogism is not applied to the principles of the sciences, and is of no avail in intermediate axioms, as being very unequal to the subtlety of nature. It forces assent, therefore, and not things.
14. The syllogism consists of propositions, propositions of words, words are the signs of notions. If, therefore, the notions (which form the basis of the whole) be confused and carelessly abstracted from things, there is no solidity in the superstructure. Our only hope, then, is in genuine induction.
15. We have no sound notions either in logic or physics; substance, quality, action, passion, and existence are not clear notions; much less, weight, levity, density, tenuity, moisture, dryness, generation, corruption, attraction, repulsion, element, matter, form, and the like. They are all fantastical and ill defined.
16. The notions of less abstract natures, as man, dog, dove; and the immediate perceptions of sense, as heat, cold, white, black, do not deceive us materially, yet even these are sometimes confused by the mutability of matter and the intermixture of things. All the rest, which men have hitherto employed, are errors; and improperly abstracted and deduced from things.
17. There is the same degree of licentiousness and error in forming axioms, as in abstracting notions: and that in the first principles, which depend on common induction. Still more is this the case in axioms and inferior propositions derived from syllogisms.
18. The present discoveries in science are such as lie immediately beneath the surface of common notions. It is necessary, however, to penetrate **[Page 346]** the more secret and remote parts of nature, in order to abstract both notions and axioms from things, by a more certain and guarded method.
19. There are and can exist but two ways of investigating and discovering truth. The one hurries on rapidly from the senses and particulars to the most general axioms; and from them as principles and their supposed indisputable

truth derives and discovers the intermediate axioms. This is the way now in use. The other constructs its axioms from the senses and particulars, by ascending continually and gradually, till it finally arrives at the most general axioms, which is the true but unattempted way.

