Psychoanalysis and the scientific mind: Robert Boyle

KARL FIGLIO*

It is a tempting exercise, both historically and psychoanalytically, to contribute to a psychoanalytic understanding of Robert Boyle. Over many years, historians of science have been amassing evidence of science as a social activity, part of the culture of its time. As these studies progress, they stumble into psychoanalytic territory willy nilly. Indeed, the very notion of enquiry into nature becomes a psychoanalytic issue, as soon as we think of it as an emotionally charged approach to an object. If we think of Boyle as an early modern scientific investigator and as a personification of the tensions surrounding the investigation of nature as an object in the psychoanalytic sense, then we have a double reason for bringing a psychoanalytic understanding to bear upon him.

One of the criticisms of a psychoanalytic enquiry into any historical figure or situation is that the object of study is not present in the way a patient is present. It is not simply that the patient is not there – after all, there is documentary evidence to stand in for the missing person – but that the key feature that makes the enquiry psychoanalytic is missing. There is no transference, and no way to monitor the accuracy of interpretations. That means that the analyst cannot sit in the place of the objects in which the subject has an intense emotional investment, and from which vantage the subject of these investments can be studied. In that sense, the enquiry cannot be said to be properly psychoanalytic in method.

Nevertheless, Freud did carry out several analyses either at a distance or from written material. He directed a process akin to a clinical analysis of a five-year-old boy, making use of his father's reports. He analysed the structure of paranoia in the case of a well-known German politician (Schreber), using an autobiographical account of his paranoid breakdown. He analysed works of fiction and of art, as in his study of the novel *Gradiva*, by Wilhelm Jensen, and his 'Moses of Michelangelo'; and he wrote a classic psychobiography of Leonardo da Vinci, which is also a contribution to psycho-iconography.1

Indeed, psychoanalysts have always been interested both in the broader application of psychoanalysis and in the similarities between their findings and insights from other

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* Centre for Psychoanalytic Studies, University of Essex, Wivenhoe Park, Colchester, Essex, CO4 3SQ.
cultural forms, such as art, literature, philosophy, anthropology and mythology. Freud wrote on the Oedipus complex both as a clinical finding and as a western cultural myth. He was followed by others; the early generations of psychoanalysts enthusiastically looked everywhere for more material, both to analyse and to buttress the theories that were flowing from their clinical work (the pages of the early psychoanalytic journals, such as *Imago*, are rich in such cultural enquiries).

Although my theme is a Kleinian inquiry into Boyle, it is relevant to consider Freud's analysis of Leonardo da Vinci, partly on grounds of methodology – Freud based his analysis on written, mainly secondary, sources, and on his paintings – but also because Leonardo was, like Boyle, an early modern scientist. So, let us see how Freud approached his project.

In Freud's view, it was significant that, in Leonardo's own mind and in the minds of contemporaries, Leonardo never completed his projects. Indeed, he withheld the *Mona Lisa* from his patron, because he thought it was unfinished, and took it with him from Florence to Paris, where it was later acquired by another patron. He even shifted his concerns away from painting, becoming more interested in natural enquiry. He was naturalist in his thinking, through and through, relying on what he could observe and on operations he could perform. It was part of a general move from a more immediate to a more displaced representation of his deepest concerns. In not finishing the symbolic representations of these deepest concerns, and in displacing them from immediate symbolization, he shifted his curiosity and his passion from its primal object to increasingly displaced objects: in particular, from mother, to paintings of mothers, to nature.

The details of Freud's study of Leonardo do not concern us now. What I want to draw from it is the basis of Freud’s analysis: that the first object of curiosity and the first object of passion, no matter how distorted and how many times displaced, is still the primal object – still the mother. Furthermore, the passion of displaced curiosity, no matter how far removed from the original passion for mother, nonetheless is borrowed from that original love. Its energy, now applied to intellectual problems – sublimated, in Freud’s terminology – is at root sexual energy. Leonardo never married, and may not have had sexual relationships. The sexual energy that Leonardo withheld from his relationships was made over to his painting and, with even that remaining somewhat sexual, he displaced it further and applied it to the study of nature.

Freud’s case rests in part on the notion of sublimation, on the idea that sexual energy can be transformed into desexualized energy, maintaining its quantitative aspect but changing in form. It is a psychoanalytic equivalent to the conservation of energy. What Leonardo withheld from sexual relationships was reapplied to inquiry. Despite this displacement, his curiosity, exploration, enquiry and representation were all applied to the primal object, to mother as the origin of all.

Leonardo was the illegitimate child of a peasant woman, with whom he lived probably for up to five years. It is possible that, in those formative years, he had no father. Then he was taken into the home of his paternal grandfather to live with his father and his father's wife, who became Leonardo's stepmother. In the first formative years, when he had no father, he learned to be his own father, and lived in bliss with his mother alone:
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In teaching that authority should be looked down on and that imitation of the 'ancients' should be repudiated, and in constantly urging that the study of nature was the source of all truth, [Leonardo] was merely repeating – in the highest sublimation attainable by man – the one-sided point of view which had already forced itself on the little boy as he gazed in wonder on the world. If we translate scientific abstraction back again into concrete individual experience, we see that the 'ancients' and authority simply correspond to his father, and nature once more becomes the tender and kindly mother who had nourished him...His later scientific research, with all its boldness and independence, presupposed the existence of infantile sexual researches uninhibited by his father, and was a prolongation of them with the sexual elements excluded.2

One could say that in this sort of psychobiography the aim is not so much to analyse a particular individual as to exemplify or epitomize a particular configuration of personality and symptoms. As many before him, Freud sought the meaning of the Mona Lisa's enigmatic smile. He also sought the roots of Leonardo's masterful precision and attention to minute detail, and his anti-authoritarian willingness to think thoughts against the grain, as in his estimate of the great age of the earth and his idea that the sun did not move around the earth.

