

FRANCIS BACON
HARBINGER OF SCIENTIFIC PSYCHOLOGY

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In the three hundred and twenty four years between the death of AQUINAS in 1274 and the birth of DESCARTES in 1596 there were, according to one American historian of psychology, no 'great psychologists' (1). Nevertheless the new psychologies that emerged after the end of this period were markedly different from that which prevailed at the end of the thirteenth century, and they were shaped not by 'great psychologists' so much as by radical transformations in outlook, ideas and society. European man, in the striking phrase of BUTTERFIELD, had donned 'a different kind of thinking cap' (2).

The trigger which initiated the rise of modern science was no doubt the influx of Greek and Islamic scientific material in the thirteenth century. SOROKIN's tables show from that time onwards a sharp and progressively accelerating rise in the output of scientific discoveries lasting right up to our own age (3). At first science was of an undisciplined nature, and science proper was for some time often inextricably mixed up with alchemy, astrology and semi-mystical, hermetic, ideas. It was not always easy to distinguish the scientist from the pseudo-scientist. Figures like PARACELSUS and BRUNO are hard to classify, and even the great NEWTON devoted large segments of his time, and wrote upwards of a million words on matters

such as alchemy. Yet when we look at a fifteenth century giant like Leonardo DA VINCI we find many marks of the scientific mentality - his stress on the need for observation, his emphasis on quantification, and his belief in causality.

It was not long after LEONARDO's death in 1519 that modern science ended its long gestation and celebrated its birthday. The year 1543 saw the publication of two famous books, the *De revolutionibus orbium coelestium* of COPERNICUS, and the *De humani corporis fabrica* of VESALIUS. In the following year appeared the Latin translation of the extant works of the Greek mathematician, ARCHIMEDES, which laid down the foundations of theoretical mechanics, and a year later the *Ars Magna* of CARDANO, a key work in the introduction of algebra into Western Europe, marking, according to one historian of mathematics, "the dividing line between medieval and modern thought" (4). With the arrival of the heliocentric universe medievalism was doomed, and modern science launched on its momentous course; while VESALIUS's anatomy of the human body opened the way for a new understanding first of the bodily, and then, consequently, of the psychological functioning of man.

By the end of the sixteenth century these new scientific ideas were arousing growing interest, and small bands of enthusiasts were getting together to discuss them. Particularly noteworthy was the establishment of Gresham College in London. Sir Thomas GRESHAM, a wealthy London merchant who died in 1579, bequeathed in his will a sum of money to the Corporation of London, for the establishment of a college in which seven professors, among them professors of astronomy and geometry, should deliver lectures. These lectures commenced in 1597, and until the foundation of the Royal Society, served as an important meeting place for those interested in science. A little later even the universities began to open their doors to scientific enquiry. Savilian chairs of astronomy and geometry were founded in Oxford in 1619, and provision for a botanic garden agreed in 1621. Science was beginning to acquire a home and an organisation. Then at the beginning of the seventeenth century emerged the prophet of its future role in the person of Francis BACON, a man of exceptional vision, who 'took all knowledge for his province', and not only foresaw the impact that science would have on human affairs, but foresaw that psychology, the science of mind, would take its place among the sciences.

Francis BACON (1561-1626) has always been a controversial figure. In his lifetime his reputation in public life was tarnished, and he was finally dismissed from the high office of Lord CHANCELLOR on charges of corruption. As a philosopher he has often been adversely criticised, and more often ignored; while his positive contributions to science have usually been regarded as negligible, and his methodological prescriptions as misguided. Nevertheless he was a man of extraordinary prophetic vision, who foresaw with astonishing clarity the role that

science was destined to play in society. Though he may have underestimated the potential dangers springing from science (5), he was certainly keenly aware of the benefits which power over nature would bring; he understood the essential basis for effective science, the need for organized research, and the systematic collection of data; and he possessed a synoptic vision of the whole possible range of science and its applications. For these reasons his achievements have been regarded by one recent commentator as "a major turning point in the history of the European mind" (6). In the field of psychology his importance has generally been regarded a slight, and historians of psychology have accorded him small consideration. BRETT was one of the few exceptions when he asserted that "the ideas that he (BACON) expressed ruled the progress of inductive or experimental psychology through all its development" (7). The truth seems to be that though BACON himself made few detailed contributions to general psychology as such, he saw more clearly than anyone of his time the need for, and the potentialities of, a psychology founded on empirical data, and capable of being applied to 'the relief of man's estate'.

