

On Bacon and Newton

Francois-Marie Arouet de Voltaire

More than any other philosophe, Voltaire (1694-1778) helped to popularize English writers and science in general to his French readers. The following excerpts are from his Letters Concerning the English Nation, published in 1733.

It is not long since the ridiculous and threadbare question was agitated in a celebrated assembly; who was the greatest man, Caesar or Alexander, Tamerlane or Cromwell? Somebody said that it must undoubtedly be Sir Isaac Newton. This man was certainly in the right; for if true greatness consists in having received from heaven the advantage of a superior genius, with the talent of applying it for the interest of the possessor and of mankind, a man like Newton—and such a one is hardly to be met with in ten centuries—is surely by much the greatest; and those statesmen and conquerors which no age has ever been without, are commonly but so many illustrious villains. It is the man who sways our minds by the prevalence of reason and the native force of truth, not they who reduce mankind to a state of slavery by brutish force and downright violence; the man who by the vigor of his mind, is able to penetrate into the hidden secrets of nature, and whose capacious soul can contain the vast frame of the universe, not those who lay nature waste, and desolate the face of the earth, that claims our reverence and admiration.

Therefore, as you are desirous to be informed of the great men that England has produced, I shall begin with the Bacons, the Lockes, and the Newtons. The generals and ministers will come after them in their turn.

I must begin with the celebrated baron Verulam, known to the rest of Europe by the name of Bacon, who was the son of a certain keeper of the seals, and was for a considerable time chancellor under James I. Notwithstanding the intrigues and bustle of a court, and the occupations incident to his office, which would have required his whole attention, he found means to become a great philosopher, a good historian, and an elegant writer; and what is yet more wonderful is that he lived in an age where the art of writing was totally unknown, and where sound philosophy was still less so. This personage, as is the way among mankind, was more valued after his death than while he lived. His enemies were courtiers residing at London, while his admirers consisted wholly of foreigners. When Marquis d'Effiat brought Princess Mary, daughter of Henry the Great, over to be married to King Charles, this minister paid Bacon a visit, who being then confined to a sick bed, received him with close curtains. “You are like the angels,”

said d'Effiat to him; "we hear much talk of them, and while everybody thinks them superior to men, we are never favored with a sight of them."

You have been told in what manner Bacon was accused of a crime which is very far from being the sin of a philosopher, of being corrupted by pecuniary gifts; and how he was sentenced by the house of peers to pay a fine of about four hundred thousand livres of our money, besides losing his office of chancellor, and being degraded from the rank and dignity of a peer. At present the English revere his memory to such a degree that only with great difficulty can one imagine him to have been in the least guilty. Should you ask me what I think of it, I will make use of a saying I heard from Lord Bolingbroke. They happened to be talking of the avarice with which the duke of Marlborough had been taxed, and quoted several instances of it, for the truth of which they appealed to Lord Bolingbroke, who, as being of a contrary party, might, perhaps, without any trespass against the laws of decorum, freely say what he thought. "He was," said he, "so great a man that I do not recollect whether he had any faults or not." I shall, therefore, confine myself to those qualities which have acquired Chancellor Bacon the esteem of all Europe.

The most singular, as well as the most excellent, of all his works, is that which is now the least read, and which is at the same time the most useful; I mean his "*Novum Scientiarum Organum*." This is the scaffold by means of which the edifice of the new philosophy has been reared; so that when the building was completed, the scaffold was no longer of any use. Chancellor Bacon was still unacquainted with nature, but he perfectly knew, and pointed out extraordinarily well, all the paths which lead to her recesses. He had very early despised what those square-capped fools teach in those dungeons called *Colleges*, under the name of philosophy, and did everything in his power that those bodies, instituted for the cultivation and perfection of the human understanding, might cease any longer to mar it, by their "quiddities," their "horrors of a vacuum," their "substantial forms," with the rest of that jargon which ignorance and a nonsensical jumble of religion had consecrated.