Freud knew what he was looking for: Leonardo's sexual inhibition; the absence of an oedipal father to restrain his curiosity; his compulsion to represent the ambiguity of a mother's love, mixed with envy, which he painted first in the Mona Lisa, then reproduced in separate figures in his paintings of St Anne and the Madonna and child. In all these instances, Freud knew what he was looking for. His discoveries were at the same time demonstrations of theory and illustrations of it.3

In such a case, an unconscious aim is revealed in a constellation of personality characteristics that can be understood psychoanalytically: we know what we want to explain psychoanalytically. The psychic constellation displays a settled defensive organization, which can be glimpsed on the surface in particular outcroppings, such as withdrawing from immediate representation of the mother and exploring nature in minute

3 According to Freud's sources, Leonardo did live his early years without a father. Bradley Collins, in Leonardo, Psychoanalysis and Art History, Evanston, 1997, a detailed study of Leonardo's life and the Leonardo literature, has established that he was surrounded by male figures, possibly even by his father. But the questions of whether Leonardo grew up without a father for the first five years, and whether his mother was adoring or ambivalent, refer to psychic, not material, realities. His withdrawal from painting, his inability to complete projects and his commitment to natural enquiry derive, psychoanalytically, from a psychic reality that can be depicted as growing up close to mother and without a father. In one respect, his biography neither confirms nor disproves the psychoanalytic thesis, and this failure of empirical grip can be seen as a criticism both by historians of science, art and culture, and also by psychoanalysts. The former will say that the established facts of biographical research must provide an account of Leonardo's achievements; the latter will say that only the transference can establish the psychic reality on which a psychoanalytic account of his achievement can be based. What we can do is make use of the results of psychoanalytic investigations of psychic reality to guess at an aspect of personality that surfaces in more than one preoccupation. In Leonardo's case, Freud thought that his struggle to represent maternal ambivalence, his withdrawal from the incestuous intensity of painting in favour of a minute observation of nature, his preoccupation with flying and confident assertion of his own discoveries against the weight of authority could all be derived from the absence of his father's authority, with a consequent triumph over him and an anxiety-ridden incestuous closeness with his mother. I suggest we take this constellation as a psychic reality, and connect it with similar information from other sources, including other psychobiographies, to construct a cultural reality of early modern science.
detail. It is not, therefore, a clinical situation. In a clinical situation, what is presented is understood as a symptom to guide further exploration. It is not in itself the object of enquiry, nor is the person in analysis explained by the symptom. The clinical situation has no predefined aim or end-point, beyond further exploration inside the analytic setting.

In the case of Robert Boyle, we might in a similar way see what we can discern in a configuration of his personality and, further, see if our findings throw any light on the intellectual currents that he helped to create. In setting about the exploration of Boyle's personality, as if the documents by him and about him were to be used as evidence about his personality, we know ahead of time what we are trying to explain: the personification of the modern scientific temper. In the clinical situation, that is what we do not know. The transferential moment is open, at most guided by a guess in support of a rough hypothesis about what might happen next. By contrast, historical documents are finished. It is an obvious, but important, point. What we can do is venture a psychoanalytically informed hunch, that the documents left by Boyle represent settled defences against anxieties. To understand them, we have to probe the anxieties against which they defend. Without the transference, we have to guess what they might be.

These anxieties, were they entering into the living encounter of the analytic process, would shape the progress of the analysis. They would form a constellation of defences in the analytic space, which would replace the neurosis that previously existed outside, and which may have been the reason for coming into analysis. Thus in one of Freud’s well-known cases, a severely obsessionnal man began to fear Freud with an intensity that belonged to the man’s father. In treating Freud in a way that was partly delusional, he provided essential insights into his obsessionality, in particular into the deployment of defences against ambivalence: the fact that he would hate those whom he loved. It is this transference situation, held in being by analyst and patient together, which is the object of investigation.⁴

Without the transference, many sensible and enlightening things might be said, but they would not be specifically psychoanalytic. In the transference, for example, the swinging of ambivalence from love, to hate, to love, may be predictable, but it is also recognized at the moment it occurs, and that recognition might alter the way it arises again. Perhaps after many recognitions the swing to hate comes to mean an envious attack upon a providing mother, which eventually becomes an admiration and a yearning for her, then a need to

⁴ This example is taken from Freud’s classic case, ‘Rat Man’:

And so it was only along the painful road of transference that he was able to reach a conviction that his [loving] relation to his father really necessitated the postulation of this unconscious complement [of hatred]. Things soon reached a point at which, in his dreams, his waking phantasies, and his associations, he began heaping the grossest and filthiest abuse upon me and my family, though in his deliberate actions he never treated me with anything but the greatest respect [and berated himself for his bad behaviour]... While he talked like this, he would get up from the sofa and roam about the room... avoiding my proximity for fear of my giving him a beating... If he stayed on the sofa he behaved like some one in desperate terror of trying to save himself from castigations of terrific violence... Thus, little by little, in this school of suffering, the patient won the sense of conviction which he had lacked — though to any disinterested mind the truth would have been almost self-evident.

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protect and nourish her. Each of these attitudes towards the other occurs as a recognition, not a prediction.

