BALANCING NEWTON’S MIND: HIS SINGULAR BEHAVIOUR AND HIS MADNESS OF 1692–93

by

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Newton grew up with a vulnerable and eccentric character besides having a low self-esteem, and he was someone who only uncommonly developed any close relationships. On review it is argued that his distrust and suspicions of others, and the fear that he might be harmed by criticism and his discoveries stolen, followed from his mother’s separation from him in childhood and not, as has been claimed, from the developmental disorder of Asperger’s syndrome. It is further firmly argued that his ‘madness’ of 1692 and 1693 was due to mercury poisoning from his alchemical experiments and not to clinical depression.

Keywords: Isaac Newton; Asperger’s syndrome; child rejection; mercury poisoning

In writing historical biography there can be an argumentative disadvantage in discussing a diagnosis not based on adequate medical grounds. In 1822 the French mathematical physicist Jean-Baptiste Biot (1774–1862), writing for the *Biographie universelle*,1 was the first to point out Isaac Newton’s period of dérangement d’esprit when he alleged that Newton had fallen into a frénésie—that is, he was insane—in 1692, adding that his intellect had been permanently weakened as a result. The want of Newton’s ‘usual consistency of mind’ in 1692 and 1693 led to lasting speculation, particularly in the nineteenth century.2 Information about the ‘madness’ comes almost entirely from a small number of letters published in volumes III (1961) and IV (1967) of *The correspondence of Isaac Newton*3 besides its mention in the journal of Christiaan Huygens FRS (1629–95), 4 the knowledge of which somehow reached Biot in Paris from Leiden.5 Its possible diagnostic cause has given rise to medical disagreement, which I discussed in a paper on Newton’s personality in *Notes and Records*6 in 1995, part of which I shall repeat here.

In the past 10 years it has been firmly claimed7,8 that Newton must have shown the developmental disorder of Asperger’s syndrome, a disorder that has also been posthumously assigned to Michelangelo (1475–1564),9 Henry Cavendish FRS (1731–1810),8 Albert Einstein ForMemRS (1879–1955),7,8 Marie Curie ForMemRS (1867–1934),8 Ludwig Wittgenstein (1889–1951)10 and Paul Dirac FRS (1902–84).8,9 The speculation on the ‘oddity’ of Newton’s behaviour will be considered before discussing his ‘disturbance of mind’ of 1692–93. Other than for this period of mental trouble, Newton was seldom ill until

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the last five years before his death at the age of 84 years in 1727. It was a rare event that was mentioned in a letter dated 10 May 1689, in which he deplored being ‘confined to my Chamber by a cold & bastard Pleurisy’ for five days.\textsuperscript{11}

The first published biography of Newton was that done for the Académie Royale des Sciences in 1727 by Bernard de Fontenelle FRS (1657–1757)\textsuperscript{12} with the personal details obtained from John Conduitt FRS (1688–1737), who was married to Newton’s half-niece, Catherine Barton (1679–1740), and through Conduitt from the antiquarian William Stukeley FRS (1687–1765). Conduitt gathered further accounts from others, which with his own papers remained unpublished until 2006, as did Stukeley’s complete memoir of 1752.\textsuperscript{13} Eighteenth-century biographies of Newton mainly used Fontenelle’s \textit{Éloge} to give him an untarnished image, whereas in the nineteenth century only uncommon and selected use was made of the Conduitt papers, which became, however, more easily available after the Portsmouth family sale in 1936. As John Maynard Keynes (1883–1946) observed after poring over the Conduitt papers, which he later bequeathed to King’s College, Cambridge:

\begin{quote}
his [Newton’s] deepest instincts were occult, esoteric, semantic—with profound shrinking from the world, a paralysing fear of exposing his thoughts, his beliefs, his discoveries in all nakedness to the inspection and criticism of the world.\textsuperscript{14}
\end{quote}

Sir David Brewster FRS (1781–1868),\textsuperscript{15} during the first half of Victoria’s reign, assumed that moral perfection had to accompany intellectual genius. He obscured unpleasant aspects of Newton’s character and suppressed such incidents as his contemptuous treatment of Robert Hooke FRS (1635–1703), the appropriation of the astronomical observations of John Flamsteed FRS (1646–1719), and also how he had repeatedly lied about questions concerned with the discovery of calculus, something that had originated from his reluctance to publish about it in his protracted dispute over the issue with Gottfried Wilhelm Leibniz FRS (1646–1716), who replied in kind.\textsuperscript{16}