BACON, who entered Trinity College, Cambridge, at the astonishingly young age of twelve, was there subjected to the usual disciplines of dialectic, grammar and rhetoric (8), and, although he acquired a deep dislike of the verbal logic-chopping of the dialecticians, he was, nevertheless, influenced by, and never entirely threw off, a good deal of the Aristotelian substructure. He still, even in his maturity, tended to think in terms of essential qualities and attributes rather than in functional and mathematical terms. His revolt was rather against the methodology and verbalism of the traditional schools than against their fundamental presuppositions. BACON's really significant achievement was his grasp of the fact that scientifically based knowledge could become a source of man's mastery over nature, that it was the road "to human utility and power" (9), that it enabled man to move from passive imitation of nature to active domination over nature. Scientific knowledge of an exact and fruitful kind was a novelty in BACON's day, and still in a very rudimentary state, yet it seemed to him vastly superior in its potential to the three rival established forms of learning, which he labelled 'contentious learning', 'delicate learning', and 'fantastic learning' (10). By 'contentious learning' BACON referred to the logomachies of the scholastics; by 'delicate learning' to the rather spineless humanism of the neo-Platonists; and by 'fantastic learning' to the esoteric mystifications of the alchemists, hermeticists and magic-mongers. None of these three types of learning was capable of producing 'fruits'; and the test of sound knowledge was its fruitfulness. So BACON set out on the ambitious attempt to provide "a total reconstruction of sciences, arts and all human knowledge raised upon proper foundations" (11). BACON had "no entire or universal theory to propound" (12). The proper foundations were not dogmatic, but methodological.

His aim was to lay the basis on which a progressive and growing body of knowledge could be established. In advocating a fresh start he was not being merely iconoclastic. Indeed he asserted that he was "zealous and affectionate to recede as little from antiquity either in terms or opinions as may stand with truth and the programme of knowledge (13) and he held that in *The Wisdom of the Ages* (*Sapientia Veterum*) (14) there were often elements of truth. Nevertheless his programme was in many ways a radical one, and its implementation has largely shaped the modern world in which we live.

The core of BACON's programme was his proposal for a new logic, a *Novum Organum*, as he entitled one of his principal works (15), to replace the Aristotelian logic of the schoolmen. BACON's logic was basically an inductive logic. The essential starting point was the collection of facts; these facts must be arranged and classified in tables; and from these tables generalizations must be derived. This would ultimately enable the enquirer to arrive at a knowledge of causes, for scientific knowledge was essentially causal knowledge. By this BACON meant a knowledge of efficient causes; final and formal causes he regarded as the proper concern, not of science, but of metaphysics. BACON's proposals have often been criticised both for neglecting the role of hypotheses in scientific enquiry, and for failing to appreciate the importance of the mathematical treatment of data. These criticisms are not entirely fair. BACON did not dismiss, though he did not emphasise, the value of hypotheses. He did point out, however, that "the fuller and more certain our anticipation is, the more direct and compendious our search" (16); and he did assert "neither is it possible to discover the more remote and deeper parts of a science, if you stand upon the level of that same science, and ascend not to a higher science" (17). Indeed, "all true and fruitful natural philosophy hath a double scale or ladder, ascendant and descendant, ascending from experiments and the intervention of causes, and decending from causes to the invention of new experiments" (18). And with regard to mathematics he did advocate that "everything relating to both bodies and virtues in nature be set forth numbered, weighted, measured and defined...when exact proportions cannot be obtained, then we have recourse to indefinite estimates and comparatives" (19). BACON's principal weakness lay in the examples he chose to illustrate his method. The two detailed examples, the study of heat in the *Novum Organum*, and the study of whiteness in *Valerius Terminus* (20) were of little scientific value, largely because his starting point, from a collection of qualitative properties, not from causal relations and measurements, was a mistaken one, and soon overtaken by advances in physics later in the century. BACON failed, too, to appreciate some of the most significant scientific advances of his age, the Copernican theory, for example, and the contemporary work of GILBERT on magnetism. If not a model, his new logic,

was, however, an encouragement to empirical research and experimentation, and had something to do with the growing seventeenth century cultivation of science. Moreover BACON did latch on to one extremely valuable logical principle, the 'vis instantiae negativae', the force of negative instances. As the logician, von WRIGHT, observed, it was "the immortal merit of BACON to have fully appreciated this asymmetry in the logical structure of laws" - the fact, in other words, that a negative instance can disprove decisively, while an accumulation of positive instances cannot decisively prove (21).