When Freud analyses the information available on Leonardo, he is making a prediction. It differs from the experimental situation, in that he knows the outcome, but it is of the same form. One might call it a retrodiction, a psychoanalytically informed account, but one that is similar to any historical explanation. It is as if he were to say, 'If Leonardo were passionately in love with his mother, unmitigated by paternal influence up to the peak of his oedipal strivings, he would be likely to displace his passion from his mother, then from all women, and he would try to represent it in the external world, perhaps in painting. Finding it still too disturbing, he would then displace this passion further, into a relentless curiosity about nature.' In the case of knowledge by recognition, on the other hand, the interest is in the discovery of the moment: an articulation that is sensed as an accurate representation in principle and also the instantaneous appreciation of a discovery.

Psychoanalysis carries out both kinds of research. The fact that the first sort of research does not study a 'psychoanalytic object', but makes use of psychoanalytic knowledge to guide historical interpretation, is irrelevant for our purposes. We are interested in the settled defensive organizations that structure cultural activity — such as the features of scientific naturalism in relation to religious feeling — and which are expressed in Leonardo's or Boyle's psychic conflicts. As investigators into culture, we are not interested in Boyle's subjectivity, recognized in a spontaneous moment, but in an analysis of cultural representations of intention and the conflict of intentions. They are the precipitate of many subjectivities and of subjectivity over time, and we can make use of Boyle's persistent patterns of psychic defence to treat his culture as a sentence that presents itself through him. Since culture is the expression of subjectivity in relation to its environment, congealed from the involvement of its members, the depiction of these settled configurations of the psyche is just what we are seeking.

From a psychoanalytic point of view, research is based on the child's sexual researches, and aims to discover the secret of mother's body. It is guided by proto-theories and aims for predictive knowledge. It also seeks to elicit the secrets of sexuality and the origin of babies through controlling the object of research in phantasy. Melanie Klein has recorded in detail the analysis of a young boy of ten, which took place during the Second World War. The boy, Richard, reported in a series of drawings the progress of the war at sea, which worried and depressed him. But the drawings also depicted his phantasies

5 It would be interesting to apply this theory of research to psychoanalytic enquiry itself, including the transferential process and its analysis.

6 I will follow the convention that phantasy, as opposed to fantasy, refers to an unconscious relationship between self and objects; and I will therefore also not repeat 'unconscious', which is redundant. The existence and content of phantasies are hypothesized from spontaneous behaviour and emotional expression, as in play or in the transference. As a production of the unconscious, they bear the character of the unconscious, including omnipotence of thought and wish-fulfilment; and in their becoming manifest through engagement with external reality they appear as part of the psyche's defensive organization, producing, for example, clusters of symptoms such as obsessionality or paranoid thoughts or conscious day-dreams, which we could call fantasies. Their existence is inferred through the manifestations of conscious behaviour, and their significance is underwritten by their explanatory power, as fundamental psychic particles. R. Hinshelwood, A Dictionary of Kleinian Thought, 2nd edn., London, 1991, 32–46.
about what went on inside his mother’s body, his competition with his father and his older brother, and also phantasies about hungry babies, like himself. He drew battleships, submarines and attacking aircraft, each representing someone in particular, forming alliances, jockeying for position and bombing. In addition, he drew a large starfish, shaded in various colours, which represented territories of mother, held by brother, father and himself. Elsewhere, starfish had represented hungry babies, with pointed edges that could cut in their hunger, just as teeth could cut the breast. He was himself the hungry baby – the starfish – so these phantasies represented himself as co-extensive with his mother; that is, they represented mother’s body in the form of his body, or the inner space of his mind as a body space. In that way, the self-control of his phantasies and his drawings aimed to control the object, his mother.7

The child’s sexual researches are carried out with the equipment at hand. That equipment is the child’s capacity to master its own body and to phantasize, to generate imaginative proto-theories in line with that mastery. The most potent phase of this controlled proto-knowledge is the anal phase, when the capacity to control the bowels is linked with phantasies of controlling the object from the inside, just as control of the bowels represents a mastery of the inside of the child’s body. It is a practical mastery, based on actions. Klein spoke more specifically of the ‘anal-sadistic’ phase, because this sort of phantasizing was characterized by an aggressive and damaging possession of the object. Faeces become missiles. Coming from the inside, they also carry in phantasy a part of the self on the inside, now a part of the self inside mother, pushed into her in a faecal attack. So the research into the origin of babies occurs as a phantasy of aggressively entering mother’s body, with the aim both of observing and of attacking her, father and babies, all from the inside.

To speak of observing from the inside is trying to put words to a more primitive situation, in which mother’s body is a phantasy space identified with the child’s body, which is itself a phantasy space. Observing from the inside means equating self with other. In an anal-sadistic mode, it would mean identifying mother’s inner world – physical and mental – with the child’s experience of objects on the inside, under sensorimotor control; that is, the control of faeces. Klein called this process ‘projective identification’.8

We can go back to Freud’s study of Leonardo to understand better his creative urge. Freud points to two detailed financial accounts in Leonardo’s diaries: one reports the expenditure on clothing for a boy who modelled for him; the other reports the funeral expenses for his mother. We know also that he surrounded himself with young, pretty boys. Here are some bits of information, small details, which invite a psychoanalytically informed hunch. Leonardo managed the passion in his early relationship with his mother by identifying with her; the young boys on whom he lavished care and attention, and whom he observed and drew, were identified with himself as seen and loved by his mother. When in later years he strove to portray the smile of his mother, in the Mona Lisa, he was also trying to observe himself on the inside, and simultaneously capture the ambiguous smile

of his double-mother. He was putting on the outside, and into an observable form, what was inner, not objective and not observable. His earliest form of understanding was in the phantasy of assimilation of himself to his mother; his later form was to place in the outside world, as if found there, the inner world of his earliest knowledge.

