The Works of Francis Bacon

Baron of Verulam, Viscount St. Albans, and Lord High Chancellor of England.

Collected and edited by

James Spedding, M.A.
In Trinity College, Cambridge;

Robert Leslie Ellis, M.A.
Late Fellow of Trinity College, Cambridge;

and

Douglas Denon Heath,
Barrister-at-Law; Late Fellow of Trinity College, Cambridge.

Vol. IV.
Translations of the Philosophical Works, Vol. 1.

London:

Longman and Co.; Humphrey and Co.; Halkett and Co.; Whitaker and Co.; J. Cain; R. Hodder; W. Cukan; B. Mizen; H. Seale; J. Scott; J. Smith; and Astley and Co.

1858.
THE

GREAT INSTAURATION.
PROCÉMNIUM
FRANCIS OF VERULAM

REASONED THIS WITH HIMSELF,

AND JUDGED IT TO BE FOR THE INTEREST OF THE PRESENT AND FUTURE
GENERATIONS THAT THEY SHOULD BE MADE ACQUAINTED
WITH HIS THOUGHTS.

Feeling convinced that the human intellect makes its own difficulties, not using the true helps which are at man's disposal soberly and judiciously; whence follows manifold ignorance of things, and by reason of that ignorance mischief innumerable; he thought all trial should be made, whether that commerce between the mind of man and the nature of things, which is more precious than anything on earth, or at least than anything that is of the earth, might by any means be restored to its perfect and original condition, or if that may not be, yet reduced to a better condition than that in which it now is. Now that the errors which have hitherto prevailed, and which will prevail for ever, should (if the mind be left to go its own way), either by the natural force of the understanding or by help of the aids and instruments of Logic, one by one correct themselves, was a thing not to be hoped for: because the primary notions of things which the mind readily and passively infibes, stores up, and accumulates (and it is from them that all the rest flow) are false, confused, and overhastily abstracted from the facts; nor are the secondary and subsequent notions less arbitrary and inconstant; whence it follows that the entire fabric of human reason which we employ in the inquiry of nature, is badly put together and built up, and like some magnificent structure without any foundation. For while men are occupied in admiring and applauding the false powers of the mind, they pass by and throw away those true powers, which, if it be supplied with the proper aids and can itself be content to wait upon nature instead of vainly affecting to overrule her,
are within its reach. There was but one course left, therefore,—
to try the whole thing anew upon a better plan, and to com-
merce a total reconstruction of sciences, arts, and all human
knowledge, raised upon the proper foundations. And this,
though in the project and undertaking it may seem a thing
infinite and beyond the powers of man, yet when it comes to be
dealt with it will be found sound and sober, more so than what
has been done hitherto. For of this there is some issue;
whereas in what is now done in the matter of science there is
only a whirling round about, and perpetual agitation, ending
where it began. And although he was well aware how solitary
an enterprise it is, and how hard a thing to win faith and credit
for, nevertheless he was resolved not to abandon either it or
himself; nor to be deterred from trying and entering upon that
one path which is alone open to the human mind. For better
it is to make a beginning of that which may lead to something,
than to engage in a perpetual struggle and pursuit in courses
which have no exit. And certainly the two ways of contem-
plation are much like those two ways of action, so much cele-
britized, in this—that the one, arduous and difficult in the
beginning, leads out at last into the open country; while the
other, seeming at first sight easy and free from obstruction,
leads to pointless and precipitous places.

Moreover, because he knew not how long it might be before
these things would occur to any one else, judging especially
from this, that he has found no man hitherto, who has applied
his mind to the like, he resolved to publish at once so much as
he has been able to complete. The cause of which haste was
not ambition for himself, but solicitude for the work; that in
case of his death there might remain some outline and project of
that which he had conceived, and some evidence likewise of his
honest mind and inclination towards the benefit of the human
race. Certain it is that all other ambition whatsoever seemed
poor in his eyes compared with the work which he had in hand;
seeing that the matter at issue is either nothing, or a thing so
great that it may well be content with its own merit, without
seeking other recompense.
TO OUR MOST GRACIOUS AND MIGHTY PRINCE AND LORD

JAMES,

BY THE GRACE OF GOD

OF GREAT BRITAIN, FRANCE, AND IRELAND KING,
DEFENDER OF THE FAITH, ETC.