Frank E. Manuel (1910–2003),\textsuperscript{17} in \textit{A portrait of Isaac Newton} in 1968, wrote from a psychoanalytical point of view what Richard S. Westfall (1924–96)\textsuperscript{18} in his biography \textit{Never at rest} in 1980 was rather resistant to and found he could not confirm; nevertheless, both emphasized Newton’s difficulty in having relations with others except on a basis of hostility or domination, and remarked on his almost total lack of generosity toward intellectual peers. However, he could support young intellectuals who did not challenge his superiority, and later in life, when he had become wealthy, he obtained a reputation for being a charitable man, particularly to members of his family, but also to unfortunates as though by doing so he hoped to compensate for his own shortcomings. In his boyhood his aggressiveness and disobedience must have made him insufferable.

With his heretical theological opinions—he was an Arian who thought that worshipping Christ as God was idolatry—and as a bachelor don, Newton was isolated in the many years he was resident in Trinity College, a solitary man with few friends.\textsuperscript{19} These were years when he would work not for personal advantage but in the ceaseless pursuit of truth. While drawing an income from Cambridge University he converted his chair into a sinecure without performing any duties during the final 15 years of his tenure. In more than 30 years as a Fellow of Trinity he tutored only three students, none of whom proceeded as far as a bachelor’s degree.

He has usually been found to have been an unsmiling and humourless, puritanical man with a countenance that was ‘ordinarily melancholy and thoughtfull’, but which, as Henry More FRS (1614–87) described during a discussion about biblical prophecy, could sometimes
become ‘mighty lightsome and chearfull, and in a maner transported.’20 He was suspicious of the poetic and the imaginative—he once described poetry (which he disliked) as ‘a kind of ingenious nonsense’21—and never diverted himself with music and art.22

It is from such reflections that Newton particularly received the reputation of being an unpleasant and unlikable man from the late 1830s despite Humphrey Newton, his amanuensis for five years, writing soon after his death that he had found ‘his Countenance mild, pleasant & Comely’ and noted he was a man whose ‘carriage then was very meek, sedate & humble, never seemingly angry, of profound Thoughts … of sedate & even Temper … his behaviour was mild & meek, without Anger, Peevishness or Passion’.23

Stukeley wrote of him in his Memoir:

according to my own observation, tho’. S’t. Isaac was of a very serious, & compos’d frame of mind yet I have often seen him laugh, & that upon moderate occasions. he had in his disposition, a natural pleasantness of temper, & much good nature, very distant from moroseness, attended neither with gayety nor levity. he usd a good many [shrewd] sayings, bordering on joke, & wit. in company he behavd very agreably; courteous, affable, he was easily made to smile, if not to laugh.24

NEWTON’S SINGULAR BEHAVIOUR

It was John Langdon Down (1828–96), physician to the (Royal) London Hospital and the first to recognize the variety of mental deficiency in infants that he called mongolism (now known as Down’s syndrome) in 1866,25 who seems also to have been the first to have described ‘Asperger’s syndrome’ in his book On Some of the Mental Affections of Childhood and Youth26 in 1887. In 1944, the Austrian Hans Asperger (1906–80) published his postgraduate thesis, ‘Die “Autistischen Psychopathen” im Kindesalter’ (‘“Autistic psychopathy” in childhood’),27 on a developmental disorder that he was convinced was determined by genetic factors. There was a diagnostic confusion in using the word autistic in the title—it was not until 1980 that the childhood abnormality of autism, identified by impaired language and social communication together with the presence of stereotyped and repetitive behaviour, became recognized as a valid diagnosis.

In 1981, Lorna Wing reviewed Asperger’s work and proposed the label ‘Asperger’s syndrome’ in broadening Asperger’s original concept while at the same time modifying the clinical criteria defining it.28 At least seven further modifications in its diagnostic characterization followed in the next 20 years, but these entailed major diagnostic discrepancies and difficulty in comparing research findings. Some definitions of the syndrome are conceptually close to autism, whereas others emphasize areas of difference.29 Retrospective diagnosis in adults may be particularly insecure in the absence of sufficient knowledge of childhood and adolescent behaviour.

