

# LECTURES ON FRANCIS BACON<sup>1</sup>

## I

### FRANCIS BACON AND PHILOSOPHIC THOUGHT

**F**IVE men, so William James told us, could have conveyed to us by word of mouth all that we know of modern science. Harvey could have spoken to Newton, and Newton to Voltaire, and Voltaire to Dalton, and Dalton to Huxley, and Huxley to some of us. For modern science, and modern thought with it, are scarcely over three centuries old. Three hundred years ago, at the gateway of the seventeenth century, stood Francis Bacon, heralding the new era, a trumpeter and a bell-ringer of the modern world. "Since I have taken upon me to ring a bell to call other wits together," he wrote to Dr. Playfer in Cambridge, "it cannot but be consonant to my desires to have that bell heard as far as may be." So he sought for his ideas the more universal and, as he thought, the more permanent medium of Latin, and believed that, in their Latin versions, his "Essays" "may last as long as books last". But as a philosopher his longevity has more than once appeared precarious during the last three centuries. True, Harvey observed rather derisively that Bacon wrote philosophy like a Lord Chancellor. On the whole, however, the seventeenth century accepted the herald at his own estimate, and the eighteenth century swelled his fame with pæans of laudation. But the nineteenth has had its doubts, and many

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minds will this year be asking the question, whether modern thought would have been radically different had Bacon never lived. This, in fact, will be the question which will interest us in this the introductory lecture of our series: Francis Bacon's position in the history of philosophy.

Pope's characterization of Bacon—"The wisest, brightest, meanest of mankind"—of which Macaulay's famous essay is a brilliant elaboration, has served to confuse modern judgment. And, it must indeed be confessed, Bacon's personality is one of puzzling contrasts. To one who recognizes in philosophy the guide of life and the deepest expression of the human spirit, who believes with Fichte that one's philosophy depends on the sort of man one is, it is disconcerting to find in Bacon loyal devotion to philosophical ideals side by side with lax loyalty in personal relations; unflinching integrity in scientific method, together with a decided elasticity in moral standards. Was Socrates right in his dictum that Virtue is knowledge, or Macaulay, that mental and moral genius nowise imply or condition each other? Embarrassment has here led some writers, holding fast to Socrates, either to mitigate Bacon's moral vices or else to depreciate his intellectual virtues. The wholesale untempered condemnation of Bacon by men like Liebig is unusual and has been disapproved by the more moderate and competent students.

Against Macaulay and other critics of Bacon's private and public character, scholars have undertaken the defense of the Chancellor, with an array of documents, seeking to prove him, if not blameless, at any rate not a corrupt judge, and open to criticism only in that he yielded to the common practice of his day. His successor in the Chancellorship, Bishop Williams, was really corrupt; Cranfield, one of the men who impeached Bacon, was convicted of embezzle-

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ment; both were disgraced. It was apparently the usual thing. Even in his much condemned disloyalty to his friend and benefactor Essex, efforts have been made to whitewash Bacon. He was grateful to Essex, of course, and his most intimate friend; when Essex turned against Queen Elizabeth, Bacon did his best to dissuade him from his traitorous course; when, despite all counsel, Essex plunged headlong, Bacon gave up the lower for the higher loyalty and stood by his sovereign. Bravely done; but, alas, as Dean Church has pointed out, Bacon was not in duty bound to take a lead in the prosecution of his delinquent friend. He was not at the time of Essex's trial a judge nor a regular law officer. Loyalty to his benefactor did not impose on him the duty of standing by Essex, but he could have withdrawn to grieve over the fall of the nobleman to whom, only one year before, he had written: "I am as much yours as any man's, and as much yours as any man". Actually, just because he was, above all men, Essex's man, he was asked to lead in his prosecution; and the courtier Bacon, ever-hopeful of preferment, consented to turn actively against his dearest friend. But if Elizabeth, the sovereign, required the fall of Essex, Elizabeth, who had loved Essex, never forgave the man who had been directly instrumental in causing his ruin. Bacon waited in vain for the preferment of which he had dreamed. Ever "a pleaser of men", a pliant courtier where he could have been a solid statesman, he was involved in temptations which he could not resist and which in the end wrought his downfall.