Most Gracious and Mighty King,

Your Majesty may perhaps accuse me of laxity, having stolen from your affairs so much time as was required for this work. I know not what to say for myself. For of time there can be no restitution, unless it be that what has been abstracted from your business may perhaps go to the memory of your name and the honour of your age; if these things are indeed worth anything. Certainly they are quite new; totally new in their very kind; and yet they are copied from a very ancient model; even the world itself and the nature of things and of the mind. And to say truth, I am wont for my own part to regard this work as a child of time rather than of wit; the only wonder being that the first notion of the thing, and such great suspicions concerning matters long established, should have come into any man's mind. All the rest follows readily enough. And no doubt there is something of accident (as we call it) and luck as well in what men think as in what they do or say. But for this accident which I speak of, I wish that if there be any good in what I have to offer, it may be ascribed to the infinite mercy and goodness of God, and to the fidelity of your Majesty's times; to which as I have been an honest and affectionate servant in my life, so after my death I may yet perhaps, through the kindling of this new light in the darkness of philosophy, be the means of making this age famous to posterity.
and surely to the times of the wisest and most learned of kings belongs of right the regeneration and restoration of the sciences. Lastly, I have a request to make—a request so way unworthy of your Majesty, and which especially concerns the work in hand; namely, that you who resemble Solomon in so many things—in the gravity of your judgments, in the peacefulness of your reign, in the largeness of your heart, in the noble variety of the books which you have composed—would further follow his example in taking order for the collecting and perfecting of a Natural and Experimental History, true and severe (uninjured with literature and book-learning), such as philosophy may be built upon.—Such, in fact, as I shall in its proper place describe: that so at length, after the lapse of so many ages, philosophy and the sciences may no longer float in air, but rest on the solid foundation of experience of every kind, and the same well examined and weighed. I have provided the machine, but the stuff must be gathered from the facts of nature. May God Almighty long preserve your Majesty!

Your Majesty's
Most bounden and devoted
Servant,
FRANCIS VERULAM,
CHANCELLOR.

THE GREAT INSTAURATION.

PREFACE.

That the state of knowledge is not prosperous nor greatly advancing; and that a way must be opened for the human understanding entirely different from any hitherto known, and other helps provided, in order that the mind may exercise over the nature of things the authority which properly belongs to it.