The clinical features of Asperger’s syndrome are (i) social impairment shown by poor nonverbal communication, poor empathy and failure to develop friendship, (ii) lack of interest in communication with others, and (iii) an all-absorbing dominant interest and strong adherence to routine. Individuals with Asperger’s syndrome are typically of normal or above-average intelligence and often show marked motor clumsiness. For success in science or art, Asperger later considered that a dash of autism was essential, and many with the syndrome are especially good at mathematics. They do not understand the subtleties of normal social interaction in having little insight into others as well as into themselves, and give offence or alienation as a result of their uninhibited and direct ways. They cannot deal effectively with
the social world because they are not motivated by social relationship and do not worry about being liked. They do not like being picked on but may learn to avoid trouble by staying silent. They have no small talk along with their unusually narrow interests, on which they are intensely preoccupied and tend to fixate to the exclusion of anything else. They may show obsessional behaviour and experience clinical levels of depression, sometimes from feelings of failure.\(^{29}\)

Simon Baron-Cohen\(^{30}\) bases his diagnosis of Newton as having had Asperger’s syndrome from his social difficulties on an unattributed quotation (actually from Humphrey Newton):

> He always kept Close to his Studyes, very rarely went a visiting, & had as few Visitors, [here the quotation omits the words that followed: ‘excepting 2 or 3 Persons… in whose Company he took much Delight and Pleasure at an Evening.’] I never knew him take any Recreation or Pastime, either in Riding out to take y⁶ Air, Walking, bowling, or any other Exercise whatever, Thinking all Hours lost, y⁶ was not spent in his Studyes… \(^{31}\)

Ioan James\(^{32}\) quotes Stukeley who reported that

> Sf. Is. was always, a sober, silent, thinking lad & never was known scarce to play with the boys abroad at their silly amusements, but w⁴ rather chuse to be at home…. \(^{33}\)

though Stukeley later wrote:

> one reason why Sf. Isaac did not play much with his schoolfellows, was, that generally, they were not very affectionate toward him. he was commonly too cunning for them in everything. they were sensible, that he had more ingenuity than they. \(^{34}\)

James continued how Newton was a man of few words, rarely initiated a subject in conversation, was highly sensitive to criticism and involved in constant quarrels and altercations, seemed to his rivals at times disingenuous, unjust and cruel, and also how he could dress badly (something common in Asperger’s syndrome) in his years at Trinity College and ‘would go [dine in Hall] very carelessly, w⁶h shoes down at Heels, stockins unty’d, surplice on, & his Head scarcely comb’d’. \(^{35}\)

These, with the addition of the observation that Newton had strong obsessions, build up an argument for Asperger’s syndrome. They are, however, not specific and can perhaps be explained equally well by another condition for which there is evidence, that of child rejection. Against a diagnosis of Asperger’s syndrome must be the variety of Newton’s interests, and his manual dexterity with his masterful technical ability would argue against clumsiness. Stukeley wrote, ‘The lad was not only very expert with his mechanical tools, but he was equally so with his pen’, and how the whole wall of his lodging room in Grantham was crowded with drawings of ‘birds, beasts, men, ships & mathematical schemes. & very well designed’. \(^{36}\) As well as his ‘uncommon skill & industry in mechanical works’ \(^{37}\) in his boyhood and his alchemy experiments, there are his telescopes and optical experiments that made him a most accomplished experimentalist.

Against Asperger’s syndrome it is unlikely that Newton could have lacked the needful subtleties of insight insinuated in this assessment of him by J. M. Keynes:

> he possessed in exceptional degree almost every kind of intellectual aptitude—lawyer, historian, theologian, not less than mathematician, physicist, astronomer. … he became one of the greatest and most efficient of our civil servants. He was a very successful investor of funds, surmounting the crisis of the South Sea Bubble, and died a rich man. \(^{38}\)

He was a highly responsible civil servant at the Royal Mint as well as an able manager of the Royal Society. The presidents before him had accepted the prestige; however, during the decade before he was elected, the president had presided at only one meeting. Newton
attended all the meetings of the Council, oversaw its financial affairs, and looked to the content of the meetings.