With Bacon's public career it is not our province to deal, nor have we time now to enter further into his moral character. As we turn to his philosophy it may appear that, in the same way as he lacked the moral uncompromising integrity of a Spinoza, Bacon lacked also Spinoza's intel-

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lectual depths and singlemindedness. The contrast with Spinoza is instructive. Here is the humble grinder of lenses with his one passion, to see life steadily and see it whole, reluctant to accept his friend De Witt's bounty, unwilling to touch in any way his simple independence, refusing the honor of the Heidelberg professorship lest it lead him to stray from his chosen path through desire or necessity of conforming to prescribed views. Thus Spinoza, singleminded philosopher. Here, on the other side, is Francis Bacon, who has "taken all knowledge for his province", but who also wants the Great Seal his father had kept for Queen Elizabeth, a philosopher who would also be a courtier, a statesman, would write the history of England and would rule England, just as he would write the history of nature and master nature. In vain does he threaten to return to Cambridge and "become some sorry book-maker". We know he never could do it.

Bacon went to breadth and expansiveness, not to depth and penetration. His love of the grandiose led him astray and involved him in circumstances fatal to his character as to his career. But this same love of the grandiose and expansive, leading him to take all knowledge for his field, determined alike the merit of his philosophical undertaking and also his main defect. Here is a survey of all sciences and a criticism of their whole cosmic sweep; but when all is said and done, what do we have? A series of magnificent and impressive introductions, as has aptly been said. To do true justice to Bacon's philosophical achievement we should keep in mind his limitations, else we impose on him standards which he will fail to meet. If we style him the Father of Modern Philosophy and treat him as a greater Galileo, it is all vanity, for a Galileo greater or lesser he assuredly was not. He is not a Galileo, and, let the truth

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be told, he does not really know and understand the Galileos. He wanted means and assistants to work out the details, the particular experiments, to establish this law, that law. Himself was Prime Minister of the realm of knowledge, without any special portfolio. In the "De Augmentis" he called Plato "a man of sublime wit (and one that surveyed all things as from a lofty cliff)". Is this Bacon's achievement, or rather this other mentioned by Nichol, that he "sharpened the instruments for others to use"? To scientific knowledge in detail or in specific method Bacon made no considerable contribution. Is it in his encyclopedic grasp of knowledge, or in his perfection of right method for attaining it, or in his prospectus of work to be done by others, or in his enthusiastic trumpet-call to labor in the vineyard of science: where lies his just claim to honor in the history of thought? Without judging him by later standards, for the attainment of which perhaps he himself, by his successes and by his failures, was in a measure responsible, let us consider Bacon's work in its historical setting and undertake an objective estimate of it.

THE RENAISSANCE was the reawakening of the human mind to the need, the right, the opportunities of unhampered, undogmatic thought, after the long centuries of ecclesiastic domination and authoritarianism. For the great world of Nature and its unvanquished mysteries, which odd mediæval minds had clandestinely been exploring, a new Greek enthusiasm now swept over Europe, and along with it an adolescent ardor of speculation. With assurance and with utter disregard of Aristotelian chapter and verse, men attacked every problem in the calendar. A Pre-Socratic array of new doctrines resulted, new and bold interpretations of Aristotle, revivals of Plato, of every

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old Greek school of thought, and likewise professedly new philosophies of nature: against the Stagirite, the Cozentine Telesio constructed his own cosmology in his treatise "On the Nature of Things", which, however, it must be confessed, shares more than its title with Lucretius.