In portraying her smile, Leonardo was trying to depict an object that he had observed carefully; and even Freud was drawn into wondering whose smile it could have been, which was then so faithfully reproduced. We can surmise that such an enigmatic expression must arise in his relationship with his primary love. The primary love – the love that is as different from later loves as the impulse itself to love – is an assimilation, an identification. The object, as it becomes more distinctly an external object to observe, then becomes an object of intense fascination; and the need to depict it attempts to capture and comprehend the unresolvable plethora of feelings and phantasies that arise from inside the child, in this primary relationship.

In reaching towards the external world, even in the form of perceiving it, we extend ourselves emotionally towards it, we love it. Paula Heimann, a student of Klein’s in her younger days, wrote,

The ego brings something of its own towards the object to be perceived. It cathects the object actively... the ultimate motive which makes the ego turn towards an object, perceive, and cathect it lies in its helplessness and in its wish to live... when the ego turns towards an object for satisfaction, what it brings forward of its own for a perception of this object is the expectation that it will be good, gratifying, loving; that is, it sends out some of its own libido towards the object.9

This loving extension of the ego towards the object establishes an identification, and builds up a world of ‘internal objects’, that is, of objects that in phantasy have been taken into the ego. Inside the ego, however, they are outside conscious monitoring, and inside what one might call, following Winnicott, a ‘sphere of omnipotence’. These objects are now phantasy objects, and partake of internal scenarios, as in the case of Richard above. They have to be reprojected and assimilated to external objects, in order to be monitored and in order to work on them. Mother as an internal object has been subjected to intense pressures: to feed from her and to attack her. This internal mother can be deposited in mother, or a representative, in the external world; caring for her, with the experience of the restorative effect of this caring, then allows a re-internalization of a mother who, as an internal object, is the nucleus of a friendly internal world and a secure sense of self.

Thus the relationship between the internal world and the external world is intense. And since the baby’s needs are great in proportion to its capacity to discriminate and make use of external objects, it is largely at the mercy of phantasy and its mother’s attunement. In Klein’s view, this early situation sets the stage for the relationship with the outside world, including nature; and it occurs mainly as an anal-sadistic phantasy:

In attacking her mother’s inside, therefore, the child is attacking a great number of objects, and is embarking on a course which is fraught with consequences. The womb first stands for the world; and the child originally approaches this world with desires to attack and destroy it, and is therefore prepared from the outset to view the real, external world as more or less hostile to

itself, and peopled with objects ready to make attacks upon it. Its belief that in thus attacking its mother's body it has also attacked its father and its brothers and sisters, and, in a wider sense the whole world, is, in my experience, one of the underlying causes of its sense of guilt, and of the development of its social and moral feelings in general.10

We can now turn to the study of the natural world and to Robert Boyle. The nub of the case I want to make about Robert Boyle, or about anyone involved in an enquiry into nature is this: every enquiry into the natural world is simultaneously an enquiry into the internal world. The external world is the place in which the internal world has been deposited for monitoring, control, resolution of conflict and restoration. What we see in the early modern period is an attempt to establish a territory of enquiry, in which the passionate engagement with the external world, both for itself and as the depository for the conflict-ridden internal world, can be moderated. Once moderated, the steadier relationship with the external world promotes the belief in naturalism, an attitude towards the world, in which reliability is expected.

'Naturalism' is a complicated word. Here I mean by it simply the idea that there is a world outside human imagination and influence. This natural world can be represented by the perceptual apparatus, and thought of as a copy, mapped onto a field of representation, such as vision. It can be studied by observation, drawing, collecting and cataloguing specimens, dissection, manipulation and the recording of connections amongst observations. In the history of painting, such an idea is also associated with an attempt to create such an idea as an illusion, a feeling of 'the real thing'.11 And it can shade into Romanticism, in which the aim of inducing an enthrallment or vivid experience of sentiment is itself just beneath the surface.

In this sense, we are already prepared for the psychoanalytic insight that naturalism, as I have defined it, includes both the idea of passionless objectivity, as in scientific naturalism, and the infusion of objectivity with passion. We are already prepared, in other


11 I want to distinguish between this use of naturalism, which is based on the psychoanalytic idea of an external world lying outside the sphere of omnipotence, and naturalism, say, in painting, which refers to the imitation of nature. While the imitation of nature can seem like magic, nature as the external world is used to control magical phantasies.

The following anecdote, found in Pliny, has been recounted innumerable times in various forms:

Zeuxis painted grapes; some sparrows flew by and pecked at the grapes. Parrhasios then asked Zeuxis to accompany him to his studio, where he would demonstrate that he could do something like it. In the studio, Parrhasios asked Parrhasios to pull back the curtain covering the picture. But the curtain was painted. Zeuxis acknowledged Parrhasios' superiority: 'I took in the sparrows, but you took me in.'