It seems to me that men do not rightly understand either their store or their strength, but overseen the one and underrate the other. Hence it follows, that either from an extravagant estimate of the value of the arts which they possess, they seek no further; or else from too mean an estimate of their own powers, they spend their strength in small matters and never put it fairly to the trial in those which go to the main. These are the pillars of false set in the path of knowledge; for men have neither desire nor hope to encourage them to penetrate further. And since opinion of store is one of the chief causes of want, and satisfaction with the present induces neglect of provision for the future, it becomes a thing not only useful, but absolutely necessary, that the sense of honour and admiration with which our existing stock of inventions is regarded be in the very entrance and threshold of the work, and that frankly and without circumlocution, stripped off, and men be duly warned not to exaggerate or make too much of them. For let a man look carefully into all the variety of books with which the arts and sciences abound, he will find everywhere endless repetitions of the same thing, varying in the method of treatment, but not new in substance, inasmuch that the whole stock, numerous as it appears at first view, proves on examination to
be but scanty. And for its value and utility it must be plainly averred that that wisdom which we have derived principally from the Greeks is but like the boyhood of knowledge, and has the characteristic property of boys: it can talk, but it cannot generate; for it is fruitful of controversies but barren of works. So that the state of learning as it now appears to be represented to the life in the old fable of Scylla, who had the head and face of a virgin, but her womb was hung round with barking monsters, from which she could not be delivered. For in like manner the sciences to which we are accustomed have certain general positions which are specious and flattering; but as soon as they come to particulars, which are as the parts of generation, when they should produce fruit and works, then arise contentions and barking disputations, which are the end of the matter and all the issue they can yield. Observe also, that if sciences of this kind had any life in them, that could never have come to pass which has been the case now for many ages,—that they stand almost at a stay, without receiving any augmentations worthy of the human race; insomuch that many times not only what was asserted once is asserted still, but what was a question once is a question still, and instead of being resolved by discussion is only fixed and fed; and all the tradition and succession of schools is still a succession of masters and scholars, not of inventors and those who bring to further perfection the things invented. In the mechanical arts we do not find it so; they, on the contrary, as having in them some breath of life, are continually growing and becoming more perfect. As originally invented they are commonly rude, clumsy, and shapeless; afterwards they acquire new powers and more commodious arrangements and constructions; in so far that men shall sooner leave the study and pursuit of them and turn to something else, than they arrive at the ultimate perfection of which they are capable. Philosophy and the intellectual sciences, on the contrary, stand like statues, worshipped and celebrated, but not moved or advanced. Nay, they sometimes flourish most in the hands of the first author, and afterwards degenerate. For when men have once made over their judgments to others' keeping, and (like those senators whom they called Federa) have agreed to support some one person's opinion, from that time they make no enlargement of the sciences themselves, but fall to the servile office of embellishing certain individual authors and increasing their renown. And let it not be said that the sciences have been growing gradually till they have at last reached their full stature, and so (their course being completed) have satiated in the works of a few writers; and that there being now no room for the invention of better, all that remains is to embellish and cultivate those things which have been invented already. Would it were so! But the truth is that this appropriating of the sciences has its origin in nothing better than the confidence of a few persons and the sloth and insobriety of the rest. For after the sciences have been in several parts perhaps cultivated and handled diligently, there has risen up some man of bold disposition, and famous for methods and short ways which people like, who has in appearance reduced them to an art, while he has in fact only spoiled all that the others had done. And yet this is what posterity like, because it makes the work short and easy, and saves further inquiry, of which they are weary and impatient. And if any one take this general sequence and consent for an argument of weight, as being the judgment of Time, let me tell him that the reasoning on which he relies is most fallacious and weak. For, first, we are far from knowing all that in the matter of sciences and arts has in various ages and places been brought to light and published; much less, all that has been by private persons secretly attempted and stirred; so neither the births nor the miscarriages of Time are entered in our records. Nor, secondly, is the consent itself and the title it has obtained a consideration of much worth. For however various are the forms of civil polities, there is but one form of policy in the sciences; and that always has been and always will be popular. Now the doctrines which find most favour with the populace are those which are either contentious and pugnacious, or specious and empty; such, I say, as either engage assent or十足去. And therefore no doubt the greatest rise in each successive age have been forced out of their own course; men of capacity and intellect above the vulgar having been paid, for reputation's sake, to bow to the judgment of the time and the multitude; and thus if any contemplations of a higher order took light anywhere, they were presently blown out by the winds of vulgar opinion. So that Time is like a river, which has brought down to us things light and puffed up, while those which are weighty and solid have sunk. Nay, those very authors who
have usurped a kind of dictatorship in the sciences and taken upon them to lay down the law with such confidence, yet when from time to time they come to themselves again, they fall to complaints of the subtility of nature, the hiding-places of truth, the obscenity of things, the entanglement of causes, the weakness of the human mind; wherein nevertheless they show themselves never the more modest, seeing that they will rather lay the blame upon the common condition of men and nature than upon themselves. And then whatever any art fails to attain, they ever set it down upon the authority of that art itself as impossible of attainment; and how can art be found guilty when it is judge in its own cause? So it is but a device for exempting ignorance from ignominy. Now for those things which are delivered and received, this is their condition: barren of works, full of questions; in point of enlargement slow and languid; carrying a show of perfection in the whole, but in the parts ill filled up; in selection popular, and unsatisfactory even to those who propound them; and therefore fenced round and set forth with sundry artifices. And if there be any who have determined to make trial for themselves, and put their own strength to the work of advancing the boundaries of the sciences, yet have they not ventured to cast themselves completely loose from received opinions or to seek their knowledge at the fountain; but they think they have done some great thing if they do but add and introduce into the existing sum of science something of their own; proudly considering with themselves that by making the addition they can assert their liberty, while they retain the credit of modesty by asentting to the rest. But these mediocrities and middle ways are much praised, in deferring to opinions and customs, turn to the great detriment of the sciences. For it is hardly possible at once to admire an author and to go beyond him; knowledge being as water, which will not rise above the level from which it fell. Men of this kind, therefore, amend some things, but advance little; and improve the condition of knowledge, but do not extend its range. Some, indeed, there have been who have gone more boldly to work, and taking it all for an open matter and giving their genius full play, have made a passage for themselves and their own opinions by pulling down and demolishing former ones; and yet all their stir has but little advanced the matter; since their aim has been not to extend...
at what it cannot master, has done more to establish and perpetuate error than to open the way to truth.