The Renaissance mind is a free mind, prizing new instances above old citations; it is a mind possessed with new interests in its own nature and in its environment, in the here-and-now. Fertile, self-confident even when inclined to scepticism, indefatigable it is; but it is also fantastic. For all its disdain of orthodox conformity and superstition, it is still credulous, with a penchant for the occult and marvelous. It is uncontrolled, inchoate and intemperate. Renaissance Europe stands as it were with her mouth open, aching to utter itself but not knowing what she really wants to say, perhaps because not knowing how to say it. The modern mind needed a new method to deal with its new problems. Against the *sic et non* of mediæval citation of authorities, against the impeccable deductions of minds that had their first truths all written in the book, there was needed a new procedure to serve searching minds that did not, like lawyers and theologians, begin with their conclusions, but sought to discover them and demanded assurance of their every step, including the first. Without an explicit formulation of such a new method, a "Novum Organum" of some sort, brilliant men, by actually using what they had not formulated, could, as of course they did, reach great scientific truth. But, whether by examining the nature of their own reasoning, or by an analysis of the nature of knowledge and the problems of the mind, a clearly enunciated new method was demanded before the modern mind could develop and understand its comprehensive

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systematic view of things. Modern science could make progress prior to such an enunciation of its method; not modern philosophy.

So it is that at the threshold of the seventeenth century modern systematic philosophy is inaugurated with discourses on method. Two varieties of method come to dominate the field and divide the loyalty of almost two centuries: the rigorous deduction from axiomatic first principles, the mathematically-minded rationalism of the Cartesian philosophy, and on the other hand the inductive procedure and the reliance on carefully collected and colligated particulars of experience, the empiricism which unites the British minds during the Age of the Enlightenment. From the death of Francis Bacon to the death of David Hume is a span of exactly one hundred and fifty years, 1626-1776. Then comes Kant, the all-destroyer, in whose mind and thought former methods are fused and refashioned, Kant the greatest and the last of the Age of the Enlightenment, the door through which we enter into the nineteenth century. Empiricism and rationalism are by him absorbed in the new Critical philosophy of intelligible experience. In this enunciation of modern method Francis Bacon took an early and a leading part; in mapping out the field which the modern mind essayed to explore and to master, Bacon's trumpet call to great endeavor was far-reaching and unmistakable.

Pre-Socratic philosophy, after the bold speculation of its first paragraphs, was settling down to master the secrets of nature by more natural methods. It is to old Democritus that Bacon owes his famous epigram: Nature to be commanded must be obeyed. But the moral and introspective twist which Socrates gave to Greek philosophy, Plato's predilection for metaphysical and mystical flights, and Aristotle's deductive bias in logic turned the course of Greek

thought away from the naturalism of the Atomists. The adoption of Aristotelianism as the intellectual groundwork of Catholic orthodoxy, later on, accentuated the formal bias of scholastic philosophy; authoritarianism and other worldliness made the progress of science in the Middle Ages impossible.

In view of this, Bacon felt the necessity of a radically new beginning in scientific and philosophical inquiry. With firm faith in the human mind, he mapped out his "Great Instauration", as he called it, "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".

Bacon's great program of reform comprised six parts; the main undertakings were really four. (1) A topical survey of existing knowledge: an inquiry into the unpromising condition of the sciences, a diagnosis of the causes for their stagnation. This is broadly, but not precisely or adequately, covered in his treatise on the "Dignity and Advancement of the Sciences". (2) The detailed elaboration of a new method for scientific and philosophical inquiry; this new logic, in explicit opposition to the Aristotelian, Bacon called the "Novum Organum". (3) Third, an immense undertaking of which only fragmentary suggestions are given in his writings, is a Natural History in the fullest and most encyclopedic sense of the term. A list of some hundred and thirty of these Natural Histories which Bacon had in mind suggests the broad range of his enterprise, and explains his pressing demand for means to undertake on a vast scale, with a large corps of assistants, his grand intellectual exploration. (4) The fourth and crowning part, to which the others were regarded as introductory, was to

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be the true interpretation of nature, an empirical philosophy solidly grounded on scientific fact. This part, of course, Bacon was not prepared to execute in full; to prepare for its execution was the object of his other inquiries. A vast plan, alongside which the career of a courtier and a statesman seemed to him, after all, narrow and impermanent: "the work of the Inventor, though a thing of less pomp and shew, is felt everywhere, and lasts for ever".