This great man is the father of experimental philosophy. It is true, wonderful discoveries had been made even before his time; the mariner's compass, the art of printing, that of engraving, the art of painting in oil, that of making glass, with the remarkably advantageous invention of restoring in some measure sight to the blind; that is, to old men, by means of spectacles; the secret of making gunpowder had, also, been discovered. They had gone in search of, discovered, and conquered a new world in another hemisphere. Who would not have thought that these sublime discoveries had been made by the greatest philosophers, and in times much more enlightened than ours? By no means; for all these astonishing revolutions happened in the ages of scholastic barbarity. Chance alone has brought forth almost all these inventions; it is even pretended that chance has had a great share in the discovery of America; at least, it has been believed that Christopher Columbus undertook this voyage on the faith of a captain of a ship who had been cast by a storm on one of the Caribbee

islands. Be this as it will, men had learned to penetrate to the utmost limits of the habitable globe, and to destroy the most impregnable cities with an artificial thunder, much more terrible than the real; but they were still ignorant of the circulation of the blood, the weight and pressure of the air, the laws of motion, the doctrine of light and color, the number of the planets in our system, etc. And a man that was capable to maintain a thesis on the “Categories of Aristotle,” the *universale a parte rei*, or such-like nonsense, was considered as a prodigy.

The most wonderful and useful inventions are by no means those which do most honor to the human mind. And it is to a certain mechanical instinct, which exists in almost every man, that we owe far the greater part of the arts, and in no manner whatever to philosophy. The discovery of fire, the arts of making bread, of melting and working metals, of building houses, the invention of the shuttle, are infinitely more useful than printing and the compass; notwithstanding, all these were invented by men who were still in a state of barbarity. What astonishing things have the Greeks and Romans since done in mechanics? Yet men believed, in their time, that the heavens were of crystal, and the stars were so many small lamps, that sometimes fell into the sea; and one of their greatest philosophers, after many researches, had at length discovered that the stars were so many pebbles, that had flown off like sparks from the earth.

In a word, there was not a man who had any idea of experimental philosophy before Chancellor Bacon; and of an infinity of experiments which have been made since his time, there is hardly a single one which has not been pointed out in his book. He had even made a good number of them himself. He constructed several pneumatic machines, by which he discovered the elasticity of the air; he had long brooded over the discovery of its weight, and was even at times very near to catching it, when it was laid hold of by Torricelli. A short time after, experimental physics began to be cultivated in almost all parts of Europe. This was a hidden treasure, of which Bacon had some glimmerings, and which all the philosophers whom his promises had encouraged made their utmost efforts to lay open. We see in his book mention made in express terms of that new attraction of which Newton passes for the inventor. “We must inquire,” said Bacon, “whether there be not a certain magnetic force, which operates reciprocally between the earth and other heavy bodies, between the moon and the ocean, between the planets, etc.” In another place he says: “Either heavy bodies are impelled toward the center of the earth, or they are mutually attracted by it; in this latter case it is evident that the nearer falling bodies approach the earth, the more forcibly are they attracted by it. We must try,” continues he, “whether the same pendulum clock goes faster on the top of a mountain, or at the bottom of a mine. If the force of the weight diminishes on the mountain, and increases in the mine, it is probable the earth has a real attracting quality.”

This precursor in philosophy was also an elegant writer, a historian, and a wit. His moral essays are in high estimation, though they seem rather calculated to instruct than to please; and as they are neither a satire on human nature, like the maxims of Rochefoucauld, nor a school of skepticism, like Montaigne,

they are not so much read as these two ingenious books. His life of Henry VII passed for a masterpiece; but how is it possible some people should have been idle enough to compare so small a work with the history of our illustrious M. de Thou? Speaking of that famous impostor Perkin, son of a Jew convert, who assumed so boldly the name of Richard IV, king of England, being encouraged by the duchess of Burgundy, and who disputed the crown with Henry VII, he expresses himself in these terms: "About this time King Henry was beset with evil spirits, by the witchcraft of the duchess of Burgundy, who conjured up from hell the ghost of Edward IV, in order to torment King Henry. When the duchess of Burgundy had instructed Perkin, she began to consider with herself in what region of the heavens she should make this comet shine, and resolved immediately that it should make its appearance in the horizon of Ireland." I think our sage de Thou seldom gives in to this gallimaufry, which used formerly to pass for the sublime, but which at present is known by its proper title, "bombast." ...