Besides advocating a new methodology BACON was perhaps the first to propose the orderly and systematic prosecution of science, and to recommend its professionalization. In the utopian community of *New Atlantis* (22) scientific activity was concentrated in 'Salomon's House', a vast foundation equipped with all kinds of facilities for scientific research, zoos, health clinics, botanic gardens, laboratories, including visual, auditory and olfactory laboratories, and a 'house of deceptions of the senses' (23), together with a team of specialised scientific workers, who consulted together in committee and planned new experiments under the guidance of top tier experts. Taken together with the orderly classification of knowledge set out earlier in *The Advancement of Learning* and the *De Dignitate et Augmentis Scientiarum* (24) - a field in which he was a pioneer - BACON's proposals must be regarded as a remarkable forecast of the way science was to develop over the coming centuries; and among the sciences that BACON listed in his classifications were "knowledges that respect the mind." (25).

We must turn, then, to BACON's psychology. The term 'Psychology', though coined towards the end of the sixteenth century by the German savant GOCCLENIUS (26), was not, of course, in general use until more than a century later even on the continent, and for considerably longer in Great Britain. Psychology was referred to by BACON simply as 'knowledge of the mind', and to this he devoted a considerable portion of his *Advancement of Learning* and two books of the *De Augmentis* (27). In his basic psychological conceptions BACON mainly followed ARISTOTLE and his scheme of faculties, but theological considerations, and possibly the influence of OCKHAM, led him to distinguish two parts of psychology, "one that inquireth of the substance or nature of the soul, or mind, the other that inquireth of the faculties or functions thereof" (28). Knowledge of the substance of the mind was beyond the scope of science, and a matter for theology, but human faculties and functions could be investigated by the same methods as the subject matter of other scientific disciplines. Of this latter, empirical, division of the subject there were two main sub-divisions, the study of 'man segregate' (i.e. individual psychology), and of 'man congregate' (i.e. social psychology). In the study of the individual it was necessary first to consider 'human nature entire' (29), that is to say, body and mind together, and

their interactions. Here BACON was not considering the psycho-physical problem, for the simple reason that this problem did not clearly emerge until after DESCARTES. Influenced by the Italian thinker, TELESIO, to whom he frequently refers, BACON was concerned rather with psycho-somatic problems, with "how far the humours and effects of the body do alter and work against the mind; or again how and how far the passions and apprehensions of the mind do alter and work upon the body." (30). He also noted the problem of "the seats and domiciles which the several faculties of the mind do take and occupate in the corpus of the body." (31)

All these were far more pertinent questions than the sterile philosophical issues engendered by Cartesian dualism.

In the study of human faculties and functions BACON advocated broadly the same methodology as in other fields of knowledge. He proposed "a history and table of discovery for anger, fear, shame and the like, and again for the mental operations, composition and division, judgment and the rest," (32) though he recognised that some modification might be required to accord "With the quality and condition of the subject of enquiry" (33). In particular he suggested that explanations in terms of final causes, which were inadmissible in the physical sciences, were legitimate in the human sciences. Unfortunately BACON did not go on to develop a general psychology on these lines. What he did was to sketch in outline fields of enquiry which later became known as differential psychology, psychotherapy, and the psychopathology of thinking.

BACON believed that it was of great practical importance "to set down sound and true distributions and descriptions of the several characters and tempers of men, natures and dispositions." (34) It was valuable to know "what kind of wit and natures are most apt and proper for what sciences" (35), since "there are minds which are proportioned to intend many matters and others to few." (36) At the time BACON wrote, however, "this kind of observation wandereth in words, but is not fixed in inquiry" (37). To build up a sound knowledge it was necessary to consider differences resulting from sex, age, region, health, sickness and from external circumstances such as wealth and status. There was a need "to procure good information of particulars touching persons, their notions, their desires and ends...not only of persons but of actions; what are on foot from time to time, and how they are conducted, favoured, opposed, and how they import and the like. For the knowledge of the present actions is not only material in itself, but without it also the knowledge of persons is very erroneous" (38). BACON regarded this knowledge as important not only in vocational choice (39), but also in the treatment of the mind when deranged (40).