To begin with, Bacon distinguishes sharply between science and theology. The confusion of these two, he insists, has been ruinous to both. He is not irreligious, he is prepared to give to God the things that are God's, but Cæsar's to Cæsar. "I had rather believe all the fables in the Legend, and the Talmud, and the Alcoran," he writes in his Essay "Of Atheism", "than that this universal frame is without a mind. . . . It is true, that a little philosophy inclineth man's mind to atheism; but depth in philosophy bringeth men's minds about to religion." But he goes on to say in the next Essay, "Of Superstition": "It were better to have no opinion of God at all, than such an opinion as is unworthy of him". In theology you proceed on faith. Religion is like a game of chess: if you wish to play at all, you must follow the rules. There is thus a fundamental antithesis in method and attitude between the scientist and the theologian. The pendulum of thought swings between scepticism and unquestioning faith: reason does not answer the questions of religion and cannot accept the answers of theology. As Kuno Fischer points out, Pierre Bayle's pursuit of this problem connects Bacon with the French Enlightenment, the seventeenth with the eighteenth century.

The adoption of theological methods in the sciences has been responsible for their decay. For while theology begins with its indubitable dogmas, true science must begin

with inquiry pure and simple; it must not anticipate its conclusions, must not anticipate nature at all, but must seek to interpret the facts of nature as it finds them. Having thus sharply distinguished between science and theology, Bacon now applies himself to the former. Dividing science in three classes, according to the three faculties of man (Memory, Fancy, Reason), Bacon distinguishes History, Poesy, Philosophy. History he divides into Natural and Civil; Poesy, into Epic, Dramatic, and Didactic or Parabolic, regarding the last as the greatest: a hint to the well-meaning employers of ample leisure who consider Bacon as the author of Shakespeare's plays. Philosophy, finally, is classified under three heads, as dealing with God, with Nature, and with Man. The Philosophy of God is the doctrine of first principles. Philosophy of Nature is divided into mechanical and teleological science. The former of these studies the actual workings of nature; but the latter, dealing with final causes and exhausting itself in empty abstractions, Bacon regards as inclined to dogmatism and as the obedient handmaiden of theology. He calls it a virgin, consecrated to God, but barren. The Philosophy of Man is elaborately classified by Bacon under a variety of categories, grouped together under the two heads of man as individual and as a citizen.

So again we ask: Why the decay of all these sciences? Bacon answers: Because of radical error in the choice of methods. To intellectual achievement he regards right method as more essential than genius. Indeed, he believes that the adoption of the right method "leaves but little to the acuteness and strength of wits, but places all wits and understandings nearly on a level"—a view which has cost him much criticism. At any rate, surely "it is no presumption if any man asserts that he can draw a circle more truly

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with a pair of compasses than another can without". (Yes, unless the other happens to be a Leonardo Da Vinci.) Science has decayed because men have had no clear view of the goal and of the path, and have wandered into futile bypaths. Even a cripple walking steadily on the right road can outstrip the fast runner who is ever digressing and losing his way. Dogmatism and confusion and false philosophy have been the sources of error and decay; the adoption of a new method is the sovereign remedy.

The first obstacles in the way of scientific inquiry are the prejudices with which we are beset. These prejudices Bacon calls the idols of the mind, and classifies them under four heads. Some of our preconceptions are artificial; Bacon calls them the Idols of the Theater: they are the scientific conventions and fashions, what the Germans call the *Zeitgeist*, the spirit of the times. They set the tone and determine the initial course of our thinking. Thus misguided at the outset, the farther we go the more we wander from the truth. Like plays upon the stage they succeed each other, and what is unquestionable for one generation may be out of the question for the next. The other three idols are more natural sources of error, prejudices native to every one of us; we can never eradicate them utterly, but can only recognize them, make allowances for them, and seek to check them as much as possible. Thus all thought requires expression in words, and words are elastic and protean, unstable bearers of confused meanings. These are the Idols of the Market-Place, the most troublesome of all. On the mart of ideas the medium of exchange is language; counterfeit here passes undetected for true coin; and, besides buying and selling with mere counters, men barter in words, all the while thinking that they are dealing in real goods; word-mongering passes for thinking; monstrous and mean-