He seems to have been conscious of his own intellectual superiority from an early age: he obviously possessed exceptional powers of reasoning, intuition, observation and logic, as well as having the necessary psychic energy with which to employ them. He clearly recognized the originality and value of his work so jealously guarded, but did not keep his discoveries locked up for ever. Although he disliked the prospect of criticism and was an oversensitive man, his reclusive tendencies were overcome by his sense of public obligation.

It is difficult to believe that Newton’s peculiar childhood did not play a major part in shaping his personality. His father had died three months before his birth, and, besides being a tiny baby and puny child—something that may alone give emotional problems—and having no father, he was deserted at the age of three years by his mother when she married the local widower, the Rev. Barnabas Smith (1582–1653). His feelings towards his mother, Hannah (d. 1679), were ambivalent after her abandonment of him to live with his unwanted stepfather who had separated him so completely from her for more than seven years. This remained long in his memory, for, when at Trinity in his twentieth year, in a confession written in shorthand in a notebook now in the Fitzwilliam Museum he recorded against sin number 13, ‘Threatning my father and mother Smith to burne them and the house over them’; against sin number 14 his entry of ‘Wishing death and hoping it to some’ was rather more obscure in its meaning. His mother also discouraged his intellectual interests and also his entrance to Cambridge University, which was consequently delayed for a year or two later than was usual at that time.

John Bowlby (1907–90) in his book A secure base distinguished three principal patterns of attachment between a mother and her child. The first one he called ‘a secure attachment’, the second ‘an anxious resistant attachment’ and the third ‘an anxious avoidant attachment’, in which a boy has no confidence that, when he seeks care and attention, he will be responded to helpfully but, on the contrary, expects to be rebuffed. This attachment disorder may lead to a variety of disruptions in interpersonal and social relationships of very different degrees of severity. When severe, as it seems to have been with Newton, such an individual may compulsively attempt to live without the love and support of others, and essays to become emotionally self-sufficient. This can lead to a lack of trust in others and a weakening of the expression of emotion. Newton was poor at human relationship such as the expression of gratitude, and had little capacity for enjoyment. He scarcely used the word ‘love’ except in his theological manuscripts, and expressions of gladness and of desire were rare.

The psychiatrist Anthony Storr (1920–2001) found that the sudden severance of the tie with an only parent at an age before it can be reasonably understood can make good self-esteem difficult to achieve. Self-esteem concerns the self-evaluation of one’s own abilities and depends on the sense of value derived from being loved. The withdrawal of love results in a child’s doubting his or her own worth and having feelings of guilt: in his youth Newton did wonder whether he would be fit for anything, and later he might show a modesty that implied a low self-esteem. John Conduitt thought that ‘an innate modesty & simplicity shewed it self in all his actions & expressions’ and Humphrey Newton, as already noted, that ‘his carriage was very meek, sedate & humble’. Conduitt also claimed that ‘he had the ornament of a quiet & meek spirit’.

Storr believed that the part of Newton’s achievement that could be attributed to ambition came from his need to obtain self-esteem in other ways than by gaining the affection (liking) of his fellows, and that his scientific attainment was thus connected with his personality and
his apparent need to succeed.48 Newton grew up with a vulnerable and eccentric character on
top of an extreme puritanism, and was someone with an inability to express emotion who only
uncommonly developed any close personal relationships. It can be well argued that his
distrust and suspicions of others and the fear that he might be harmed by criticism and his
discoveries stolen were derived from his maternal deprivation.

Newton’s evocation of himself, late in life, as a boy on the seashore playing with shells
may be cited to illustrate his humility before the great ocean of Truth and, indeed, of his low
self-esteem.49 Correspondingly, the remark that he made in a letter50 of 5 February 1675/6 to
Robert Hooke, ‘If I have seen further it is by standing on ye sholders of Giants’—which seems
not to have been original but a quotation first derived from Bernard of Chartres, who died in
about 1130—may not have been written, as so commonly assumed, from false humility. As
Manuel concluded in his book, ‘his injured self-esteem could never be repaired....[but] demanded a continual bolstering through the elimination of any threat to his tenuous
security’.51 Similarly, the childish doubt of what he would be fit for as an adult meant he
needed a freedom from fear, suspicion, anxiety and mistrust. His mother’s betrayal had
produced the threat to his self-esteem that was removed neither by the accolade of knighthood
nor the presidency of the Royal Society nor adoration and world renown. The retrospective
speculation that Asperger’s syndrome is an explanation of Newton’s odd behaviour and
personality must surely fade when the foregoing counter-argument is considered.