20. The understanding when left to itself proceeds by the same way as that which it would have adopted under the guidance of logic, namely, the first. For the mind is fond of starting off to generalities, that it may avoid labour, and after dwelling a little on a subject is fatigued by experiment. But these evils are augmented by logic, for the sake of the ostentation of dispute.
21. The understanding when left to itself in a man of a steady, patient, and reflecting disposition (especially when unimpeded by received doctrines), makes some attempt in the right way, but with little effect; since the understanding, undirected and unassisted, is unequal to and unfit for the task of vanquishing the obscurity of things.
22. Each of these two ways begins from the senses and particulars, and ends in the greatest generalities. But they are immeasurably different; for the one merely touches cursorily the limits of experiment, and particulars, whilst the other runs duly and regularly through them; the one from the very outset lays down some abstract and useless generalities, the other gradually rises to those principles which are really the most common in nature.
23. There is no small difference between the idols of the human mind, and the ideas of the divine mind; that is to say, between certain idle dogmas, and the real stamp and impression of created objects, as they are found in nature.
24. Axioms determined upon in argument can never assist in the discovery of new effects: for the subtlety of nature is vastly superior to that of argument. But axioms properly and regularly abstracted from particulars, easily point out and define new particulars, and therefore impart activity to the sciences.
25. The axioms now in use are derived from a scanty handful, as it were, of experience, and a few particulars of frequent occurrence, whence they are of much the same dimensions or extent as their origin. And if any neglected or unknown instance occurs, the axiom is saved by some frivolous distinction, when it would be more consistent with truth to amend it.
26. We are wont, for the sake of distinction, to call that human reasoning which we apply to nature, the anticipation of nature, (as being rash and premature;) and that which is properly deduced from things, the interpretation of nature.
27. Anticipations are sufficiently powerful in producing unanimity, for if men were all to become even uniformly mad, they might agree tolerably well with each other.
28. Anticipations again will be assented to much more readily than interpretations; because, being deduced from a few instances, and these principally of familiar occurrence, they immediately hit the understanding, and satisfy the imagination; whilst, on the contrary, interpretations, being deduced from various subjects, and these widely dispersed, cannot suddenly strike the understanding; so that, in common estimation, they must appear difficult and discordant, and almost like the mysteries of faith.
29. In sciences founded on opinions and dogmas, it is right to make use of anticipations and logic, if you wish to force assent rather than things.
30. If all the capacities of all ages should unite and combine and transmit their labors, no great progress will be made in learning by anticipations; because the radical errors, and those which occur in the first process of the mind, are not cured by the excellence of subsequent means and remedies.
31. It is in vain to expect any great progress in the sciences by the superinducing or engrafting new matters upon old. An instauration must be made from the very foundations, if we do not wish to revolve forever in a circle, making only some slight and contemptible progress.
32. The ancient authors, and all others, are left in undisputed possession of their honors. For we enter into no comparison of capacity or talent, but of method; and assume the part of a guide, rather than of a critic.
33. To speak plainly, no correct judgment can be formed, either of our method, or its discoveries, by those anticipations which are now in common use; for it is not to be required of us to submit ourselves to the judgment of the very method we ourselves arraign.
34. Nor is it an easy matter to deliver and explain our sentiments: for those things which are in themselves new can yet be only understood from some analogy to what is old.
35. Alexander Borgia said of the expedition of the French into Italy, that they came with chalk in their hands to mark up their lodgings, and not with weapons to force their passage. Even so do we wish our philosophy to make its way quietly into those minds that are fit for it, and of good capacity. For we have no need of contention where we differ in first principles, and our very notions, and even in our forms of demonstration.
36. We have but one simple method of delivering [Page 347] our sentiments: namely, we must bring men to particulars, and their regular series and order, and they must for a while renounce their notions and begin to form an acquaintance with things.
37. Our method and that of the skeptics agree in some respects at first setting out: but differ most widely and are completely opposed to each other in their conclusion. For they roundly assert that nothing can be known; we, that but a small part of nature can be known by the present method. Their next step, however, is to destroy the authority of the senses and understanding, whilst we invent and supply them with assistance.
38. The idols and false notions which have already preoccupied the human understanding, and are deeply rooted in it, not only to beset man's minds, that they become difficult of access, but, even when access is obtained, will again meet and trouble us in the instauration of the sciences, un-

less mankind, when forewarned, guard themselves with all possible care against them.

39. Four species of idols beset the human mind: to which (for distinction's sake) we have assigned names: calling the first idols of the tribe; the second idols of the den; the third idols of the market; the fourth idols of the theatre.
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 gener-
- ally 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.
46. The human understanding, when any proposition has been once laid down (either from general admission and belief, or from the pleasure [Page 348] it affords), forces every thing else to add fresh support and confirmation; and although more cogent and abundant instances may exist to the contrary, yet either does not observe or despises them, or gets rid of and rejects them by some distinction, with violent and injurious prejudice, rather than sacrifice the authority of its first conclusions. It was well answered by him who was shown in a temple the votive tablets suspended by such as had escaped the peril of shipwreck, and was pressed as to whether he would then recognise the power of the gods, by an inquiry; "But where are the portraits of those who have perished in spite of their vows?" All superstition is much the same, whether it be that of astrology, dreams, omens, retributive judgment, or the like; in all of which the deluded believers observe events which are fulfilled, but neglect and pass over their failure, though it be much more common. But this evil insinuates itself still more craftily in philosophy and the sciences; in which a settled maxim vitiates and governs every other circumstance, though the latter be much more worthy of confidence. Besides, even in the absence of that eagerness and want of thought (which we have mentioned), it is the peculiar and perpetual error of the human understanding to be more moved and excited by affirmatives than by negatives, whereas it ought duly and regularly to be impartial; nay, in establishing any true axiom, the negative instance is the most powerful.
47. The human understanding is most excited by that which strikes and enters the mind at once and suddenly, and by which the imagination is immediately filled and inflated. It then begins almost imperceptibly to conceive and suppose that every thing is similar to the few objects which have taken possession of the mind; whilst it is very slow and unfit for the transition to the remote and heterogeneous instances, by which axioms are tried as by fire, unless the office be imposed upon it by severe regulations, and a powerful authority.

