1. "The Hunting of the Greene Lyon"

Introduction

In the late 1670's or early 1680's, a Fellow of Trinity College, Cambridge, made extensive abstracts from an alchemical poem entitled "The Hunting of the Greene Lyon." At the end of his abstract he made some notes.

> The ↗ script ↙ conteins ye Regimen of ye work in common gold after ye ~~Phos~~ ☿ is made. Jn ye following notes you have the consent of it with other authors & elucidation thereby.[1]

The "work" referred to was the Great Work of alchemy and the man writing was Isaac Newton. How he came to be engaged in that peculiar activity has been the subject of considerable wonder and no little controversy. It is the purpose of the present work to attempt a relief of both wonder and controversy by establishing the historical context and foundations of Newton's alchemy.

Although alchemy is now considered a delusion, a mystical pursuit, or at best a pseudo-science, that was not always necessarily the case. In the seventeenth century quite different attitudes towards it were possible. In this study, after a brief biographical sketch of Newton's life and achievements, an historiographical survey of writings on Newton's alchemy, and a preliminary examination of his alchemical papers, some of the larger questions concerning alchemy in general will be undertaken. In succeeding chapters alchemy will be discussed from the viewpoint of analytical psychology, and a survey of its little-understood developments in the seventeenth century will be made.

With something of the broad currents of seventeenth-century alchemy in hand and with some background information on the flood of alchemical literature of the period, it will then be possible to turn to events in Cambridge as Newton came upon them and to approach the questions involved in the more immediate historical context of his work. It is hoped that a glimpse of that concrete setting Newton encountered in Cambridge will make his alchemical studies seem not only reasonable and natural but indeed almost inevitable.

Then Newton's own earliest alchemical studies and experiments will be considered. It will be seen that Newton attacked alchemical questions

[1] King's College, Cambridge, Keynes MS 20, f. 5r, hereinafter referred to as Keynes MS 20. Techniques utilized in the dating of the Newtonian manuscripts used in this study are discussed in Appendix D. For an explanation of transcription notation on manuscript materials and of alchemical symbols used, see the Preface.

with quite definite chemical processes, working within a fairly widespread alchemical tradition of the period. In the event, Newton achieved some alchemical success, preparing a "philosophical mercury" which he took to be preliminary to "ye Regimen of ye work in common gold."

That success, about 1675 or perhaps a little after, colored a great many of his later scientific ideas. Although it is beyond the scope of the present study to attempt a detailed analysis of Newton's alchemical studies after 1675, some places in his later scientific writings in which alchemical ideas are reflected will be indicated.

Biographical sketch

Isaac Newton was born on Christmas Day, 1642, the premature, posthumous, and only child of an illiterate yeoman farmer of Lincolnshire.[2] Not really expected at first to live – he was later to remark that at his birth he was so small that he might have been put into a quart mug – he survived war, revolution, plague, and the seventeenth-century pharmacopoeia to the age of eighty-four, to be buried in Westminster Abbey, idolized by his countrymen and admired by the world.

His genius appeared more mechanical than intellectual at first: as a boy he constructed water clocks, windmills, kites, and sundials, and cleverly used the force of the wind to enable himself to outjump the other boys. But nurtured by neighboring village schools and the King's School at Grantham his intellectual prowess and his enormous power of concentration slowly became apparent. Recalled from school by his mother to learn the art of farming, he spent his time under the hedges with his books and his calculations, to the utter neglect of the life of his ancestors. Eventually a maternal uncle, a Cambridge man himself, intervened to have him returned to the school at Grantham to be prepared for Cambridge, and Isaac went up to that venerable seat of learning in 1661, entering Trinity College. He was aged eighteen, a little older than most entering students and probably less well prepared than many, but evidently with all his faculties ready to flower. Stimulated by the new Cartesian ferment in physics, philosophy, and mathematics, by Kepler's optics and laws of planetary motion, by Galileo's mechanics, and by the work in mathematics and optics of his own teacher Isaac Barrow, the young Newton