**NEWTON’S DistURBANCE OF MIND IN 1692–93 FROM PoISONING BY MERCURY**

The knowledge of Newton’s mental illness in 1692 and 1693 comes mainly, as already
mentioned, from letters published in the Royal Society’s edition of *The correspondence of Isaac Newton.*52 The illness, said by Huygens53 to have lasted for 18 months, was described
in two papers in *Notes and Records*54 in 1979, and earlier by Manuel, who gave as a summary:

> He broke with his friends, crawled into a corner, accused his intimates of plotting against
> him, and reported conversations that never took place.55

From the letters, Newton’s main symptoms were melancholia, or depression, with a desire
to withdraw from contact with even good friends, apathy, insomnia, loss of appetite, a period
of persecution when he suffered the delusion that his friends were turning against him, and
possible loss of memory and amnesia. The limited amount of evidence from the letters is
inevitably patchy, particularly during an illness in which the writing of letters became
unusually irksome and correspondence was rarely initiated, and give little indication for how
long the symptoms lasted.

Brewster argued that the want of Newton’s ‘usual consistency of mind arose ... from want
of sleep and appetite during the preceding year’,56 and others have thought that it followed
from overwork, the crisis in his friendship with Nicolas Fatio de Duillier (1664–1753),
the burden of being a secret heretic, or the failure to capitalize on his own self-worth to
procure a top position in London, besides Simon Schaffer’s belief that the ‘madness’ was due
to exhaustion.57

Manuel58 found that Newton sank into delusion only once (in a letter to Pepys on 13
September 1693), but others in referring to his delusions have diagnosed a late-onset
psychosis.59 The argument is, however, whether Newton’s *dérangement* at the age of 50 years
was, as Storr60 believed, primarily a mid-life depression with secondary paranoid ideas in
which he had to come to terms with the fact that his great days of inventiveness were over, or was due to mercurial poisoning. Storr noted that insomnia, loss of memory, and delusions do occur in mercury poisoning, but argued against it in the absence of tremor and loss of teeth and because he found that the symptoms subsided too quickly for that diagnosis to be likely, even though we do not know for how long Newton showed symptoms.

Newton first took an interest in alchemy in 1669 when he bought the six volumes of *Theatrum Chemicum* and made purchases of two furnaces, chymical glasses and various chymicals. His library at his death contained 170 books on alchemy among the 538 on science. There are extensive records among his manuscripts of his alchemical experiments, but these manuscripts are limited to two periods, from 1678 to 1688 and from 1692 to 1696: the first experiment recorded was on 10 December 1678 and the last in February 1696, and during those 18 years he performed several hundred experiments. The materials used included sulphur, ‘sal armoniack’ (ammonium chloride), salt of tartar (potassium carbonate), sublimate of mercury (mercuric chloride), white lead (lead oxide), spirit of wine (ethanol), aqua fortis (nitric acid) and sulphuric acid, and antimony, silver, gold, mercury, iron, tin, bismuth, lead, ‘arsnick’ and copper as well as some of their ores.

Newton’s ‘elaboratory’, which is shown in the 1688 print of Trinity College by David Loggan (1635–1700), was placed at the side of the Chapel in his garden facing Trinity Street. It is depicted as a wooden shed with a window but no chimney despite containing two furnaces. Humphrey Newton wrote of its use by Newton in the 1680s:

> … especiaily at spring & ffall of ye Leaf, at wch. Times he us’d to imploy about 6 weeks in his Elaboratory, the ffire scarcely going out either Night or Day, he siting up one Night, as I did another till he had finished his Chymical Experiments … ye Crucibles … in wch he fused his Metals. … The transmuting of Metals, being his Chief Design …

and Newton in a letter to John Locke on 15 October 1693 wrote:

> The last winter by sleeping too often by my fire I got an ill habit of sleeping & a distemper this summer has been epidemical put me further out of order, so that when I wrote to you I had not slept an hour a night for a fortnight together & for 5 nights together not a wink.