48. The human understanding is active and cannot halt or rest, but even, though without effect, still presses forward. Thus we cannot conceive of any end or external boundary of the world, and it seems necessarily to occur to us, that there must be something beyond. Nor can we imagine how eternity has flowed on down to the present day, since the usually received distinction of an infinity, *a parte ante* and *a parte post*, cannot hold good: for it would thence follow that one infinity is greater than another, and also that infinity is wasting away and tending to an end. There is the same difficulty in considering the infinite divisibility of lines, arising from the weakness of our minds, which weakness interferes to still greater disadvantage with the discovery of causes. For, although the greatest generalities in nature must be positive, just as they are found, and in fact not causable, yet, the human understanding, incapable of resting, seeks for something more intelligible. Thus, however, whilst aiming at further progress, it falls back to what is actually less advanced, namely, final causes; for they are clearly more allied to man's own nature than the system of the universe; and from this source they have wonderfully corrupted philosophy. But he would be an unskillful and shallow philosopher, who should seek for causes in the greatest generalities, and not be anxious to discover them in subordinate objects.
49. The human understanding resembles not a dry light, but admits a tincture of the will and passions, which generate their own system accordingly: for man always believes more readily that which he prefers. He, therefore, rejects difficulties for want of patience in investigation; sobriety, because it limits his hope; the depths of nature, from superstition; the light of experiment, from arrogance and pride, lest his mind should appear to be occupied with common and varying objects; paradoxes, from a fear of the opinion of the vulgar; in short, his feelings imbue and corrupt his understanding in innumerable and sometimes imperceptible ways.
50. But by far the greatest impediment and aberration of the human understanding proceeds from the dullness, 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.
51. The human understanding is, by its own nature, prone to abstraction, and supposes that which is fluctuating to be fixed. But it is better to dissect than abstract nature; such was the method employed by the school of Democritus, which made greater progress in penetrating nature than the rest. It is best to consider matter, its [Page 349] conformation, and the changes of that conformation, its own action, and the law of this action or motion, for forms are a mere fiction of the human mind, unless you will call the laws of action by that name. Such are the idols of the tribe, which arise either from the uniformity of the constitution of man's spirit, or its prejudices, or its limited faculties, or restless agitation, or from the interference of the passions, or the incompetency of the senses, or the mode of their impressions.
52. Such are the idols of the tribe, which arise either from the uniformity of the constitution of man's spirit, or its prejudices, or its limited faculties or restless agitation, or from the interference of the passions, or the incompetency of the senses, or the mode of their impressions.
53. The idols of the den derive their origin from the peculiar nature of each individual's mind and body; and also from education, habit, and accident. And although they be various and manifold, yet we will treat of some that require the greatest caution, and exert the greatest power in polluting the understanding.
54. Some men become attached to particular sciences and contemplations, either from supposing themselves the authors and inventors of them, or from having bestowed the greatest pains upon such subjects, and thus become most habituated to them. If men of this description apply themselves to philosophy and contemplations of an universal nature, they wrest and corrupt them by their preconceived fancies; of which Aristotle affords us a signal instance, who made his natural philosophy completely subservient to his logic, and thus rendered it little more than useless and disputatious. The chemists, again, have formed a fanciful philosophy with the most confined views, from a few experiments of the furnace. Gilbert, too, having employed himself most assiduously in the consideration of the magnet, immediately established a system of philosophy to coincide with his favorite pursuit.
55. The greatest, and, perhaps, radical distinction between different men's dispositions for philosophy and the sciences is this; that some are more vigorous and active in observing the differences of things, others in observing their resemblances. For a steady and acute disposition can fix its thoughts, and dwell upon, and adhere to a point, through all the refinements of differences; but those that are sublime and discursive recognise and compare even the most delicate and general resemblances. Each of them readily falls into excess, by catching either at nice distinctions or shadows of resemblance.
56. Some dispositions evince an unbounded admiration of antiquity, others eagerly embrace novelty; and but few can preserve the just medium, so as neither to tear up what the ancients have correctly laid down, nor to despise the just innovations of the moderns. But this is very