Upon the whole therefore, it seems that men have not been happy hitherto either in the truth which they have placed in others or in their own industry with regard to the sciences; especially as neither the demonstrations nor the experiments as yet known are much to be relied upon. But the universe to the eye of the human understanding is framed like a labyrinth; presenting as it does on every side so many ambiguities of way, such deceitful resemblances of objects and signs, natures so irregular in their lines, and so knotted and entangled. And then the way is still to be made by the uncertain light of the sense, sometimes shining out, sometimes clouded over, through the woods of experience and particulars; while those who offer themselves for guides are (as was said) themselves also panting, and increase the number of errors and wanderers. In circumstances so difficult neither the natural force of man's judgment nor even any accidental fidelity offers any chance of success. No excellence of wit, no repetition of chance experiments, can overcome such difficulties as these. Our steps must be guided by a clue, and the whole way from the very first perception of the senses must be laid out upon a sure plan. Not that I would be understood to mean that nothing whatever has been done in so many ages by so great labours. We have no reason to be ashamed of the discoveries which have been made, and no doubt the ancients proved themselves in everything that turns on wit and abstract meditation, wonderful men. But as in former ages when men sailed only by observation of the stars, they could indeed coast along the shores of the old continent or cross a few small and Mediterranean seas; but before the ocean could be traversed and the new world discovered, the use of the mariner's needle, as a more faithful and certain guide, had to be found out; in like manner the discoveries which have been hitherto made in the arts and sciences are such as might be made by practice, meditation, observation, argumentation,—for they lay near to the senses, and immediately beneath common notions; but before we can reach the remoter and more hidden parts of nature, it is necessary that a more perfect use and application of the human mind and intellect be introduced.

For my own part at least, in obedience to the everlasting love of truth, I have committed myself to the uncertainties and difficulties and solitudes of the ways, and relying on the divine assistance have upheld my mind both against the shocks and embittered ranks of opinion, and against my own private and inward hesitations and scruples, and against the fogs and clouds of nature, and the phantoms flitting about on every side; in the hope of providing at last for the present and future generations guidance more faithful and secure. Whereas if I have made any progress, the way has been opened to me by no other means than the true and legitimate humiliation of the human spirit. For all those who before me have applied themselves to the invention of arts have but cast a glance or two upon facts and examples and experience, and straightforward proceeded, as if invention were nothing more than an exercise of thought, to invoke their own spirits to give them oracles. If, on the contrary, dwelling purely and constantly among the facts of nature, withdraw my intellect from them no further than may suffice to let the images and rays of natural objects meet in a point, as they do in the sense of vision; whence it follows that the strength and excellency of the wit has but little to do in the matter. And the same humility which I use in inventing I employ likewise in teaching. For I do not endeavour either by triumphs of confirmation, or pleadings of antiquity, or assumption of authority, or even by the veil of obscurity, to invest these inventions of mine with any majesty; which might easily be done by one who sought to give lustre to his own name rather than light to other men's minds. I have not sought (I say) nor do I seek either to force or ensnare men's judgments, but I lead them to things themselves and the concordances of things, that they may see for themselves what they have, what they can dispute, what they can add and contribute to the common stock. And for myself, if in anything I have been either too credulous or too little sagacious and assiduous, or if I have fallen off by the way and lost the legacy incompleat, nevertheless I so present these things naked and open, that my errors can be marked and set aside before the mass of knowledge be further infected by them, and it will be easy also for others to continue and carry on my labours. And by these means I suppose that I have established for ever a true and lawful marriage between the empirical and the rational faculty, the united and ill-starred divorce and separation of which has thrown into confusion all the affairs of the human family.
Wherefore, seeing that these things do not depend upon myself, at the outset of the work I most humbly and fervently pray to God the Father, God the Son, and God the Holy Ghost; that remembering the sorrows of mankind and the pilgrimage of this our life wherein we wear out days few and evil, they will vouchsafe through my hands to endow the human family with new mercies. This likewise I humbly pray, that things human may not interfere with things divine, and that from the opening of the ways of sense and the increase of natural light there may arise in our minds no incredulity or darkness with regard to the divine mysteries; but rather that the understanding being thereby purified and purged of vanities and vanities, and yet not the less subject and entirely submissive to the divine oracles, may give to faith that which is faith's. Lastly, that knowledge being now discharged of that venom which the serpent infused into it, and which makes the mind of man to swell, we may not be wise above measure and become, but cultivate truth in charity.