Psychotherapy, or the treatment of 'the diseases and infirmities of the mind' (41) was a matter of much concern to BACON, who had, after all, a wide experience of public life in law and politics, and extensive acquaintance with the

aberrations of human nature. His famous *Essays* are a mine of shrewd observation and worldly wisdom. In practical affairs he regarded 'the management of the mind' as a matter having the first priority. "For the remove of the impediments of the mind will sooner clear the passages of fortune, than the obtaining of fortune will remove the impediments of the mind" (42). There was a real need, therefore, for what he called 'The Georgics of the Mind', that is to say the husbandry or tillage of the mind, and this meant wise ordering and exercise, involving a consideration of individual differences, of the influence of environmental factors and the fluctuations of mood. In particular he prescribed a knowledge of affective dynamics, and a series of sensible rules for acquiring and removing of habits - the desirability of limited goals, timing, attention to 'the good hours of the mind', the need for effort and the value of distractions (43).

Of special interest to BACON was the psychopathology of thinking. Here he was again a pioneer. ARISTOTLE in his *De Sophisticis Elenchis* (Sophistical Refutations) had examined logical fallacies in thinking. BACON in his famous theory of 'Idols' was perhaps the first to grasp the importance, and to deal systematically with, psychological distortions of the thought processes. By 'Idols' BACON meant the phantasms, delusions and prejudices to which the human mind is prone. "The human understanding is like a false mirror, which receives rays irregularly, distorts and discolours the nature of things by mingling its own nature with it" (44). Some of these distortions are common to humanity, for example distortions by emotional factors (Idols of the Tribe). Others relate to individual biases (Idols of the Cave), for "every individual in consequence of his education, interests and constitution is attended by a delusive power, his own familiar demon, which mocks his mind and troubles it with various unsubstantial spectres" (45); to verbal snares (Idols of the Market Place), "those faulty meanings of words that cast their rays, or stamp their impression, in the mind itself" (46); and finally (Idols of the Theatre) to the systems, or ideologies as we should term them today, that provide ready-made patterns of thought and thus obscure reality. These pathologies of thinking BACON believed could be overcome by a strict adherence to a sound methodology. "A new method must be found for quiet entry in minds choked and overgrown" (47). Given sound methodology outstanding ability was not so important. "My system and method of research, declared BACON, is of such a nature that it tends to equalise men's wits and capacities" (48). No doubt BACON placed too much faith in the virtues of strict methodology, and possessed an inadequate recognition of the deep-seated unconscious roots of human prejudice. All the same his account of the 'Idols' was a remarkable first sketch of the psychopathology of thought.

BACON's ideas for a soundly based empirical psychology, applicable to the cultivation and guidance of human nature and the correction of its diseases and

infirmities, was too far in advance of its time to have an immediate impact. It was nearly three hundred years before his ideas began to be realised in the various fields of clinical and applied psychology. Equally some of his other prophetic visions, such as man's conquest of the air (49), took some centuries before their realisation. More immediate was his influence on some of the pioneers of British science who were responsible for the founding of the Royal Society later in the seventeenth century. "Robert HOOKE and Robert BOYLE, writes the philosopher QUINTON, praised him without qualification, and he became the patron saint or presiding genius of the Royal Society" (50). The immediate road of advance in science, however, was not a Baconian one, and the next developments in psychology were due much less to BACON than to the philosophers who succeeded him.

RESUMEN

Francis BACON (1561-1626) ha sido siempre una figura controvertida. En su vida privada y como filósofo fue unas veces agriamente criticado y otras más ignorado.

BACON posiblemente fuera el primero en proponer el estudio ordenado y sistemático de la ciencia, y su profesionalización. Para la psicología abogó por la aplicación de la misma metodología que para los otros campos del saber. Consideró de gran importancia el estudio empírico, la distribución y descripción de distintos caracteres y temperamentos del hombre, naturaleza y disposiciones.

Hizo un énfasis especial en la importancia del conocimiento del hombre para realizar una psicoterapia adecuada, siendo de máximo interés las psicopatologías del pensamiento, donde, una vez más, fue pionero, adelantándose trescientos años hasta que sus ideas se comenzaron a realizar en los campos de la psicología clínica y aplicada.

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- (26) The term 'Psychology' appears to have been first employed by Goclenius of Marburg who wrote a book entitled *Psychologia* in 1590. The book, which was on scholastic lines, went through several editions, and the term 'Psychology' was adopted by his pupil, COSMANN, but did not pass immediately into general use. It was reintroduced by Christian WOLFF in the 18th century in his two books, *Psychologia Empirica*, 1732 and *Psychologia Rationalis*, 1734.
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