prejudicial to the sciences and philosophy, and, instead of a correct judgment, we have but the factions of the ancients and moderns. Truth is not to be sought in the good fortune of any particular conjuncture of time, which is uncertain, but in the light of nature and experience, which is eternal. Such factions, therefore, are to be abjured, and the understanding must not allow them to hurry it on to assent.

57. The contemplation of nature and of bodies in their individual form distracts and weakens the understanding; but the contemplation of nature and of bodies in their general composition and formation stupifies and relaxes it. We have a good instance of this in the school of Leucippus and Democritus compared with others: for they applied themselves so much to particulars as almost to neglect the general structure of things, whilst the others were so assounded whilst gazing on the structure, that they did not penetrate the simplicity of nature. These two species of contemplation must therefore be interchanged, and each employed in its turn, in order to render the understanding at once penetrating and capacious, and to avoid the inconveniences we have mentioned, and the idols that result from them.
58. Let such, therefore, be our precautions in contemplation, that we may ward off and expel the idols of the den: which mostly owe their birth either to some predominant pursuit; or, secondly, to an excess in synthesis and analysis; or, thirdly, to a party zeal in favor of certain ages; or, fourthly, to the extent or narrowness of the subject. In general, he who contemplates nature should suspect whatever particularly takes and fixes his understanding, and should use so much the more caution to preserve it equal and unprejudiced.
59. The idols of the market are the most troublesome of all, those, namely, which have entwined themselves round the understanding from the associations of words and names. For men imagine that their reason governs words, whilst, in fact, words react upon the understanding; and this has rendered philosophy and the sciences sophisticated and inactive. Words are generally formed in a popular sense, and define things by those broad lines which are most obvious to the vulgar mind; but when a more acute understanding, or more diligent observation is anxious to vary those lines, and to adapt them more accurately to nature, words oppose it. Hence the great and solemn disputes of learned men often terminate in controversies about words and names, in regard to which it would be better (imitating the caution of mathematicians) to proceed more advisedly in the first instance, and to bring such disputes to a regular issue by definitions. Such definitions, however, cannot remedy the evil in natural and material objects, because they consist themselves of words, and these words produce others; so that we must necessarily have recourse to particular instances, and their regular [Page 350] series and arrangement, as we shall mention when we come to the mode and scheme of determining notions and axioms.
60. The idols imposed upon the understanding by words are of two kinds. They are either the names of things which

have no existence (for, as some objects are from inattention left without a name, so names are formed by fanciful imaginations which are without an object, or they are the names of actual objects, but confused, badly defined, and hastily and irregularly abstracted from things. Fortune, the *primum mobile*, the planetary orbits, the element of fire, and the like fictions, which owe their birth to futile and false theories, are instances of the first kind. And this species of idols is removed with greater facility, because it can be exterminated by the constant refutation or the desuetude of the theories themselves. The others, which are created by vicious and unskillful abstraction, are intricate and deeply rooted. Take some word for instance, as moist; and let us examine how far the different significations of this word are consistent. It will be found that the word moist is nothing but a confused sign of different actions, admitting of no settled and defined uniformity. For it means that which easily diffuses itself over another body; that which is indeterminable and cannot be brought to a consistency; that which yields easily in every direction; that which is easily divided and dispersed; that which is easily united and collected; that which easily flows and is put in motion; that which easily adheres to and wets another body; that which is easily reduced to a liquid state, though previously solid. When, therefore, you come to predicate or impose this name, in one sense flame is moist, in another air is not moist, in another fine powder is moist, in another glass is moist; so that it is quite clear that this notion is hastily abstracted from water only, and common, ordinary liquors, without any due verification of it.