And now having said my prayers I turn to men; to whom I have certain salutary admonitions to offer and certain fair requests to make. My first admonition (which was also my prayer) is that men confine the senses within the limits of duty in respect of things divine: for the senses is like the sun, which reveals the face of earth, but seals and shuts up the face of heaven. My next, that in flying from this evil they fall not into the opposite error, which they will surely do if they think that the inquisition of nature is in any part interdicted or forbidden. For it was not that pure and uncontaminated natural knowledge whereby Adam gave names to the creatures according to their propriety, which gave occasion to the fall. It was the ambitious and proud desire of moral knowledge to judge of good and evil, to the end that man may revolt from God and give laws to himself, which was the form and manner of the temptation. Whereas of the sciences which regard nature, the divine philosopher declares that "it is the glory of God to conceal a thing, but it is the glory of the King to find a thing out." Even as though the divine nature took pleasure in the innocent and kindly sport of children playing at hide and seek, and vouchsafed of its kindness and goodness to admit the human spirit for his playfellow at that game. Lastly, I would address one general admonition to all; that they consider what are the true ends of knowledge, and that they seek it not either for pleasure of the mind, or for contention, or for superiority to others, or for profit, or fame, or power, or any of those inferior things; but for the benefit and use of life; and that they perfect and govern it in charity. For it was from lust of power that the angels fell, from lust of knowledge that man fell; but of charity there can be no excess, neither did angel or man ever come in danger by it.

The requests I have to make are these. Of myself I say nothing; but in behalf of the business which is in hand I entreat men to believe that it is not an opinion to be held, but a work to be done; and to be well assured that I am labouring to lay the foundation, not of any sect or doctrine, but of human utility and power. Next, I ask them to deal fairly by their own interests, and laying aside all estimations and prejudices in favour of this or that opinion, to join in consultation for the common good; and being now freed and guarded by the securities and help which I offer from the errors and impediments of the way, to come forward themselves and take part in that which remains to be done. Moreover, to be of good hope, nor to imagine that this vast and gigantic work is a thing infinite and beyond the power of man, when it is in fact the true end and termination of infinite error; and seeing also that it is by no means forgetful of the conditions of mortality and humanity, (for it does not suppose that the work can be altogether completed within one generation, but provides for its being taken up by another); and finally that it seeks for the sciences not arrogantly in the little cells of human wit, but with reverence in the greater world. But it is the empty things that are vast: things solid are most contracted and lie in little room. And now I have only one favour more to ask (else injustice to me may perhaps imperil the business itself)—that men will consider well how far, upon that which I must needs assert (if I am to be consistent with myself), they are entitled to judge and decide upon these doctrines of mine; inasmuch as all that premature human reasoning which anticipates inquiry, and is abstracted from the facts ready and sooner than is fit, is by me rejected (so far as the inquisition of nature is concerned), as a thing uncertain, confused, and ill built up; and I cannot be fairly asked to abide by the decision of a tribunal which is itself on its trial.
THE PLAN OF THE WORK.

The work is in six Parts:

1. The Divisions of the Sciences.
2. The New Organon; or, Directions concerning the Interpretation of Nature.
3. The Phenomena of the Universe; or, Natural and Experimental History for the foundation of Philosophy.
5. The Premonitory; or, Anticipations of the New Philosophy.
6. The New Philosophy; or, Active Science.

The Arguments of the several Parts.

It being part of my design to set everything forth, as far as may, plainly and perspicuously (for nakedness of the mind is still, as nakedness of the body once was, the companion of innocence and simplicity), let me first explain the order and plan of the work. I distribute it into six parts.

The first part exhibits a summary or general description of the knowledge which the human race at present possesses. For I thought it good to make some pause upon that which is received; that thereby the old may be more easily made perfect and the new more easily approached. And I hold the improvement of that which we have to be as much an object as the acquisition of new. Besides which it will make me the better listened to; for "He that is ignorant (says the proverb) receives not the words of knowledge, unless thou first tell him that which is in his own heart." We will therefore make a coasting voyage along the shores of the arts and sciences received; not without importing into them some useful things by the way.

In laying out the divisions of the sciences however, I take into account not only things already invented and known, but...
logic professes to contrive and prepare helps and guards for the understanding, as mine does; and in this one point they agree. But mine differs from it in three points especially; viz. In the end aimed at; in the order of demonstration; and in the starting point of the inquiry.

For the end which this science of mine proposes is the invention not of arguments but of arts; not of things in accordance with principles, but of principles themselves; not of probable reasons, but of designations and directions for works. And as the intention is different, so accordingly is the effect; the effect of the one being to overcome an opponent in argument, of the other to command nature in action.