[2] Lesser biographies of Newton are legion; a number are noted in the Bibliography. The three fullest and most serious biographical studies of Newton in English are: (1) David Brewster, *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton* (2 vols.; Edinburgh: Thomas Constable and Co.; Boston: Little, Brown, and Co., 1855), hereinafter referred to as Brewster, *Memoirs*; (2) Louis Trenchard More, *Isaac Newton. A Biography* (London: Constable and Co.; 1934; New York: Charles Scribner's Sons, 1934; New York: Dover Publications, 1962), hereinafter referred to as More, *Newton*; (3) Frank E. Manuel, *A Portrait of Isaac Newton* (Cambridge, Mass.: The Belknap Press of Harvard University Press, 1968), hereinafter referred to as Manuel, *Portrait*. The following sketch is indebted to all but especially to More, *Newton*.

was soon to tackle – and solve – many of the physical and mathematical questions which engaged his contemporaries. And through all his subsequent work the niceness of his mechanical aptitude and the fine-grained quality of his physical comprehension, that early mechanical genius of his childhood, kept steady pace with his developing intellectual genius and strengthened it.

In January 1664/65 Newton took his Bachelor of Arts degree but in the summer of 1665 was forced to retire to his home at Woolsthorpe as the University was closed because of an outbreak of the plague. It remained closed most of the time until the spring of 1667 and Newton spent the period at his mother's manor, a fact which would hardly bear notice in this summary biography had that period not proved to be his *annus mirabilis*, the marvelous year in which he invented his "fluxions" (later to be developed into the calculus), discovered white light to be compounded of all the distinctly colored rays of the spectrum, and found out a mathematical law of gravity. The gradual development and unfolding to the world, throughout subsequent years, of the productions of that brief period were to establish his reputation upon the granite foundation it still enjoys.

In 1667, however, he merely returned to Cambridge, quietly proceeded Master of Arts, was elected to a Trinity Fellowship, and settled down. Only Isaac Barrow seems to have had an inkling of what was going on in Newton's mind, as Newton had shown him one of the mathematical papers from the Woolsthorpe period. Barrow immediately put it into circulation among interested mathematicians and in 1669 resigned his Lucasian Chair of Mathematics in Newton's favor.

In 1672 Newton disclosed some of the optical discoveries of the Woolsthorpe period to the Royal Society and was in consequence elected Fellow of that group. But it was not until 1684 that the full extent of his gravitational studies came to light. By that time a number of Fellows of the Royal Society had come to the conclusion that the centripetal force of the sun which acted upon the planets must be inversely proportional to the square of the intervening distance, but they could not prove it. Edmund Halley, later Astronomer-Royal, knowing from earlier exchanges that Newton had some ideas on the subject, made the journey to Cambridge to ask him about it. Halley

> at once indicated the object of his visit by asking Newton what would be the curve described by the planets on the supposition that gravity diminished as the square of the distance. Newton immediately answered, *an ellipse*. Struck with joy and amazement, Halley asked him how he knew it? Why, replied he, I have calculated it. . . .[3]

[3] From a manuscript by John Conduitt, who married Newton's niece and lived in Newton's London residence for many years, quoted in More, *Newton*, p. 299. Conduitt prepared the manuscript with a view to writing a "Life" of Newton, but never did so:

Newton had lost his papers on it but at Halley's urging prepared his proofs again and proceeded to work up a course of lectures on planetary motion, *De motu corporum*, and another *On the System of the World*. Due almost entirely to Halley's insistence these eventually became the *Philosophiae naturalis principia mathematica*, in English the *Mathematical Principles of Natural Philosophy*, commonly called now simply the *Principia* and said to be the greatest work of science ever published.[4]

Newton's life of retiring scholarship ended in 1696 with his appointment as Warden of the Mint just as the great recoinage of William III's reign got underway. Charles Montague, later Lord Halifax, who had known and admired Newton at Cambridge, was then Chancellor of the Exchequer. He had already been engaged for some time in his reorganization of the nation's finances, establishing the Bank of England and founding the national debt to finance William's wars. In 1695 Montague was empowered by William to prepare a bill for recoinage also, as a part of the total effort at the reform and stabilization of the monetary system, for coins in circulation were far below face value from clipping and counterfeiting. In January 1695/96 the bill was passed, in February the recoinage was begun, and in March, Newton, through Montague's efforts, arrived to take over the post of Warden.