There are, however, different degrees of distortion and mistake in words. One of the least faulty classes is that of the names of substances, particularly of the less abstract and more defined species; (those then of chalk and mud are good, of earth, bad;) words signifying actions are more faulty, as to generate, to corrupt, to change; but the most faulty are those denoting qualities (except the immediate objects of sense), as heavy, light, rare, dense. Yet in all of these there must be some notions a little better than others, in proportion as a greater or less number of things come before the senses.

61. The idols of the theatre are not innate, nor do they introduce themselves secretly into the understanding; but they are manifestly instilled and cherished by the fictions of theories and depraved rules of demonstration. To attempt, however, or undertake their confutation, would not be consistent with our declarations. For, since we neither agree in our principles nor our demonstrations, all argument is out of the question. And it is fortunate that the ancients are left in possession of their honors. We detract nothing from them, seeing our whole doctrine relates only to the path to be pursued. The lame (as they say) in the path outstrip the swift, who wander from it, and it is clear that the very skill and swiftness of him who runs not in the right direction, must increase his aberration.

Our method of discovering the sciences is such as to leave little to the acuteness and strength of wit, and indeed rather to level wit and intellect. For, as in the drawing of a line or

accurate circle by the hand, much depends upon its steadiness and practice, but if a ruler or compass be employed there is little occasion for either; so it is with our method. Although, however, we enter into no individual confutations, yet a little must be said, first, of the sects and general divisions of these species of theories; secondly, something further to show that there are external signs of their weakness, and, lastly, we must consider the causes of so great a misfortune, and so long and general a unanimity in error, that we may thus render the access to truth less difficult, and that the human understanding may the more readily be purified, and brought to dismiss its idols.

62. The idols of the theatre or of theories are numerous, and may and perhaps will be still more so. For, unless men's minds had been now occupied for many ages in religious and theological considerations, and civil governments (especially monarchies) had been averse to novelties of that nature, even in theory (so that men must apply to them with some risk and injury to their own fortunes, and not only without reward, but subject to contumely and envy), there is no doubt that many other sects of philosophers and theorists would have been introduced, like those which formerly flourished in such diversified abundance amongst the Greeks. For, as many imaginary theories of the heavens can be deduced from the phenomena of the sky, so it is even more easy to found many dogmas upon the phenomena of philosophy; and the plot of this our theatre resembles those of the poetical, where the plots which are invented for the stage are more consistent, elegant, and pleasurable than those taken from real history.

In general, men take for the groundwork of their philosophy either too much from a few topics, or too little from many; in either case their philosophy is founded on too narrow a basis of experiment and natural history, and decides on too scanty grounds. For the theoretic philosopher seizes various common circumstances by experiment, [Page 351] without reducing them to certainty, or examining and frequently considering them, and relies for the rest upon meditation and the activity of his wit.

There are other philosophers who have diligently and accurately attended to a few experiments, and have thence presumed to deduce and invent systems of philosophy, forming every thing to conformity with them.

A third set, from their faith and religious veneration, introduce theology and traditions; the absurdity of some amongst them having proceeded so far as to seek and derive the sciences from spirits and genii. There are, therefore, three sources of error and three species of false philosophy; the sophistic, empiric, and superstitious.