E. Kris and O. Kurz, Legend, Myth, and Magic in the Image of the Artist: a Historical Experiment, New Haven and London, 1979, 62. In this form of naturalism, the painter becomes a magician. I think a similar case can be made for the modern scientist, who imitates nature in the experimental manipulation of nature, on Baconian principles. That is why I want to reserve the notion of naturalism for the ego's use of the external world to control magical phantasies, in contrast to exciting a spiral of ever greater levels of magic. At the same time, it pinpoints the ambiguity, which I think is inherent in modern science, of the temptation of magic. Keith Thomas noted a similar early modern temptation of magic in the Protestant renunciation of magic in Catholicism. K. Thomas, Religion and the Decline of Magic: Studies in Popular Belief in Sixteenth- and Seventeenth-Century England, London, 1971.
words, for the idea that the scientific spirit, in its dedication to patient detailed enquiry, passionately embraces its objects. And, when that is not apparent, when the culture seems to limit this passion, we are prepared to find an eruption of a split-off exaggerated version of it, in magic, occultism, fundamentalism and fervour.

Boyle is interesting in this respect, in that evidence of deep internal conflict lies on the surface of a mind dedicated to rational argument and persistent enquiry into natural phenomena. It is as if the enquiry had as one of its aims the quelling of internal conflict by appeal to a final truth after a relentless search through all the areas of doubt.

We could say that Boyle was driven by conscience, and in that form of moral urgency he and his science were modern. David Sabean makes a similar point in arguing that a major current of early modern religion, in conjunction with statecraft, was the internalization of authority. Not only did a citizenry have to obey central authority, it had to experience an inner authority. Religious authority sought to inculcate an inner need to attend mass in the right spirit, in a population that found the cause of every happening in an external agent, such as a malicious neighbour. The centralization of external authority worked through the centralization of internal authority. Sabean holds that conscience is the hallmark of the modern period. Freud would agree that conscience is not universal and that modern civilization suffers especially from conscience, or more particularly, from the super-ego.

Modern western culture builds on the idea of being modern. It overturns the authority of the past, and, in the idea of progress, it continuously overturns authority. It makes use of what Rank calls the ‘myth of the birth of the hero’. Heroes are not born to normal parents and, in particular, they have no fathers (as Freud said of Leonardo, in the quotation above). In procreating children with his own mother, Oedipus gives birth to himself. The founding genius of art or science – a Leonardo, Michelangelo, Boyle or Newton – is a hero, a man born of himself, and though there are classical roots to this myth, it is primarily a theme of the Renaissance.

A culture that promotes the internalization and the annulling of authority will need continuously to investigate and control the internal world in an externalized form. Curiously, it will be tempted by magic as much as by science, because of the omnipotent phantasies of annulling the father, and ultimately the parents. The more the magic, the more the need for science as an externalized control of phantasy.

15 This theme is developed for the myth of artistic genius by Kris and Kurz, op. cit. (11). It is characteristic of psychoanalytic thinking that multiple, in particular contradictory, unconscious phantasies are carried by a conscious presentation. Freud says that in the phantasy of having a child with his mother, the boy not only triumphs over his father, but gives back to the parents the gift of life that they bestowed upon him. The conscious motif of the birth of the hero thus amalgamates aggression and triumph with tenderness and love; see S. Freud, ‘Contributions to the psychology of love: a special type of choice of object made by men’ (1910), in Freud, op. cit. (1), vii, 227–46. The attempt to express both hatred and love becomes especially acute in the presence of the super-ego, an institution of the psyche itself, which knows everything and makes no distinction between wish, phantasy, motive and deed in the external world: Freud, op. cit. (13), 320.
Now let us turn to Boyle’s philosophy. Boyle was a major proponent of the corpuscularian philosophy, according to which matter and all the qualities displayed by natural bodies derived from the mass, configuration and movement of minute particles. He contrasted the corpuscularian view of the sensible properties of bodies with the traditional Aristotelian view and with the doctrine of the chemists. In both of these schools, sensible qualities arose from the similar qualities of a small number of primary substances. By contrast, the corpuscularian philosophy reduced sensible – ‘secondary’ – qualities, such as hot, cold, texture and colour, to the mechanics of particles. The corpuscles themselves were devoid of qualities, but their activity – ‘primary qualities’ – produced what were perceived as sensible qualities. It was truly a reductive philosophy, based on the subsuming of one class of phenomena – sensible qualities – to another, lower-order class: the movements of particles.

Precisely this reduction, however, became an argument for the existence of God. Using examples similar to the idea that by chance monkeys sitting at typewriters could produce the works of Shakespeare, Boyle argued on grounds of plausibility that there must have been at least an initial guidance to set the corpuscles into the movements that would produce the phenomena that we observe. I want to draw attention to just two features of his argument.

First, the mechanical philosophy, in its very reductiveness, implies a creator, since the observable qualities – the phenomena we need to explain – are not in the phenomena themselves, but outside them. Although the Aristotelian idea that hot substances contain a preponderance of fire might seem naïve, one does not need to seek outside the object for an explanation of its properties. Corpuscularianism, in its very reductiveness, sets up a dualism between cause and effect. This dualism leads inevitably to an invisible realm, to the idea of the mind of God, and to science as the exploration of the mind of God.

This distinction between the properties of corpuscles and the qualities of perceptible bodies, between primary and secondary qualities, left no intrinsic connection – no similarity of essence – between them. This dualism paralleled the Cartesian dualism between mind and matter: mind perceived the sensible – secondary – qualities, which were based upon – but essentially different from – the realm of extension or primary qualities.

This theory is a mechanical theory of natural phenomena. Boyle often drew a parallel between the mechanics of corpuscles and the mechanics of clocks; between the natural mechanics of invisible fundamental particles and the human contrivances whose mechanics were visible and intelligible, because they were built by human beings. By extension, the mechanics of corpuscles were also intelligible in principle, especially if one thought of them as designed by God, whose capacity to design natural machinery infinitely outshone human ability.