At that time the principal duties of the Warden were of a legal nature and Newton was expected to oversee the detection and prosecution of counterfeiters and clippers of coins. He superintended that work in detail and also dealt from time to time with other infractions, such as conflicts between Mint personnel and the Tower garrison. In 1699 he was translated to the Mastership of the Mint, which position he held until his death. The latter was the general administrative post of the organization. Newton handled it with his accustomed thoroughness, straightening out

his papers on the subject now comprise a part of the Keynes Collection, King's College, Cambridge.

[4] Isaac Newton, *Philosophiae naturalis principia mathematica* (Londini: Jussu *Societatis Regiae* ac Typis *Josephi Streater*. Prostat apud plures Bibliopolas, 1687). Of the many subsequent editions, the most convenient modern one, and the one used primarily in the present study, is Isaac Newton, *Sir Isaac Newton's Mathematical Principles of Natural Philosophy and his System of the World. Translated into English by Andrew Motte in 1729. The translations revised, and supplied with an historical and explanatory appendix, by Florian Cajori* (2 vols.; Berkeley and Los Angeles: University of California Press, 1966), hereinafter referred to as Newton, *Principia*. Recently a definitive variorum edition has been prepared: Isaac Newton, *Isaac Newton's Philosophiae naturalis principia mathematica. The Third edition (1726) with Variant Readings. Assembled and Edited by Alexandre Koyré and I. Bernard Cohen with the Assistance of Anne Whitman* (2 vols.; Cambridge, Mass.: Harvard University Press, 1972), hereinafter referred to as Koyré and Cohen, *Newton's Principia*. Page references in the present study will be given for both the English of Mott and Cajori and the Latin of the Koyré and Cohen edition. A wealth of detail on the preparation of the first three editions of the *Principia* and on their contemporary reception appears in a companion volume to the variorum edition: I. Bernard Cohen, *Introduction to Newton's 'Principia'* (Cambridge, Mass.: Harvard University Press, 1971).

the chaos of records and accounts left by his predecessors and, when questions of procedure arose, searching out all the precedents as far back as Elizabethan times. The Mastership of the Mint cushioned Newton's later years with a financial security he had never known before, and the impecunious lad from Lincolnshire, who had entered Cambridge as a subsizar working for his keep, died a wealthy man.[5]

Although Newton's duties as Warden and as Master did not require it, he soon made himself familiar with the technical processes involved in minting. He learned the technique of the assaying of fine gold and silver, with which he had apparently been unfamiliar in 1696, and served sometimes as his own assayer even when the regular assay work was done by the Crown Assayer.[6] As John Conduitt observed, Newton "had frequent opportunities of employing his skill in mathematics and chemistry, particularly in his . . . assays of foreign coins . . . ."[7] He seems in general to have been most conscientious in his attention to business, and Craig relates one humorous occasion when Newton's mathematical abilities gave aid and comfort to the Crown in an unexpected way. Parliament had passed such an involuted Tonnage and Poundage Act that the Treasury was at a loss as to how to apply it. It involved a percentage duty calculated on net price realized, less the amount of tax, and no one could quite cope with the computations. In 1703 the Treasury sent the problem to Newton and he, after two examinations of the Act, several arithmetical and algebraic approaches, and three draft replies, reduced the question to the point where only one sum needed to be done by the Customs Officer.[8]

For many years Newton never intended to publish any of his discoveries. His early disclosures to the Royal Society concerning his work in optical matters had generated controversies which caused him to forswear further publication and it had taken all Halley's tact and energy to obtain the manuscript of the *Principia* from him and to see it through the press. When additional controversies arose over the *Principia*, Newton became

[5] John Craig, *Newton at the Mint* (Cambridge: At the University Press, 1946), hereinafter referred to as Craig, *Mint*.

[6] *Ibid.*, p. 122.