63. Aristotle affords the most eminent instance of the first; for he corrupted natural philosophy by logic: thus, he formed the world of categories, assigned to the human soul, the noblest of substances, a genus determined by words of secondary operation, treated of density and rarity (by which bodies occupy a greater or lesser space) by the frigid distinctions of action and power, asserted that there was a peculiar and proper motion in all bodies, and that if they shared in any other motion, it was owing to an

external moving cause, and imposed innumerable arbitrary distinctions upon the nature of things; being everywhere more anxious as to definitions in teaching, and the accuracy of the wording of his propositions, than the internal truth of things. And this is best shown by a comparison of his philosophy with the others of greatest repute among the Greeks. For the similar parts of Anaxagoras, the atoms of Leucippus and Democritus, the heaven and earth of Parmenides, the discord and concord of Empedocles, the resolution of bodies into the common nature of fire, and their condensation, according to Heraclitus, exhibit some sprinkling of natural philosophy, the nature of things, and experiment, whilst Aristotle's physics are mere logical terms, and he remodelled the same subject in his metaphysics under a more imposing title, and more as a realist than a nominalist. Nor is much stress to be laid on his frequent recourse to experiment in his books on animals, his problems, and other treatises; for he had already decided, without having properly consulted experience as the basis of his decisions and axioms, and after having so decided, he drags experiment along, as a captive constrained to accommodate herself to his decisions; so that he is even more to be blamed than his modern followers (of the scholastic school), who have deserted her altogether.

64. The empiric school produces dogmas of a more deformed and monstrous nature than the sophistic or theoretic school: not being founded in the light of common notions (which, however poor and superficial, is yet in a manner universal and of a general tendency), but in the confined obscurity of a few experiments. Hence this species of philosophy appears probable and almost certain to those who are daily practiced in such experiments, and have thus corrupted their imagination, but incredible and futile to others. We have a strong instance of this in the alchemists and their dogmas; it would be difficult to find another in this age, unless, perhaps, in the philosophy of Gilbert. We could not, however, neglect to caution others against this school, because we already foresee and augur, that if men be hereafter induced by our exhortations to apply seriously to experiments (bidding farewell to the sophistic doctrines), there will then be imminent danger from empirics, owing to the premature and forward haste of the understanding, and its jumping or flying to generalities and the principles of things. We ought, therefore, already to meet the evil.

65. The corruption of philosophy by the mixing of it up with superstition and theology is of a much wider extent, and is most injurious to it, both as a whole and in parts. For the human understanding, is no less exposed to the impressions of fancy, than to those of vulgar notions. The disputatious and sophistic school entraps the understanding, whilst the fanciful, bombastic, and, as it were, poetical school rather flatters it. There is a clear example of this among the Greeks, especially in Pythagoras, where, however, the superstition is coarse and overcharged, but it is more dangerous and refined in Plato and his school. This evil is found also in some branches of other systems of philosophy, where it introduces abstracted forms, final and first causes, omitting frequently the intermediate, and

the like. Against it we must use the greatest caution; for the apotheosis of error is the greatest evil of all, and when folly is worshipped, it is, as it were, a plague spot upon the understanding. Yet, some of the moderns have indulged this folly, with such consummate inconsiderateness, that they have endeavored to build a system of natural philosophy on the first chapter of Genesis, the book of Job, and other parts of Scripture; seeking thus the dead amongst the living. And this folly is the more to be prevented and restrained, because not only fantastical philosophy but heretical religion spring from the absurd mixture of matters divine and human. It is, therefore, most wise soberly to render unto faith the things that are faith's.

66. Having spoken of the vicious authority of the systems founded either on vulgar notions, or on a few experiments, or on superstition, we must now consider the faulty subjects for contemplation, especially in natural philosophy. The [Page 352] human understanding is perverted by observing the power of mechanical arts, in which bodies are very materially changed by composition or separation, and is induced to suppose that something similar takes place in the universal nature of things. Hence the fiction of elements, and their cooperation in forming natural bodies. Again, when man reflects upon the entire liberty of nature, he meets with particular species of things, as animals, plants, minerals, and is thence easily led to imagine that there exist in nature certain primary forms which she strives to produce, and that all variation from them arises from some impediment or error which she is exposed to in completing her work, or from the collision or metamorphosis of different species. The first hypothesis has produced the doctrine of elementary properties, the second that of occult properties and specific powers: and both lead to trifling courses of reflection, in which the mind acquiesces, and is thus diverted from more important subjects. But physicians exercise a much more useful labor in the consideration of the secondary qualities of things, and the operations of attraction, repulsion, attenuation, inspissation, dilatation, astringency, separation, maturation, and the like; and would do still more if they would not corrupt these proper observations by the two systems I have alluded to, of elementary qualities and specific powers, by which they either reduce the secondary to first qualities, and their subtle and immeasurable composition, or at any rate neglect to advance by greater and more diligent observation to the third and fourth qualities, thus terminating their contemplation prematurely. Nor are these powers (or the like) to be investigated only among the medicines of the human body, but also in all changes of other natural bodies.