Newton conducted alchemical experiments in December 1692 and January 1693, and a recurrent theme of the experiments, mostly done in open vessels, was the heating of metals to convert them into a volatile form. Some of the procedures extended over long hours and even days, and Newton must have risked exposing himself to cumulative mercury poisoning, whether from inhalation of the fumes, or by direct ingestion through the skin from handling, or from ‘quick-silver’d surfaces’. Sometimes, it could be by tasting—on 108 separate occasions he recorded that he tasted materials. The chance of absorbing toxic substances from the heating of metals and their ores or compounds in open vessels must have been great. There is nothing to suggest that any of the self-administered medicines he swallowed contained mercury or mercurial salts such as ‘grey powder’.

Chronic mercurialism may produce neurological, psychiatric, oral and renal effects from the intoxication. The changes are reversible because, if the exposure stops, the mercury continues to be excreted in the urine, and the blood level falls to normal. The raised levels in hair and nails may persist for years after the poisoning has ceased, as the high body stores of mercury in the liver and bones deplete only gradually. The manifestations of mercury toxicity depend on the kind of mercury and on whether the exposure is acute or chronic, and they do not invariably occur.
Metallic mercury is most poisonous as vapour, and particularly gives inflammation of the mouth and gums, loss of teeth, salivation and tremor, none of which Newton seems to have experienced—he was said not to have lost more than one tooth to the day of his death. The salts give the more chronic effects, such as the neurological ones of weakness, pains in the limbs and the ‘shakes’. The ‘madness’ of chronic mercury poisoning, or erethism, is characterized by diffidence, increasing shyness, loss of self-confidence, anxiety, and a desire to remain unobserved and unobtrusive. It may produce excitability, outbursts of temper, depression, insomnia, and, sometimes, hallucinations, delusions and mania. Chronic lead poisoning may give irritability, insomnia and depression with loss of appetite, loss of concentration, and nervousness among its other symptoms.

In 1979, Spargo and Pounds analysed four samples of hair, reasonably thought to have been Newton’s and acceptably labelled in three, for gold, mercury, arsenic, antimony, silver and lead. High values were obtained for mercury in all the hairs, and for the assays of gold, arsenic, antimony and lead from three of the samples. From these findings it was concluded that Newton’s ‘nervous breakdown’ of 1692 and 1693 was due principally to poisoning by the metals, especially from mercury but additionally from lead, which he used so frequently in his alchemical experiments. Besides being based on physical measurement, the raised levels in the hairs of the metals other than mercury can be explained in Newton but less easily in others.

Ditchburn did not accept that these measurements provided evidence for or against the hypothesis that Newton’s illness was due to mercury or lead. He argued that Newton’s illness in the 1690s was unconnected with his chemical experiments, and that in those years he suffered from depressive illness, a disease that, although it may last for years, often ends in spontaneous recovery, without relapse. He reached this conclusion because depressive illness is immensely more common than mercurialism, because of the uncertainty of the measurements and because Newton did not have the physical symptoms of the poisoning.

Storr, as already mentioned, argued for depression as the diagnosis and was against mercury poisoning because of the absence of tremor and loss of teeth and a too-quick recovery, although agreeing that some of Newton’s symptoms might have been due to it. The absence of physical symptoms, which more commonly occur in acute mercury poisoning, is not a contraindication of chronic mercury poisoning. It cannot honestly be said that Newton’s recovery was too quick for him to have had mercurialism, for we do not know well enough the periods when he was mentally ill. Storr considered that, in the letter of 13 September 1693 to Pepys, Newton admits a psychotic episode preceded by anorexia and insomnia, for which he retained insight; that the period during which he accused his friends was succeeded by depression; that his paranoid ideas were secondary to depression; and that Newton’s normal mixture of traits was manifested in exaggerated form during his illness.

There is no evidence for any periods of clinical mental disturbance in the years before or after 1692/3, and the arguments in favour of mercurial poisoning explaining Newton’s illness of 1692 and 1693 have now been given. Anthony Storr made clinical depression the alternative diagnosis to mercurialism—manic depression has even been suggested, although unbelievably because there is no convincing evidence for mood swings—strengthened by the belief that Newton had a depressive personality. In this paper it has been argued that his psychiatric symptoms in the 1690s were due to erethism in an eccentric, paranoid man, and it is known that toxic substances may exacerbate quirks of personality.