[7] John Conduitt, "Memoirs of Sir Isaac Newton, sent by Mr. Conduitt to Monsieur Fontenelle, in 1727," in Edmund Turnor, *Collections for the History of the Town and Soke of Grantham. Containing Authentic Memoirs of Sir Isaac Newton, Now First Published From the Original MSS. in the Possession of the Earl of Portsmouth* (London: Printed for William Miller, Albemarle Street, by W. Bulmer and Co. Cleveland-Row, St. James's, 1806), p. 162, the larger work hereinafter referred to as Turnor, *Collections*. See also "Sir Isaac Newton's Memorial on the State of the Gold and Silver Coin," prepared for the Commissioners of the Treasury, dated Mint Office, September 21, 1717, in *Observations on the Subjects Treated Of in Dr Smith's Inquiry into the Nature and Causes of the Wealth of Nations by David Buchanan [1817] with Appendices: Sir Isaac Newton's Memorial on the Gold and Silver Coins 1717 And Other Documents* (The Adam Smith Library; Reprints of Economic Classics; New York: Augustus M. Kelley, 1966), Appendix, pp. 1–7.

[8] Craig, *Mint*, pp. 62–63 (1, n. 5). Craig's account is based on Newton MSS III, 441 and 446, of those "Papers relating to the Mint by Sir I. Newton," now at the Royal Mint.

even more reluctant to publish. But as the duties of the Mastership of the Mint allowed him the leisure, the death of old enemies and the kindly pressure of friends combined to dissuade Newton from his earlier reticence. The year 1704 saw the publication of his optical papers in a systematic form, two mathematical papers being included also in the same volume.[9] Second, third, and fourth editions of the *Opticks* were prepared by Newton with new material (1706, 1721, and the posthumous edition of 1730), as also second and third editions of the *Principia* (1713, 1726). More mathematical papers appeared (*Arithmetica universalis*, 1707, *De analysi* and *Methodus differentialis*, 1711) and a number of less well-known items.

Honours accumulated for the aging Newton: in 1699 he was elected as one of the first eight foreign associates of the French Academy of Sciences; in 1703 he became President of his own country's Royal Society, to which office he was re-elected annually until his death; in 1705 he was knighted by Queen Anne. Awestruck disciples saw to it that he became the virtual dictator of science while he yet lived, and he continued in that role so completely even after death that the sciences developed in the eighteenth and nineteenth centuries all came to be framed according to Newtonian models.

The Newtonian world-view, indeed, developed almost wholly on the basis of his successes in mathematics and physical science, so subtly and deeply colored the thoughts of succeeding generations that the fuller seventeenth-century context in which Newton's thought had developed was lost to view.[10] Thus it became a curious anomaly – and one to be explained away – that Newton's studies in astronomy, optics, and mathematics only occupied a small portion of his time. In fact most of his great powers were poured out upon church history, theology, "the chronology of ancient kingdoms," prophecy, and alchemy.

The historiography of Newton's alchemy

All of these, which now seem such obscure and unlikely studies for a great natural philosopher to pursue, were of vital interest in the seventeenth century. Then uncertainties in creed and dogma were fought out on intel-

[9] Isaac Newton, *Opticks: or, a Treatise of the Reflexions, Refractions, Inflexions and Colours of Light. Also Two Treatises of the Species and Magnitude of Curvilinear Figures* (London: Printed for Sam. Smith, and Benj. Walford, Printers to the Royal Society, at the *Prince's Arms* in St. *Paul's* Church-yard, 1704). A convenient modern edition of the optical material is Isaac Newton, *Opticks, or A Treatise of the Reflections, Refractions, Inflections & Colours of Light*, foreword by Albert Einstein, introd. by Sir Edmund Whittaker, preface by I. Bernard Cohen, analytical table of contents by Duane H. D. Roller (based on the 4th edn., London, 1730; New York: Dover Publications, 1952), hereinafter referred to as Newton, *Opticks*.