A greater evil arises from the contemplation and investigation rather of the stationary principles of things, from which, than of the active, by which things themselves are created. For the former only serve for discussion, the latter for practice. Nor is any value to be set on those common differences of motion which are observed in the received system of natural philosophy, as generation, corruption, augmentation, diminution, alteration, and translation. For this is their meaning: if a body, unchanged in other respects, is moved from its place, this is translation;

if the place and species be given, but the quantity changed, it is alteration; but if, from such a change, the mass and quantity of the body do not continue the same, this is the motion of augmentation and diminution; if the change be continued so as to vary the species and substance, and transfuse them to others, this is generation and corruption. All this is merely popular, and by no means penetrates into nature; and these are but the measures and bounds of motion, and not different species of it; they merely suggest how far, and not how or whence. For they exhibit neither the affections of bodies, nor the process of their parts, but merely establish a division of that motion, which coarsely exhibits to the senses matter in its varied form. Even when they wish to point out something relative to the causes of motion, and to establish a division of them, they most absurdly introduce natural and violent motion, which is also a popular notion, since every violent motion is also in fact natural, that is to say, the external efficient puts nature in action in a different manner to that which she had previously employed.

But if, neglecting these, any one were for instance to observe, that there is in bodies a tendency of adhesion, so as not to suffer the unity of nature to be completely separated or broken, and a vacuum to be formed; or that they have a tendency to return to their natural dimensions or tension, so that, if compressed or extended within or beyond it, they immediately strive to recover themselves, and resume their former volume and extent; or that they have a tendency to congregate into masses with similar bodies, the dense, for instance, towards the circumference of the earth, the thin and rare towards that of the heavens, these and the like are true physical genera of motions, but the others are clearly logical and scholastic, as appears plainly from a comparison of the two.

Another considerable evil is, that men in their systems and contemplations bestow their labor upon the investigation and discussion of the principles of things and the extreme limits of nature, although all utility and means of action consist in the intermediate objects. Hence men cease not to abstract nature till they arrive at potential and shapeless matter, and still persist in their dissection, till they arrive at atoms; and yet, were all this true, it would be of little use to advance man's estate.

67. The understanding must also be cautioned against the intemperance of systems, so far as regards its giving or withholding its assent; for such intemperance appears to fix and perpetuate idols, so as to leave no means of removing them.

These excesses are of two kinds. The first is seen in those who decide hastily, and render the sciences positive and dictatorial. The other in those who have introduced scepticism, and vague, unbounded inquiry. The former subtiles, the latter enervates the understanding. The Aristotelian philosophy, after destroying other systems (as the Ottomans do their brethren) by its disputations, confutations, decided upon every thing, and Aristotle himself then raises up questions at will, in order to settle them; so that

every thing should be certain and decided, a method now in use among his successors.

The school of Plato introduced skepticism, first, as it were, in joke and irony, from their dislike [Page 353] to Protagoras, Hippias, and others, who were ashamed of appearing not to doubt upon any subject. But the new academy dogmatized in their skepticism, and held it as their tenet. Although this method be more honest than arbitrary decision (for its followers allege that they by no means confound all inquiry, like Pyrrho and his disciples, but hold doctrines which they can follow as probable, though they cannot maintain them to be true), yet, when the human mind has once despaired of discovering truth, every thing begins to languish. Hence men turn aside into pleasant controversies and discussions, and into a sort of wandering over subjects, rather than sustain any rigorous investigation. But, as we observed at first, we are not to deny the authority of the human senses and understanding, although weak; but rather to furnish them with assistance.