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A Frenchman who arrives in London will find philosophy, like everything else, very much changed there. He had left the world a *plenum*, and he now finds it a *vacuum*. At Paris the universe is seen composed of vortices of subtle matter; but nothing like it is seen in London. In France it is the pressure of the moon that causes the tides; but in England it is the sea that gravitates towards the moon; so that when you think that the moon should make it flood with us, those gentlemen fancy it should be ebb, which, very unluckily, cannot be proved. For to be able to do this it is necessary the moon and the tides should have been enquired into at the very instant of the Creation.

You'll observe farther that the sun, which in France is said to have nothing to do in the affair, comes in here for very near a quarter of its assistance. According to your Cartesians, everything is performed by an impulsion, of which we have very little notion; and according to Sir Isaac Newton, it is by an attraction, the cause of which is as much unknown to us. At Paris you imagine that the earth is shaped like a melon, or of an oblique figure; at London it has an oblate one. A Cartesian declares that light exists in the air; but a Newtonian asserts that it comes from the sun in six minutes and a half. The several operations of your chemistry are performed by acids, alkalies and subtile matter; but attraction prevails even in chymistry among the English.

The very essence of things is totally changed. You neither are agreed upon the definition of the soul nor on that of matter. Descartes, as I observed in my last, maintains that the soul is the same thing with thought, and Mr. Locke has given a pretty good proof of the contrary.

Descartes asserts farther, that extension alone constitutes matter, but Sir Isaac adds solidity to it.

How furiously contradictory are these opinions!

Non nostrum inter vos tantas componere lites. VIRGIL, ECLOG. III.

'Tis not for us to end such great Disputes.

This famous Newton, this destroyer of the Cartesian system, died in March Anno 1727. His countrymen honored him in his lifetime, and interred him as though he had been a king who had made his people happy.

The English read with the highest satisfaction, and translated into their tongue, the elogium of Sir Isaac Newton which Mr. de Fontenelle spoke in the Academy of Sciences. Mr. de Fontenelle presides as judge over philosophers; and the English expected his decision as a solemn declaration of the superiority of the English philosophy over that of the French. But when it was found that this gentleman had compared Descartes to Sir Isaac, the whole Royal Society in London rose up in arms. So far from acquiescing with Mr. de Fontenelle's judgment, they criticized his discourse. And even several (who, however, were not the ablest philosophers in that body) were offended at the comparison, and for no other reason but because Descartes was a Frenchman.

It must be confessed that these two great men differed very much in conduct, in fortune, and in philosophy.

Nature had indulged Descartes a shining and strong imagination, whence he became a very singular person both in private life and in his manner of reasoning. This imagination could not conceal itself even in his philosophical works, which are everywhere adorned with very shining, ingenious metaphors and figures. Nature had almost made him a poet; and indeed he wrote a piece of poetry for the entertainment of Christina, Queen of Sweden, which, however, was suppressed in honor to his memory.

He embraced a military life for some time, and afterwards becoming a complete philosopher, he did not think the passion of love derogatory to his character. He had by his mistress a daughter called Froncine, who died young and was very much regretted by him. Thus he experienced every passion incident to mankind.

He was a long time of the opinion that it would be necessary for him to fly from the society of his fellow creatures, and especially from his native country, in order to enjoy the happiness of cultivating his philosophical studies in full liberty.

Descartes was very right, for his contemporaries were not knowing enough to improve and enlighten his understanding, and were capable of little else than of giving him uneasiness.

He left France purely to go in search of truth, which was then persecuted by the wretched philosophy of the Schools. However, he found that reason was as much disguised and depraved in the universities of Holland, into which he withdrew, as in his own country. For at the time that the French condemned the only propositions of his philosophy which were true, he was persecuted by

the pretended philosophers of Holland, who understood him no better, and who, having a nearer view of his glory, hated his person the more, so that he was obliged to leave Utrecht. Descartes was injuriously accused of being an atheist, the last refuge of religious scandal; and he who had employed all the sagacity and penetration of his genius in searching for new proofs of the existence of a God was suspected to believe there was no such Being.

Such a persecution from all sides must necessarily suppose a most exalted merit as well as a very distinguished reputation, and indeed he possessed both. Reason at that time darted a ray upon the world through the gloom of the Schools and the prejudices of popular superstition. At last his name spread so universally that the French were desirous of bringing him back into his native country by rewards, and accordingly offered him an annual pension of a thousand crowns. Upon these hopes Descartes returned to France, paid the fees of his patent, which was sold at that time, but no pension was settled upon him. Thus disappointed, he returned to his solitude in North Holland, where he again pursued the study of philosophy, whilst the great Galileo, at fourscore years of age, was groaning in the prisons of the Inquisition, only for having demonstrated the earth's motion.