The idea that nature comprised a complex system of machinery meant that the principles of nature could be studied not only as determinate but also as intelligent, not in themselves but as the products of Divine intelligence. There could therefore be a science as we know it and also a religion.

The second feature of his argument, to which I want to draw attention, was the clinching argument for Divine presence, at least at the beginning. This was the implausibility that a dead man could come to life.
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If an Epicurean should be told, that a Man, after having been for some days really dead, became alive again, I think it will not be doubted, but that he would reject such a Relation as impossible, and therefore too manifestly false to be believed by any Man in his Wits: And yet, according to his Principles, the Man, as well Soul as Body, consisted only of divers Particles of the Universal Matter, by various Motions brought together, and dispos'd after a certain manner: And consequently, he must ground his perswasion that 'tis impossible to re-integrate the Engine once spoil'd by death, upon this, That as Chance cannot with the least probability be presum'd to have produced such a strange Effect; so according to him, there can be no Cause assign'd, knowing and powerful enough, to rally and bring together again the disbanded and scattered parcels of Matter... as were requisite to make a living Man once more result from them.16

On this clinching argument by plausibility, Boyle rests his case that phenomena, including life, must have arisen from at least an original Divine guidance.

Let us put this argument next to the following account from a friend of Boyle's. Boyle had told him of attending a sermon delivered by a well-known figure, who interpreted Daniel 12:2, concerning Resurrection, allegorically, as referring to the revival of religious doctrines ('many of them that sleepe in the dust of death shall awake, some to Everlasting Life, and some to shame & Everlasting Contempt'). Boyle publicly disputed his interpretation, arguing from the Hebrew text that the calling of the dead to life was meant literally.

I think my selfe for the honor of Gods Truth here obliged to say that that place in Daniel being the clearest one in all the Old Testament for the proof of the Resurrection, we ought not to suffer the meaning of it to evaporate into Allegory... And if it be denied that the plaine & genuine meaning of those words in Daniel is to assert the Resurrection of dead bodies, I am now ready to prove it so to be, both out of the words of the Text and Context in the Originall Language, and from the best Expositors both Christian & Jewish...17

What the comparison of these texts shows is that Boyle's argument to support the corpuscularian view of matter, which for him implied a Divine presence, could for him have been justified from a literal reading of the Hebrew of the Old Testament. The resurrection of dead bodies, which would be impossible without Divine intervention, is indeed proved by the reading of the original text.

Boyle was accomplished in several languages, including Latin, Greek and Hebrew, and would attend church services with original texts in hand. He would also refer to them to resolve an issue of moral uncertainty, finding that his perplexity arose from a misrepresentation in translation, which could be settled by establishing the original meaning.18 The detailed examination of a text became equivalent to a detailed examination of the internal world, looking for evidence of damage done and opportunities for restoration. The text could be the Bible, or any text that invited intensive study and interpretation.

Boyle was a devout Christian, but the particular aspect of his personality to which I am drawing attention is his search for, and deference to, an ultimate authority that would quell all doubt and uncertainty. The casuist tradition that Boyle was caught up in was an attempt to formulate general principles for decision-making in particular cases of moral ambiguity:

18 Hunter, op. cit. (17), 65–6.
an attempt to achieve certainty by continuous refinement of the problem through discriminations. He refused to accept the presidency of the Royal Society of London, because he would have been legally bound to swear an oath.\textsuperscript{19} Since he could not be sure of his capacity in the future to honour the oath, he could not in good conscience swear it. He was also beleaguered by blasphemy in the form of the eruption of sudden and unwelcome thoughts. He suffered anxiety about these ‘Impious or Blasphemous Suggestions or Injections’ to such an extent that he consulted ecclesiastical authorities to try to determine whether he was accountable for them.\textsuperscript{20} He turned the doubts that arose from these ‘injections’ into a benefit, which reinforced his need for relentless enquiry. He said he

\begin{quote}
deriv’d from this Anxiety the Advantage of Groundednesse in his Religion: for the Perplexity his doubts created oblig’d him…to be seriously inquisitive of the Truth of the very fundamentals of Christianity: & to heare what both Turkes, & Jewes, & the cheefe Sects of Christians cud alledge for their severall opinions: that so tho he beleev’d more than he could comprehend, he might not beleve more then he cud prove…\textsuperscript{21}
\end{quote}

Boyle also suffered acute attacks of conscience over income from lands that had been appropriated from the Irish church, and consulted ecclesiastical authorities to find the correct way to deal with what might have been a sacrilege. He even commissioned a text on casuistry, an attempt to establish principles for assessing the correctness of behaviour, from Robert Sanderson, Regius Professor of Divinity at Oxford.