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ingless errors are thus begotten. In addition to the error due to the confused use of words each one of us has prejudices of his own, individual prepossessions, partialities, peculiarities, narrowness. "For every man," Bacon says, "has a cave or den of his own, which refracts and discolors the light of nature." These are the Idols of the Cave. Underlying all these are prejudices and erroneous ways of thought which seem ingrained in human nature and in the tribe or race of men. Bacon calls them Idols of the Tribe. We mistake the mere succession of two events for a causal relation between them, whence arise superstitions without end, about thirteen at table, journeying on Friday, looking over one's left shoulder, and so forth. We attend to instances which bear out our special prejudices, quite overlooking instances to the contrary. We generalize hastily from insufficient data, leaping at conclusions based on random similarities, mistaking the odd and striking for the characteristic.

Before fruitful scientific work can be assured, the mind must be rid as much as possible of the confusing influence of these idols. The Idols of the Theater, our intellectual conventions, we must discipline or repudiate. The Idols of the Market-Place, the confusion of words, we must check and correct by keeping as close as may be to concrete things, by perfecting the precision of our terms, and by avoiding abstractions which are but empty shells. Of our racial prejudices and individual prepossessions we must ever be clearly aware, being on our guard lest they mislead us altogether. In all we must be vigilant against prejudice; the scientific mind must be a mind open, a blank tablet on which Nature may write her own story; the mind must be made an unbiased recorder of facts.

For such an unbiased inquiry a new procedure is needed,

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a new logic of induction from particular observations to general conclusions. This Bacon proposes to supply in the second book of the "Novum Organum".

The richer our collection of data, of course, the better prepared we are; but Bacon warns us against depending on the mere counting of instances. "The induction which proceeds by simple enumeration is childish," he writes; "its conclusions are precarious, and exposed to peril from a contradictory instance; and it generally decides on too small a number of facts, and on those only which are at hand. But the induction which is to be available for the discovery and demonstration of sciences and arts, must analyze nature by proper rejections and exclusions; and then, after a sufficient number of negatives, come to a conclusion on the affirmative instances." Uncritical induction is like the work of the ant which only collects and drags material together. The dogmatist is like the spider making cobwebs out of his own substance, spinning doctrines out of his inner cosmos. But the true scientist is like the bee, which "gathers its material from the flowers of the garden and of the field but transforms and digests it by a power of its own". True induction does not merely enumerate; it eliminates.

Accordingly, to the Table of Essence and Presence must be subjoined the Table of Deviation, or of Absence in Proximity: the one containing all the affirmative, the other all the negative instances of the nature under inquiry, and corresponding to John Stuart Mill's Methods of Agreement and Difference. Next we must observe variations and presence in different degrees, by comparing either increase or decrease. This, corresponding to Mill's Method of Concomitant Variations, Bacon calls Table of Degrees or Table of Comparison. A general conclusion is thus drawn, like the first vintage in the interpretation of nature. This now

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is followed in Bacon's plan by a series of inquiries calculated to perfect the completeness and test the accuracy and adequacy of the induction. Particular and extended treatment Bacon gives to what he calls Prerogative Instances: Solitary, Clandestine, Constitutive, and twenty-four others, most notably Instances of the Fingerpost or Crucial Instances. These last are decisive instances, experiments which sway the balance between contending views of the understanding. These "afford very great light, and are of high authority, the course of interpretation sometimes ending in them and being completed".