At last Descartes was snatched from the world in the flower of his age at Stockholm. His death was owing to a bad regimen, and he expired in the midst of some *literati* who were his enemies, and under the hands of a physician to whom he was odious.

The progress of Sir Isaac Newton's life was quite different. He lived happy and very much honored in his native country, to the age of fourscore and five years.

It was his peculiar felicity not only to be born in a country of liberty, but in an age when all Scholastic impertinencies were banished from the world. Reason alone was cultivated, and mankind could only be his pupil, not his enemy.

One very singular difference in the lives of these two great men is that Sir Isaac, during the long course of years he enjoyed, was never sensible to any passion, was not subject to the common frailties of mankind, nor ever had any commerce with women; a circumstance which was assured me by the physician and surgeon who attended him in his last moments.

We may admire Sir Isaac Newton on this occasion, but then we must not censure Descartes.

The opinion that generally prevails in *England* with regard to these two philosophers is that the latter was a dreamer and the former a sage.

Very few people in England read Descartes, whose works indeed are now useless. On the other side, but a small number peruse those of Sir Isaac, because to do this the student must be deeply skilled in the mathematics, otherwise those works will be unintelligible to him. But notwithstanding this, these great men are the subject of everyone's discourse. Sir Isaac Newton is allowed every advantage, whilst Descartes is not indulged a single one. According to some, it is to the former that we owe the discovery of a vacuum, that the air is a heavy body, and

the invention of telescopes. In a word, Sir Isaac Newton is here as the Hercules of fabulous story, to whom the ignorant ascribed all the feats of ancient heroes.

In a critique that was made in London on Mr. de Fontenelle's discourse, the writer presumed to assert that Descartes was not a great geometrician. Those who make such a declaration may justly be reproached with flying in their master's face. Descartes extended the limits of geometry as far beyond the place where he found them as Sir Isaac did after him. The former first taught the method of expressing curves by equations. This geometry, which, thanks to him for it, is now grown common, was so abstruse in his time that not so much as one professor would undertake to explain it; and Schotten in Holland, and Format in France, were the only men who understood it.

He applied this geometrical and inventive genius to dioptrics, which, when treated of by him, became a new art. And if he was mistaken in some things, the reason of that is, a man who discovers a new tract of land cannot at once know all the properties of the soil. Those who come after him, and make these Lands fruitful, are at least obliged to him for the discovery. I will not deny but that there are innumerable errors in the rest of Descartes's works.

Geometry was a guide he himself had in some measure fashioned, which would have conducted him safely through the several paths of natural philosophy. Nevertheless he at last abandoned this guide, and gave entirely into the humor of forming hypotheses; and then philosophy was no more than an ingenious romance, fit only to amuse the ignorant. He was mistaken in the nature of the soul, in the proofs of the existence of a God, in matter, in the laws of motion, and in the nature of light. He admitted innate ideas, he invented new elements, he created a world; he made Man according to his own fancy; and it is justly said that the Man of Descartes is in fact that of Descartes only, very different from the real one.

He pushed his metaphysical errors so far as to declare that two and two make four for no other reason but because God would have it so. However, it will not be making him too great a compliment if we affirm that he was valuable even in his mistakes. He deceived himself, but then it was at least in a methodical way. He destroyed all the absurd chimaeras with which youth had been infatuated for two thousand years. He taught his contemporaries how to reason, and enabled them to employ his own weapons against himself. If Descartes did not pay in good money, he however did great service in crying down that of a base alloy.

I indeed believe that very few will presume to compare his philosophy in any respect with that of Sir Isaac Newton. The former is an essay, the latter a masterpiece. But then the man who first brought us to the path of truth was perhaps as great a genius as he who afterwards conducted us through it.

Descartes gave sight to the blind. These saw the errors of antiquity and of the sciences. The path he struck out is since become boundless. Rohault's little work was during some years a complete system of physics; but now all the transactions of the several academies in Europe put together do not form so much as the

beginning of a system. In fathoming this abyss no bottom has been found. We are now to examine what discoveries Sir Isaac Newton has made in it.