The cumulative poisoning by mercury (and lead) would inevitably have varied in degree from period to period—he made no experiments in the years of his preoccupation with preparing the Principia for publication—and the symptoms would have disappeared...
with sufficient urinary excretion of the mercury but still leaving high levels in the hair for many years. However, the possibility must be recognized that Newton suffered from both mercury poisoning and depression, and that his psychiatric symptoms of the 1690s were not necessarily due entirely to one or the other but to both.

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NOTES

5 It seems likely that it was Hendrick van Swinden (1746–1823) who told J.-B. Biot from Leiden of the mention of Newton’s illness in the Huygens journal.
13 Iliffe et al., op. cit. (note 2), vol. 1 (Eighteenth-century biography of Isaac Newton), which includes B. de Fontenelle, op. cit. (note 12), pp. 109–121.


Manuel, op. cit. (note 17), p. 77.


James, op. cit. (note 8).


Stukeley, op. cit. (note 33), p. 75.


Keynes, op. cit. (note 14), p. 32–33.

Manuel, op. cit. (note 17).


It is now suggested that the reason for making the list of 49 sins headed ‘Before Whitsunday 1662’, followed by nine more ‘Since Whitsunday 1662’, was that Newton was being prepared for confirmation of the vows taken on his behalf when baptized a week after birth on 1 January 1643. The Puritans recognized only two sacraments—Baptism and Holy Communion—but not, as episcopacy was unacceptable, Confirmation, which implied the laying on of hands by a bishop and could be practised only surreptitiously during the interregnum. In 1660 at the Restoration, it was resumed, although not wholly consistently, until the revision of the Book of Common Prayer in 1662 by John Pearson (1613–86), Master of Trinity College and Lady Margaret Professor of Divinity 1662–72, who as catechist would have required of his confirmands assurance that they recognized their sinful transgressions but not confessions as this would have smacked of popery. Newton matriculated on 8 July 1661 and so was in his first year at Cambridge at Whitsun 1662 which was a time of year, seven weeks after Easter, when Confirmation services commonly take place. There are no records of confirmations in Trinity or at Ely close to Whitsun 1662.

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48 Storr, op. cit. (note 44).
49 Turnor, op. cit. (note 21); Joseph Spence, Anecdotes, Observations, and Characters, of Books and Men, collected from the conversation of Mr Pope, and other eminent persons of his time (ed. Samuel Singer) (London, 1820), p. 362.
52 Newton, op. cit. (note 3).
57 S. Schaffer, Newton, the dark heretic, BBC2 TV, 1 March 2003; R. Iliffe, Newton: a very short introduction (Oxford University Press, 2007).
60 Storr, op. cit. (note 44).
61 Storr, op. cit. (note 44).
64 Westfall, op. cit. (note 16).
65 Newton, op. cit. (note 23), vol. 1, pp. 134–136. A letter from Nicholas Wickins to Robert Smith (1689–1768) at Trinity College, Cambridge, op. cit. (note 13), vol. 1, pp. 131–133, about Newton’s friendship with his father John Wickins (1644–1719) may additionally be quoted: ‘He was turning Grey, I think, at Thirty, and when my Father observed to him as ye Effect of his deep attention of Mind; He would jest wth ye Experiments he made so often wth Quick Silver [mercury] as if from thence he took so soon the Colour:’.
66 Spargo and Pounds, op. cit. (note 54). A letter by M. T. P. Gilbert, A. S. Wilson, M. Bunce et al. (‘Supplemental data: ancient mitochondrial DNA from hair’, Curr. Biol. 14, R463-R464 (2004)) described the examination of six hair samples claimed to have been Newton’s and obtained from Woolsthorpe Manor, Cullum Collection, the Royal Society and the American Philosophical Society, with two from the Earl of Portsmouth, and found that at least three of them did not originate from Newton. Of the four samples analysed in Spargo and Pounds’ study, two were from the same two locks of hair belonging to the Earl of Portsmouth but the other two were from the Library of Trinity College, Cambridge. This more recent study does not negate the findings of 1979.
67 Turnor, op. cit. (note 21).

69 Spargo and Pounds, *op. cit.* (note 54).


71 Storr, *op. cit.* (note 44).

72 P. Bidstrup, *op. cit.* (note 68); Browning, *op. cit.* (note 68).