In accordance with this end is also the nature and order of the demonstrations. For in the ordinary logic almost all the work is spent about the syllogism. Of induction the logicians seem hardly to have taken any serious thought, but they pass it by with a slight notice, and hasten on to the formulas of disputation. I on the contrary reject demonstration by syllogism, as acting too confusedly, and letting nature slip out of its hands. For although no one can doubt that things which agree in a middle term agree with one another (which is a proposition of mathematical certainty), yet it leaves an opening for deception; which is this. The syllogism consists of propositions; propositions of words; and words are the tokens and signs of notions. Now if the very notions of the mind (which are as the soul of words and the basis of the whole structure) be improperly and over-hastily abstracted from facts, vague, not sufficiently definite, faulty in short in many ways; the whole edifice tumbles. Therefore reject the syllogism; and that not only as regards principles (for to principles the logicians themselves do not apply it) but also as regards middle propositions; which, though obtainable, do not by the syllogism, are, when so obtained, barren of works, remote from practice, and altogether unavailable for the active department of the sciences. Although therefore I leave to the syllogism and those famous and boasted modes of demonstration their jurisdiction over popular arts and such as are matter of opinion (in which department I leave all as it is), yet in dealing with the nature of things I use induction throughout; and that in the minor propositions as well as the major. For I consider induction to be that form of demonstration which upholds the sense, and closes with nature,
ought to call those putative principles to account until they are fully established. Then with regard to the first notions of
the intellect; there is not one of the impressions taken by the
intellect when left to go its own way, but I hold it for sus-
ppected, and no way established, until it has submitted to a new
trial and a fresh judgment has been thereupon pronounced.
And lastly, the information of the sense itself I sift and ex-
amine in many ways. For certain it is that the sense deceives;
but then at the same time they supply the means of discovering
their own errors; only the errors are here, the means of dis-
covery are to seek.

The sense fails in two ways. Sometimes it gives no infor-
mation, sometimes it gives false information. For first, there
are very many things which escape the sense, even when best
disposed and no way obstructed; by reason either of the sub-
tility of the whole body, or the minuteness of the parts, or
distance of place, or slowness or else swiftness of motion, or
familiarity of the object, or other causes. And again when the
sense does apprehend a thing its apprehension is not much to
be relied upon. For the testimony and information of the sense
has reference always to man, not to the universe; and it is a
great error to assert that the sense is the measure of things.

To meet these difficulties, I have sought on all sides di-
gently and faithfully to provide help for the sense—substitutes
to supply its failures, rectifications to correct its errors; and this
I endeavour to accomplish not so much by instruments as by
experiments. For the subtlety of experiments is far greater
than that of the sense itself, even when assisted by exquisite
instruments; such experiments, I mean, as are skilfully and
artificially devised for the express purpose of determining
the point in question. To the immediate and proper perception
of the sense therefore I do not give much weight; but I contrive
that the office of the sense shall be only to judge of the experi-
ment, and that the experiment itself shall judge of the thing.
And thus I conceive that I perform the office of a true priest
of the sense (from which all knowledge in nature must be
sought, unless men mean to go mad) and a not unskilful inter-
preter of its oracles; and that while others only profess to
uphold and cultivate the sense, I do so in fact. Such then are
the provisions I make for finding the genuine light of nature
and kindling and bringing it to bear. And they would be suffi-
cient of themselves, if the human intellect were even, and like

a fair sheet of paper with no writing on it. But since the
minds of men are strangely possessed and beset, so that there
is no true and even surface left to reflect the genuine rays of
things, it is necessary to seek a remedy for this also.

Now the idols, or phantasms, by which the mind is occupied are
either adventitious or innate. The adventitious come into the
mind from without; namely, either from the doctrines and sects
of philosophers, or from perverted rules of demonstration. But
the innate are inherent in the very nature of the intellect,
which is far more prone to error than the sense is. For let
men please themselves as they will in admiring and almost
adoring the human mind, this is certain; that as an uneven
mirror distorts the rays of objects according to its own figure
and section, so the mind, when it receives impressions of objects
through the sense, cannot be trusted to report them truly, but
in forming its notions mixes up its own nature with the nature
of things.