This new logic of induction has been estimated variously; it has aroused the highest praise and also negligent disdain. In his defense of the positive merit of the "Novum Organum" Fowler has called attention to seven points in particular: Bacon's constant emphasis on the necessity of a thorough acquaintance with the facts of nature, as a preservative against prejudice and dogmatism; his advocacy of artificial experiments to supplement the usual observation of nature; his distinction between scientific induction and mere counting of instances; his recognition of the relation between induction and deduction; his distinct perception that the real object of science is causal knowledge; his insistence on the unity of nature and the unity of science; and, of course, his classification of fallacies, the doctrine of the Idols. But Church is also right: "Bacon never adequately realized that no promiscuous assemblage of even the most certain facts could ever lead to knowledge, could ever suggest their own interpretation, without the action on them of the living mind, without the initiative of an idea." Bacon had "one conspicuous and strange defect for a man who undertook what he did. He was not a mathematician". This want accounts in a measure for his inability to under-

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stand, appreciate, and share in the scientific work of a mathematically-minded age; it indicates a lack still more fundamental: his inadequate estimate of the importance of hypothesis in all scientific work, his suspicion of system in his overemphasis on natural history.

In opposing the deductive formalism of the scholastic logic, Bacon, for all his protestations to the contrary, does incline too much to the side of pure induction. Scientific experiment, as everyone knows, involves the use of hypotheses. The investigator makes no fetish of them; he is ready to abandon them the moment experience shows them to be untenable, but without them he cannot move at all. In studying nature we cannot proceed with our minds utterly blank; we must be looking for something. We may not find it, of course, or we may find something radically different. Like Saul, we may be looking for mules and asses and discover a kingdom—or our fortune may be just the reverse. Nature speaks to us in different languages according to our different problems and inquiries. But to him who lacks a problem nature is dumb because himself is deaf. Kant, writing one hundred and sixty years after Bacon, stated the matter clearly in his famous dictum which we can apply to our purpose here: "Thoughts without contents are empty, perceptions without conceptions are blind." Every fruitful inquiry involves both induction and deduction. Of this truth Bacon was by no means entirely unaware; had his grasp of it been sufficiently thorough, however, the "Novum Organum" would have been a different book, different also the entire Baconian philosophy.

Bacon overestimated the importance of inventory and of apparatus; he underestimated the importance of theory and of the understanding. His was to the end the sublime confidence in ingenious contrivances, mechanical or logical,

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that would make all minds equal, keys that would unlock any door no matter in whose hands. While engaged in wholesale prosecution of Truth and, a self-appointed generalissimo, mapping out the campaign of all the sciences, he was insufficiently acquainted with the work of the modern soldiers and captains of science in his own day. He complains that no formulas for the abridgment of arithmetical computations have been discovered, yet makes no mention of Napier's Logarithms. He disparages the work of Gilbert, who in his own day was advancing science with his studies of magnetism. The Copernican astronomy he rejects with increasing decision. He seems ignorant of Kepler's work. In mechanics he takes no notice of Archimedes, nor is he sufficiently aware or appreciative of his great contemporary Galileo. And, as Nichol wittily puts it, "he depreciates Roger Bacon, who invented gunpowder, whereas Francis thought the courage of soldiers might be increased by eating it". Most amazing appears his ignorance or his ignoring of Harvey's work on the circulation of the blood. Harvey was Bacon's own physician as well as the favorite doctor of the king. It is true that his great work did not appear until two years after Bacon's death, but in 1615 Harvey was teaching anatomy and surgery in London. Is it conceivable that Bacon, who was loudly trumpeting to the world the need of combined effort on the part of many investigators to wrest from Nature her many secrets, took no occasion to find out what his own physician was investigating? Was he ignorant of Harvey's work, was he jealous of him, did he oppose him unnamed? We cannot say; but Harvey's name is not to be found in Bacon's Works.

An ardent advocate of experimental methods, Bacon was himself no experimenter of any note, nor did he contribute any distinct scientific discovery. Laplace has summed up

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the case in a sentence: "For the pursuit of truth Chancellor Bacon gave us the precept, not the example". The experiment that caused his last illness, which proved fatal, was stuffing a fowl with snow to determine if it would retard putrefaction. Those who have compared Bacon to Aristotle, "the Master of those who know", have overshot the mark. Aristotle actually carried the available knowledge of his day in his head; he wrote his name high on the roll of achievement in whatever field he entered, and no predecessor or contemporary of Aristotle's was unduly neglected by him.