[10] Gerd Buchdahl, *The Image of Newton and Locke in the Age of Reason* (Newman History

lectual as well as physical battlefields, and an age which still held largely to the literal truth of Scripture sought signs of the fulfillment of prophecy in contemporary events. When the question was agitated, whether the world was decaying towards its final end from a pristine Golden Age or was entering upon a joyful expansion of human knowledge and skill,[11] then it became important to know the exact relationships which held between the ancient kingdoms of the world. Newton struggled with these questions no more and no less than his contemporaries.

Twentieth-century scholarship is slowly restoring the lost context of Newton's thought. McLachlan has studied some of Newton's theological works[12] and Manuel some of his ideas on "chronology."[13] But Newton's alchemical studies have not yet received a thorough explication; the many attempts at explanation have long see-sawed between rationalistic and mystical interpretations and none of them has been wholly convincing.

Confusion over Newton's approach to alchemy arose in the very earliest period after his death, when biographical materials were being collected from those who had known the great man personally. At that time John Conduitt wrote to Dr. Humphrey Newton of Grantham, a man who had served Sir Isaac as amanuensis and laboratory assistant from 1685 until 1690. Humphrey Newton sent back his personal reminiscences, which painted a graphic picture of Sir Isaac in the heat of battle with the elements.

> He very rarely went to bed till *two* or *three* of the clock, sometimes not until *five* or *six*, lying about *four* or *five* hours, especially at spring and fall of the leaf, at which times he used to employ about six weeks in his elaboratory, the fire scarcely going out either night or day; he sitting up one night and I another, till he had finished his chemical experiments, in the performances of which he was the most accurate, strict, exact. What his aim might be I was not able to penetrate into, but his pains, his diligence at these set times made me think he aimed at something beyond the reach of human art and industry.... On the left end of the garden was his elaboratory, near the east end of the

and Philosophy of Science Series, no. 6, gen. ed., M. A. Hoskin; London and New York: Sheed and Ward, 1961).

[11] Richard Foster Jones, *Ancients and Moderns. A Study of the Rise of the Scientific Movement in Seventeenth-Century England* (2nd edn.; St. Louis: Washington University Studies, 1961), esp. pp. 23–40.

[12] Herbert McLachlan, *Religious Opinions of Milton, Locke, and Newton* (Publications of the University of Manchester, no. 276, Theological Series, no. 6; Manchester: Manchester University Press, 1941); Isaac Newton, *Sir Isaac Newton: Theological Manuscripts*, selected and ed., with introd., by Herbert McLachlan (Liverpool: At the University Press, 1950), hereinafter referred to as Newton, *Theological MSS.*

[13] Frank E. Manuel, *Isaac Newton, Historian* (Cambridge, Mass.: The Belknap Press of Harvard University Press, 1963), hereinafter referred to as Manuel, *Historian.*

> chapel, where he at these set times employed himself in with a great deal of satisfaction and delight. Nothing extraordinary, as I can remember, happened in making his experiments; which, if there did, he was of so sedate and even temper, that I could not in the least discover it.[14]

About a month later Humphrey Newton sent Conduitt a second letter, recalling additional details.

> About 6 weeks at spring, and 6 at the fall, the fire in the elaboratory scarcely went out, which was well furnished with chemical materials as bodies, receivers, heads, crucibles, etc., which was [*sic*] made very little use of, the crucibles excepted, in which he fused his metals; he would sometimes, tho' very seldom, look into an old mouldy book which lay in his elaboratory, I think it was titled *Agricola de Metallis*, the transmuting of metals being his chief design, for which purpose antimony was a great ingredient.... His brick furnaces, *pro re nata*, he made and altered himself without troubling a bricklayer.[15]

Humphrey Newton presented a portrait of Isaac as the Great Experimenter in these reminiscences to Conduitt, consistent with what he said also to William Stukeley, who was collecting materials for a "Life" of Newton a little later. Stukeley wrote,

> Dr Newton of Grantham...was assistant to him [Sir Isaac], particularly in his chymical operations, which he pursu'd many years. He often admir'd Sir Isaacs patience in his experiments, how scrupulously nice he was in weighing his materials, and that his fires were almost perpetual.[16]