And as the first two kinds of idols are hard to eradicate, so
idols of this last kind cannot be eradicated at all. All that can
be done is to point them out, so that this intangible action of
the mind may be marked and reproved (else as fast as old errors
are destroyed new ones will spring up out of the ill complex-
on of the mind itself; and so we shall have but a change of errors,
and not a clearance); and to lay it down once and for all as a fixed
and established maxim, that the intellect is not qualified to
judge except by means of induction, and induction not a legi-
timate form. This doctrine then of the expurgation of the
intellect to qualify it for dealing with truth, is comprised in
three refutations: the refutation of the Philosophers; the refu-
tation of the Demonstrations; and the refutation of the Natural
Human Reason. The explanation of which things, and of the
true relation between the nature of things and the nature of
the mind, is as the strewing and decoration of the bridal
chamber of the Mind and the Universe, the Divine Goodness
assisting; out of which marriage let us hope (and be this the
prayer of the bridal song) there may spring help to men, and
a line and race of inventions that may in some degree subdue
and overcome the necessities and miseries of humanity. This
is the second part of the work.

But I assign not only to indicate and mark out the ways,
but also to enter them. And therefore the third part of the
work embraces the Phenomena of the Universe; that is to say, experience of every kind, and such a natural history as may serve for a foundation to build philosophy upon. For a good method of demonstration or form of interpreting nature may keep the mind from going astray or stumbling, but it is not any excellence of method that can supply it with the material of knowledge. Those however who aspire not to guess and divine, but to discover and know; who propose not to derive mimic and fabulous worlds of their own, but to examine and dissect the nature of this very world itself; must go to facts themselves for everything. Nor can the place of this labour and search and worldwide persambulation be supplied by any genius or meditation or argumentation; no, not if all men's wise could meet in one. This therefore we must have, or the business must be for ever abandoned. But up to this day such has been the condition of men in this matter, that it is no wonder if nature will not give herself into their hands.

For first, the information of the sense itself, sometimes falling, sometimes false; observation, careless, irregular, and led by chance; tradition, vain and fed on rumour; practice, slavishly bent upon its work; experiment, blind, stupid, vague, and prematurely broken off; lastly, natural history trivial and poor;—all these have contributed to supply the understanding with very bad materials for philosophy and the sciences.

Then an attempt is made to mend the matter by a profuseous subtilety and winnowing of argument. But this comes too late, the case being already past remedy; and is far from setting the business right or setting away the errors. The only hope therefore of any greater increase or progress lies in a reconstruction of the sciences.

Of this reconstruction the foundation must be laid in natural history, and that of a new kind and gathered on a new principle. For it is in vain that you polish the mirror if there are no images to be reflected; and it is as necessary that the intellect should be supplied with fit matter to work upon, as with safeguards to guide its working. But my history differs from that in use (as my logick does) in many things,—in end and office, in mass and composition, in subtilty, in selection also and setting forth, with a view to the operations which are to follow.

For first, the object of the natural history which I propose is not so much to delight with variety of matter or to help with present use of experiments, as to give light to the discovery of causes and supply a suckling philosophy with its first food. For though it be true that I am principally in pursuit of works and the active department of the sciences, yet I wait for harvest-time, and do not attempt to sow the mors or to reap the green corn. For I well know that actions once rightly discovered will carry whole troops of works along with them, and produce them, not here and there one, but in clusters. And that unseasonable and wiser hurry to snatch by way of earnest at the first works which come within reach, I utterly condemn and reject, as an Atlas's apple that hinders the race. Such then is the office of this natural history of mine.

Next, with regard to the mass and composition of it: I mean it to be a history not only of nature free and at large (when she is left to her own course and does her work her own way),—such as that of the heavenly bodies, meteors, earth and sea, minerals, plants, animals,—but much more of 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 moulded. Therefore I set down at length all experiments of the mechanical arts, of the operative part of the liberal arts, of the many crafts which have not yet grown into arts properly so called, so far as I have been able to examine them and see the public in view. Nay (to say the plain truth) I do in fact (low and vulgar as man may think it) count more upon this part both for help and satisfaction than upon the other; seeing that the nature of things betrays itself more readily under the vexations of art than in its natural freedom.

Nor do I confuse the history to Bodies; but I have thought it my duty besides to make a separate history of such Virtues as may be considered cardinal in nature. I mean those original passions or desires of matter which constitute the primary elements of nature; such as Dæmos and Rare, Hot and Cold, Solid and Fluid, Heavy and Light, and several others.

Then again, to speak of subtilty: I seek out and get together a kind of experiments much simpler and simpler than those which occur accidentally. For I dig into light many things which no one who was not proceeding by a regular and certain way to the discovery of causes would have thought
PLAN OF THE WORK.