Nor was Bacon the British Socrates, as Fowler has called him. True, he had the Socratic confidence in the powers of the mind; against sceptics and dogmatists alike he urged unbiased inquiry, confident of success. But his whole philosophical estimate of the center of knowledge is at variance with the Socratic idea. As Adam points out, the true center for Socrates was man, the microcosm; for Bacon, the great world outside. Precisely the Socratic influence in ancient thought Bacon regarded as responsible for the sorry deflection of the Greek mind from the path of knowledge, from the naturalism of the Pre-Socratics into channels of speculation and evaluation: a philosophy profitless to man, barren and frivolous: in place of fruits and grape and olive, it bore thorns and briars of dispute and contention. Bacon is a modern Pre-Socratic, an undismayed and sanguine naturalist. If we were to survey modern thought on the analogy of Greek antiquity, the rôle of Socrates, or rather Plato, would be played by Kant, with his Critical theory of knowledge and his Primacy of Practical Reason.

One misses the characteristic greatness of Bacon, I think, in matching him with the Galileos. Bacon may praise Democritus above his classical successors, but his own name

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attaches to no modern theory to match the Democritean Atomism. He was not a great scientist; he was not a great metaphysician; he was not a great philosopher, theoretical or practical. He was a great arouser of philosophical and scientific interest. Rémusat very aptly calls him a promoter, not an inventor. If, instead of going to antiquity for our comparisons, we look about in our own time, we might find his analogue in William James. In venturing this suggestion, I surely need not say that no comparison is possible between Bacon's personal character and that of James, of whom Bertrand Russell wrote that "certainly he was not a pharisee, but he probably committed as few sins as any man who ever lived". Nor would I trust the comparison to press it too far. But still: consider the ample hospitality of the two minds; their occasional failing for the occult, and their unreluctant faith; their insistence on the observation of the immediately given; their indifference or hostility to system; their reformatory zeal and their readiness to wipe the slate clean, go around Aristotle or Kant as the case may be and begin Volume Next; their pragmatic emphasis on "fruits", on "what makes a difference"; their boundless, stirring, contagious enthusiasm. Neither cared overmuch to establish a school; each has fathered a tradition.

If we undertake an estimate of Bacon's work as a philosopher, we shall find his merit not in any great positive contribution which he made to philosophical doctrine, but in his effective stimulus to philosophic-scientific inquiry, in his ardent espousal of a new method, in his expansion of the scope of scientific interest. Parts of his work had certainly been undertaken by others before him; and what he did poorly others after him have done well. But no one at the dawn of modern thought took so broad a view of the

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possible glory of the new day. His intellectual optimism was the mark of, as it was also the stimulus to, creative intelligence. Between the dogmatist who confused words with knowledge and cited authorities to nature, and the sceptic to whom all knowledge was vain, words, words, words, Bacon held to an optimistic mean: with the right method any mind could attain real knowledge.

Even without the right method of inquiry and invention men had unravelled many of nature's secrets: how, then, could Protean Nature withstand the search after knowledge, if man pressed her rightly and insistently to answer his questions? The successful advance of science demands the realization that science is one, demands comprehensive strategy and plan. The Staff of Solomon's House in the New Atlantis shows what Bacon was prepared to expect of a society which recognized the possibilities of scientific inquiry and by united endeavor attacked on all fronts the forces of nature, to comprehend and utilize them for man's progress. Bacon's eye was steadily fixed on the total enterprise; perhaps on that account he has been, as Nichol says, "the *bête noire* and butt of Specialists, the modern schoolmen, who resent his insufficient view of their little worlds".

Yet we should do Bacon injustice if we mistook him for a mere utilitarian, a terrestrial or celestial mechanic. The end of knowledge is not the mere satisfaction of curiosity, or private gain or fame or controversial skill. It is for the glory of God and the relief of man's estate that the scientist must ever be laboring. Science may not loftily look on this everyday world as if she had no part and lot in it. "In this theater of man's life," Bacon says, "it is reserved only for God and angels to be lookers-on." But this does not mean that scientific inquiry is to aim at immediate practical profit and utility. Bacon distinguishes "experiments of

light", *experimenta lucifera*, and prefers them to the "experiments of fruit", *experimenta fructifera*, for the former are designed to understand nature; although perhaps of no immediate use, yet in the end they serve to reveal the vaster sources of human advantage. Here is clear recognition that real applied science must rest on pure science.