Michael Hunter says that, in his constant soul-searching, Boyle was out of line with the ecclesiastical thinking of his time. With respect to blasphemous thoughts, for example, such opinion steered away from any spiritual dimension, and instead took the wholly naturalistic line that they were a religious ‘melancholy’, caused by a ‘distemperature of our bodies’, the ‘irregular motions of our animal spirits’. Indeed, Boyle’s religious mentors were finding him a bit exasperating with his incessant questioning. Hunter also points out that casuistry, the discipline that traditionally tried to establish principles for just these sorts of doubts, was soon to collapse.\textsuperscript{22}

I accept Hunter’s assessment of the historical situation, but I draw the conclusion that Boyle shows us, in his exaggerated scrupulosity, precisely the problem we are exploring. What we find in Boyle is the conflict within the scientific spirit itself. The drive towards natural enquiry encompasses the anxiety about the internal world. To Hunter’s statement that Boyle displayed ‘an acute concern about the irreligious threat posed by the predominant Aristotelian natural philosophy of the day, combined with the view that the best means to offset this was a recourse to experimental data’, I would add that Boyle suffered an acute concern about the doubt that erupted inside him, and strove relentlessly to quell his anxiety by investing it in the external world, by projecting it, in phantasy, in

\begin{footnotes}
22 Hunter, op. cit. (20), quotation from John Sharp on 92.
\end{footnotes}
the form of objects that would then bear the disturbed quality of his internal world. These objects could then be separated from objects that contained hopefulness, and disposed of; or they could be doubted as to their quality, or scrutinized and kept under watch, or restored into wholesome objects. It is a curious ambiguity that the words scruple, scrupulous and scrupulosity, which Boyle used repeatedly, still retained in the seventeenth century the meaning of one-twentieth of a grain and one minute of arc, that is, that this moral cautiousness referred also to units of measure, in line with scientific enquiry.

There is a parallel between Boyle and Leonardo. In Freud's analysis, Leonardo was driven to the investigation of nature as a way of mitigating intense sexual conflict, mainly through displacement from the original object of his desire and through identification with her. In my view, his identification with his mother supports the hunch that, in painting women as well as in describing nature, he was exploring his own internal world through his enquiry into the external world. Boyle's intense scrupulosity, doubt and temptation to swear seem also to promote a minute investigation of the external world as a displacement from his internal world. And in both cases, the external enquiry supplies resources for restoring the internal world. Boyle struggled more overtly with conscience than Leonardo did, and he revealed the drive to displace internal conflict into the external world more forcefully than did Leonardo. But both men show the need of an external world as a repository for phantasy, and as a resource for its modification.

In my view, we can make sense of Boyle and Leonardo, as personifications of the drive to enquire into nature, only with a concept of an internal world and, in particular, the internal agency that Freud called the super-ego. Boyle was deeply conflicted, and he seems to have led an austere life, always attending to, and overcoming, temptations and a proneness to guilt. He was a man driven by conscience, but that is too general a notion. The concept of the super-ego, supplemented by Klein's views on its primitive severity and its modification through the externalization and internalization of object relations, can throw light on the relentlessness and the penetration of conscience into every detail of his life. By super-ego, I am referring to an agency inside the psyche that traps the aggression of the ego and turns it back upon the ego, with the aim of protecting the primal love


24 It may have been that Leonardo's identification with his mother allowed him an erotic relationship with all objects of enquiry, freed of oedipal conflict. This would be consistent with his not feeling a father's restraint, not feeling deeply troubled by it; and it would represent a constellation of personality, whether or not Freud was right to say that his father was, as a material fact, absent during Leonardo's early childhood, and whether or not he was left alone with his mother. For the historical evidence on this point, see Collins, op. cit. (3). By contrast, Boyle seems to have been more tormented, more overtly experiencing conflict, not only in his scrupulosity but in his tendency to doubt, to swearing and to a general worry that he might have been doing wrong. Here is another constellation of personality. We could speculate that he did feel a father's restraint, that he was bound to his mother, but less by identification than by maintaining his relationship in a displaced form, perhaps through his sister; and that he feared his aggression, perhaps evidenced to him through his mother's death: his mother's death, in that he was her only child, though one of fourteen of his father's children. These contrasts in personality might illuminate styles of natural enquiry within the general territory in which natural enquiry is driven by the need to externalize an internal world dominated by phantasy, and to re-internalize that world in a mitigated form. I am proposing that this need, which was congealed into a cultural form, is a modern phenomenon. Our psychobiographies will always lack the essential feature of psychoanalytic enquiry – the transference – but will reveal psychoanalytically informed cultural patterns, such as the modern drive to investigate nature.
objects. It is cruel, therefore, in proportion to the cruelty of the ego, not to that of external figures such as parents. And because it is inside the psyche, it reacts not to deeds but to motives, to every minute detail of the unconscious. That is why, paradoxically, someone striving to be good only suffers more persecution by the super-ego: the attention to atonement only keeps the punishable motive before the super-ego.

The dynamics of the super-ego in relation to the ego must be distinguished from any notion of social anxiety, from any notion of appearing worthy in the eyes of one's fellows and of fearing their judgement. As Klein pointed out, the super-ego is at its most ferocious intensity in the child, whose aggressiveness has not yet been channelled and who is most under the sway of phantasy. From this point of view, Boyle's good works, of which there were countless – both in charity and in the whole orientation of his researches, for example, into medicines – could, paradoxically and without any visible justification, have spurred his super-ego on to greater severity, and driven his defensive search for ultimate moral rectitude and severity in his own life on to greater efforts. That is why his search for the truth – in the Bible, in nature, in everyday life – intensified his guilt. His aggressive surveillance of these objects was reflected back from his super-ego.

Boyle's relentless investigations are of a piece with his corpuscularian philosophy, which he used to demonstrate a Divine influence upon natural phenomena, as part of his case against irreligion. The extensiveness of his investigations suggest the need for a connectedness among natural phenomena, so that gaps would not appear through which doubt could again emerge. If all phenomena were connected without gaps, then disbelief could not erupt. One possibility is this: that Boyle found in corpuscularianism a place for a good internal object – a super-ego – that guided him from the inside, as the invisible principles and actions of corpuscles guided observable phenomena. In this view, he repudiated Aristotelian natural philosophy as part of a world-view that not only did not conform to his experimental researches, but that also tempted him to eliminate the invisible dimension in which dwelled the source of both the phenomenal world of experience and the internal good authority that guided his behaviour.