Of inquiring after; being indeed in themselves of no great use; which shows that they were not sought for as their own account; but having just the same relation to things and works which the letters of the alphabet have to speech and words — which, though in themselves useless, are the elements of which all discourse is made up.

Further, in the selection of the relations and experiments I conceive I have been a more cautious purveyor than those who have hitherto dealt with natural history. For I admit nothing but on the faith of eyes, or at least of careful and severe examination; so that nothing is exaggerated for wonder's sake, but what I state is sound and without mixture of fables or vanity. All received or current falsehoods also (which by strange negligence have been allowed for many ages to prevail and become established) I prescribe and brand by name; that the sciences may be no more troubled with them. For it has been well observed that the fables and superstitions and futilities which nurce innit into children do serious injury to their minds; and the same consideration makes me anxious, having the management of the childhood as it were of philosophy in its course of natural history, not to let it occasion itself in the beginning to any vanity. Moreover, whenever I come to a new experiment of any subtility (though it be in my own opinion certain and approved), I nevertheless subjoin a clear account of the manner in which I made it; that men knowing exactly how each point was made out, may see whether there be any error connected with it, and may accuse themselves to devise proofs more trustworthy and exquisite, if such can be found; and finally, I interpose everywhere admonitions and scruples and cautions, with a religious care to eject, repress, and as it were excise every kind of phantasm.

Lastly, knowing how much the sight of man's mind is distracted by experience and history, and how hard it is at the first (especially for minds either tender or preoccupied) to become familiar with nature, I not unfrequently subjoin observations of my own, being as the first offers, inclinations, and as it were glimpses of history towards philosophy; both by way of an assurance to men that they will not be kept for ever toasting on the waves of experience, and also that when the time comes for the intellect to begin its work, it may find everything the more ready. By such a natural history then as I have

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they will serve in the meantime for wayside inns, in which the mind may rest and refresh itself on its journey to more certain conclusions. Nevertheless I wish it to be understood in the meantime that they are conclusions by which (as not being discovered and proved by the true form of interpretation) I do not at all mean to bind myself. Nor need any one be alarmed at such suspension of judgment, as one who maintains not simply

that nothing can be known, but only that nothing can be known except in a certain course and way; and yet establishes provisionally certain degrees of assurance, for use and relief until the mind shall arrive at a knowledge of causes in which it can rest. For even those schools of philosophy which held the absolute impossibility of knowing anything were not inferior to those which took upon them to pronounce. But then they did not provide help for the sense and understanding, as I have done, but simply took away all their authority: which is quite a different thing—almost the reverse.

The sixth part of my work (to which the rest is subservient and ministrant) discloses and sets forth that philosophy which by the legitimate, chaste, and severe course of inquiry which I have explained and provided is at length developed and established. The completion however of this last part is a thing both above my strength and beyond my hopes. I have made a beginning of the work—a beginning, as I hope, not unimportant;—the fortune of the human race will give the issue;— such an issue, it may be, as in the present condition of things and man’s minds cannot easily be conceived or imagined. For the matter in hand is no more the subject of speculation, but the real business and fortunes of the human race, and all power of operation. For man is but the servant and interpreter of nature: what he does and what he knows is only what he has observed of nature’s order in fact or in thought; beyond this he knows nothing and can do nothing. For the chain of causes cannot by any force be loosed or broken, nor can nature be commanded except by being obeyed. And so those twin objects, human Knowledge and human Power, do really meet in one; and it is from ignorance of causes that operation fails.

And all depends on keeping the eye steadily fixed upon the facts of nature and so receiving their images simply as they are. For God forbid that we should give out a dream of our own imagination for a pattern of the world; rather may be graciously grant to us to write an apocalypse or true vision of the footsteps of the Creator imprinted on his creatures.

Therefore do thou, O Father, who gavest the visible light as the first fruits of creation, and didst breathe into the face of man the intellectual light as the crown and consummation thereof, guard and protect this work, which coming from thy goodness returneth to thy glory. Thou when thou turnest to look upon the works which thine hands had made, sawst that all was very good, and didst rest from thy labours. But man, when he turned to look upon the work which his hands had made, saw that all was vanity and vexation of spirit, and could find no rest therein. Wherefore if we labour in thy works with the sweat of our brows thou wilt make us partakers of thy vision and thy sabbath. Humbly we pray that this mind may be steadfast in us, and that through these our hands, and the hands of others to whom thou shalt give the same spirit, thou wilt vouchsafe to endow the human family with new mercies.