Confident that his method would advance natural science, Bacon was hopeful also that inductive methods would promote real knowledge in the field of morals. Before undertaking to pronounce with dogmatic assurance how man ought to act, we should first carefully observe how man does act. Descriptive ethics is for Bacon the sound propaedeutic to any systematic theory of morals. Man should approach his own nature in the same spirit in which he approaches physical nature; he should seek to understand in order to master it. We must "study and watch our fellows, with the patience and perseverance of the Natural Philosopher". This passage has an unpleasant Machiavellian aftertaste, when we think of Bacon the courtier and the eternal suitor for preferment; but this does not affect the value of Bacon's demand that ethics be brought down to earth, that it rest on an intimate knowledge of man's actual conduct. Moralists since Bacon's day have continued his "Georgics of the Soul"; not only agriculture, not only medicine, but likewise ethics rests to-day on an increasingly vast and ever more thoroughly cultivated field of empirical knowledge.

The results of Bacon's work and the extent of his influence it would be difficult to overestimate. Even if we yield to the protest that many have mistakenly worshipped at his temples who should have bowed down at the shrine of Galileo, or Harvey, or John Locke, the fact remains that Bacon's name adorns the corner-stones of some of the noblest edifices of scientific and philosophical inquiry. When

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Isaac Walton named Bacon "the great secretary of nature and of science" he spoke for a great and eminent multitude. When Bishop Sprat published the first history of the Royal Society of London, he stated that his book required as preface one of Bacon's writings. Wallis, Hooke, Boyle, Evelyn, all recognized in Bacon their master; his vision of Solomon's House in the New Atlantis is the inspiration of their Society. So Joseph Glanvill observes that by adopting Bacon's methods and the prophetic scheme of Solomon's House, the Royal Society had done more to promote knowledge "than all the philosophers of the notional way since Aristotle opened his shop in Greece". And not only in Britain did Bacon's work bear fruit. In 1666 the Academy of Sciences was organized in Paris, and its first secretary put Bacon's induction on a par with Aristotle's syllogism. At the inaugural session of the Berlin Society, in 1711, the Bishop Jablonski called Bacon by the name which Dante had applied to Aristotle, "the Master of those who know". In Galileo's Italy, in 1714, Count Masigli founded an Institute at Bologna placing it under the auspices of the great Lord Chancellor of England.

Adam, who has carefully surveyed the history of Bacon's influence, points out how the French Encyclopedists swelled the Englishman's fame during the eighteenth century. Voltaire, Diderot follow Baconian paths; D'Alembert, in 1751, in the *Discours préliminaire de l'Encyclopédie*, lists Bacon with Descartes, Newton, and Locke, as the four masters of modern philosophy. To Leibnitz he gives only a few phrases, to Galileo two lines, to Spinoza not even one; but Bacon is for him "the greatest, the most universal, the most eloquent of philosophers". It is true that Bacon's star, on the ascendant for two hundred years, began to decline during the nineteenth century. Joseph de Maistre attacked

his religion; Macaulay brilliantly exhibited the unlovely sides of his character. But if Liebig turned on him with undisguised hostility, Charles Darwin recorded that, in starting his inquiry, he "worked on true Baconian principles, and, without any theory, collected facts on a wholesale scale". Professor Sorley well says: "It is the leading thinkers—men such as Leibnitz, Hume, and Kant—who acknowledge most fully the greatness of Bacon. . . . He had the insight to discover, the varied learning to illustrate, and the eloquence to enforce, certain principles regulative of the mind's attitude to the world which, once grasped, became a permanent possession. He did more than anyone else to help to free the intellect from preconceived notions and to direct it to the unbiased study of the facts, whether of nature, of mind, or of society; he vindicated an independent position for the positive sciences; and to this, in the main, he owes his position in the history of modern thought."

RADOSLAV ANDREA TSANOFF.