In one of his classic cases of obsessional neurosis, Freud referred to the patient's use of formulae to condense longer statements into which impious thoughts might have intruded. The corpuscularian philosophy supported a similar view, in that the vast array of bodies, their qualities and their phenomena could arise from the huge variety of sizes, configurations and movements of the minute corpuscles. There need have been no intervening forces, nothing to erupt from between the corpuscles. The systematic and comprehensive overview of nature, all based on the diversity of corpuscles, became an

26 Klein, op. cit. (10).
27 Freud considered the paradoxical idea that the more conscience was assuaged by good efforts, the more severe it became, to be a unique psychoanalytic contribution to human understanding, Freud, op. cit. (13), 321. It derives from the concept of the super-ego, so to the extent that the super-ego is a feature of modern Western society, this problem of conscience is also a feature of a society in which the formation of a super-ego constitutes the main mode of controlling aggression and promoting social life. I see Boyle as a personification and a carrier of this modern cultural form, and modern science, partly in its relationship with magic and religion, to be the core cultural expression of it.
externalized version of the need to fill the mind without gaps through which doubt or blasphemy could erupt.

What was this doubt and blasphemy, but an attempt either to avoid or to condemn an overly severe super-ego. Further, the systematic enquiry attempted both to show good motives, to be beyond reproach, and also to bind the severe super-ego into an orderly system, and eliminate its arbitrary harshness. Since the external world, which was under investigation, contained the externalized internal world, which was laden with conflict, phantasy and erratic swings of thought and feeling, to have brought order into it would also have been to order the internal world. To have treated it well and to have improved it was also to have restored the internal world from the damage caused by internal conflict – what Klein called the depressive position. Indeed, the use of the external world in order to observe and restore the internal world would have acted as a constant pressure towards investigation:

In the process of acquiring knowledge, every new piece of experience has to be fitted into the patterns provided by the psychic reality which prevails at the time; whilst the psychic reality of the child is gradually influenced by every step in his progressive knowledge of external reality. Every such step goes along with his more and more firmly establishing his inner ‘good’ objects, and is used by the ego as a means of overcoming the depressive position.

Boyle exemplifies this process, whereby inner conflicts drive naturalistic enquiry. I am not, however, psychoanalysing Boyle. As in Freud’s analysis of Leonardo, I know what I am trying to explain; I am looking for psychoanalytically intelligible connections between his science and his religiosity. The subtleties by which Boyle worked with his conscience and, in Klein’s terminology, worked through his depressive anxieties, remain unknown outside the transference. I am using Boyle to draw out an aspect of scientific naturalism: an inherent dilemma whereby the more scientific our culture becomes, the more magical it also becomes. The more scientific culture attempts to extrude the unconscious from its naturalistic discourse and attitude, the more it returns in extreme forms.

One conclusion we can draw is that as scientific enquiry is increasingly used to try to liberate oneself from an experienced tyranny of, or dependence upon, internal objects, so that quest for mastery generates a further fear of those objects. We can ask of Boyle, and of the culture he represented, to what extent did enquiry aim at the benign cycle of externalization and internalization, in the service of establishing a good object, as described above; and to what extent did it seek mastery over internal objects, setting off a relentless need for more mastery.

I am treating Boyle as an epitome of a new culture of scientific naturalism. His struggles with his conscience express the tension in such a culture. What seems to drive the intense need to experiment with and to describe natural phenomena is the need to monitor and manage an invisible world, in which the most powerful and primitive phantasies continually irrupt. What is modern is the experience of an internal world, a territory outside observation and the ordinary means of management through action. The cycles of externalization and internalization are driven by the need to manage this internal world as if by the tools of the external world; continually to place under observation and mastery

29 Hinshelwood, op. cit. (6), 138–55.
an internal object with its associated unconscious phantasies, then to reintegrate that modified object into the internal world.

Boyle sought to mitigate anxiety through relentless natural enquiry and through a theory of natural phenomena which gave a place to both human and Divine intelligence, and which prevented blasphemy. Since we are concerned with the emergence of modern science, we need to remember the question of whether the profile of defences which we find in Boyle are peculiarly modern. Briefly, is conscience modern; or, in psychoanalytic terms, is the super-ego modern?

I have argued that such a view implies that an internal world, withdrawn from observation, laden with phantasies and an accompanying fear of being seen ‘on the inside’, in one’s secret intentions, is modern. The warding-off of excruciating internal observation, pushing this internal world into the external world, to enquire relentlessly into its nature, to transform it, make it better, but also to control it, would also be modern. We know that scientific naturalism is modern, but do we know that it is paralleled by internal enquiry in the way I have suggested? Do we know that this feature of the psyche is not only modern but has contributed to the naturalistic bent of Western culture in the modern period?

From a psychoanalytic point of view, the concept of a super-ego highlights certain features of a society that supports scientific naturalism, especially the sharpening of conflict with magic, the relentless quality of enquiry, the whirlpool of progress, the sense that good works do not adequately justify scientific and technological achievements, and, generally, that there are no bounds to a science that is profound and a resource of both salvation and destruction. Boyle seems to personify the coming into being of these distinctively modern currents. He had to manage the conflicts among them in himself, since the social formations that could mitigate their intensity, such as scientific societies and a secularized culture, did not exist. That makes him a good choice for a psychoanalytic enquiry into the foundations of science.