68. We have now treated of each kind of idols, and their qualities; all of which must be abjured and renounced with firm and solemn resolution, and the understanding must be completely freed and cleared of them; so that the access to the kingdom of man, which is founded on the sciences, may resemble that to the kingdom of heaven, where no admission is conceded except to children.
69. Vicious demonstrations are the muniments and support of idols, and those which we possess in logic, merely subject and enslave the world to human thoughts, and thoughts to words. But demonstrations are, in some manner, themselves systems of philosophy and science. For such as they are, and accordingly as they are regularly or improperly established, such will be the resulting systems of philosophy and contemplation. But those which we employ in the whole process leading from the senses and things to axioms and conclusions, are fallacious and incompetent. This process is fourfold, and the errors are in equal number. In the first place the impressions of the senses are erroneous, for they fail and deceive us. We must supply defects by substitutions, and fallacies by their correction. 2dly. Notions are improperly abstracted from the senses, and indeterminate and confused when they ought to be the reverse. 3dly. The induction that is employed is improper, for it determines the principles of sciences by simple enumeration, without adopting the exclusions, and resolutions, or just separations of nature. Lastly, the usual method of discovery and proof, by first establishing the most general propositions, then applying and proving the intermediate axioms according to them, is the parent of error and the calamity of every science. But we will treat more fully of that which we now slightly touch upon, when we come to lay down the true way of interpreting nature, after having gone through the above expiatory process and purification of the mind.
70. But experience is by far the best demonstration, provided it adhere to the experiment actually made; for if that experiment be transferred to other subjects apparently similar, unless with proper and methodical caution, it becomes

fallacious. The present method of experiment is blind and stupid. Hence men wandering and roaming without any determined course, and consulting mere chance, are hurried about to various points, and advance but little; at one time they are happy, at another their attention is distracted, and they always find that they want something further. Men generally make their experiments carelessly, and as it were in sport, making some little variation in a known experiment, and then, if they fail, they become disgusted and give up the attempt: nay, if they set to work more seriously, steadily, and assiduously, yet they waste all their time on probing some solitary matter; as Gilbert on the magnet, and the alchemists on gold. But such conduct shows their method to be no less unskillful than mean. For nobody can successfully investigate the nature of any object by considering that object alone; the inquiry must be more generally extended.

Even when men build any science and theory upon experiment, yet they almost always turn with premature and hasty zeal to practice, not merely on account of the advantage and benefit to be derived from it, but in order to seize upon some security in a new undertaking of their not employing the remainder of their labor unprofitably; and by making themselves conspicuous, to acquire a greater name for their pursuit. Hence, like Atalanta, they leave the course to pick up the golden apple, interrupting their speed, and giving up the victory. But, in the true course of experiment, and in extending it to new effects, we should imitate the Divine foresight and order. For God, on the first day, only created light, and assigned a whole day to that work, without creating any material substance thereon. In like manner, we must first, by every kind of experiment, elicit the discovery of causes and true axioms, and seek for experiments which may afford light rather than profit. Axioms, when rightly investigated and established, prepare us not for a limited but abundant practice, and bring in their train whole troops of effects. But we will treat hereafter of the ways of experience, which are not less beset and interrupted than those of judgment; having spoken at present of common experience only as a bad species of demonstration, the order of our subject now requires some mention of those external signs of the weakness in practice of the received systems of philosophy and contemplation, which we referred to above, and of the causes of a circumstance at first sight so wonderful and incredible. For the knowledge of these external signs prepares the [Page 354] way for assent, and the explanation of the causes removes the wonder; and these two circumstances are of material use in extirpating more easily and gently the idols from the understanding.