But Stukeley was one of the awestruck disciples and already by the mid-eighteenth century he was attempting to rescue Sir Isaac's reputation from the taint of alchemy. Stukeley knew a little more than Humphrey Newton did about the intellectual production that might have resulted from Sir Isaac's laboratory work and was not averse to "explaining" more about it than he actually knew. Stukeley said:

> He [Sir Isaac] wrote likewise an intire work on chymistry, explaining the principles of matter, and elementary components, from that abstruse art; on experimental and mathematical proof. He had himself a good opinion of this work; but the MS. was unluckily burnt in the

[14] Humphrey Newton to John Conduitt, January 17, 1727/28, Keynes MS 135, King's College, Cambridge, as quoted in More, *Newton*, pp. 247–48 (1, n. 2), and in Brewster, *Memoirs*, II, 93–94 (1, n. 2).

[15] Humphrey Newton to John Conduitt, Feb. 14, 1727/28, Keynes MS 135, King's College, Cambridge, as quoted in More, *Newton*, p. 249 (1, n. 2), and in Brewster, *Memoirs*, II, 95–97 (1, n. 2).

[16] William Stukeley, *Memoirs of Sir Isaac Newton's Life by William Stukeley, M.D., F.R.S. 1752 Being some Account of his Family and Chiefly of the Junior Part of his Life*, ed. by A. Hastings White (London: Taylor and Francis, 1936), p. 56, hereinafter referred to as Stukeley, *Memoirs*.

laboratory, which casually took fire. He never could undertake it again, a loss not to be sufficiently regretted. . . .

As to chymistry in general, we may very well presume Sir Isaac, from his long and constant application to that pyrotechnical amusement, had made very important discoverys in this branch of philosophy, which had need enough of his masterly skill, to rescue it from superstition, from vanity and imposture, and from the fond inquiry of alchymy and transmutation. By this means Sir Isaac carryed his inquiry very far downwards into the ultimate component parts of matter, as well as upwards towards the boundless regions of space. . . .[17]

Now Stukeley got it almost right, recognizing as he did Newton's strong experimental program as well as his intellectual commitment to inquiring into "the ultimate component parts of matter." But Stukeley, a young man when Newton died, had had his thinking colored by the eighteenth century's reaction against alchemy, and he called Sir Isaac's work "chymistry" and said it would have rescued that field from "alchymy and transmutation." In contrast to that, it will be the position of the present study that it was precisely *by* the route of alchemy and transmutation that Sir Isaac expected to elucidate "the ultimate component parts of matter."

But even before Stukeley's death in the eighteenth century there arose the ghost of Newton's predilection for the mystical component of alchemy, a ghost which has been adequately laid only in the present century if at all. A Rev. Mr. William Law (1686–1761) first made the suggestion that Jacob Boehme had inspired much of Newton's thought in natural philosophy.

The illustrious Sir *Isaac Newton* when he wrote his *Principia*, and publish'd to the World his great Doctrine of *Attraction*, and those *Laws of Nature* by which the *Planets* began, and continue to move in their Orbits, could have told the World, that the *true and infallible* Ground of what he there advanced, was to be found in the *teutonick Theosopher*, in his *three first Properties of Eternal Nature*; he could have told them, that he had been a *diligent Reader* of that wonderful Author, that he had made large extracts out of him . . . .[18]

Jacob Boehme (1575–1624), or Behmen as he was usually called by the English, was a Christian mystic, poorly educated, a journeyman shoemaker in Prussia. Having acquired some knowledge of alchemy during

[17] *Ibid.*, pp. 59–60.

[18] William Law, *An Appeal To all that Doubt, or Disbelieve The Truths of the Gospel, Whether they be Deists, Arians, Socinians, or Nominal Christians. In which, the true Grounds and Reasons of the whole Christian Faith and Life are plainly and fully demonstrated. To which are added, Some Animadversions upon Dr. Trap's late Reply* (London: Printed for W. Innys, at the West-End of St. *Paul*'s, 1742), p. 314.

his apprenticeship, he described his later ecstatic religious experiences in a kind of transfigured Hermetic terminology.[19] If Newton had indeed found the key to his natural philosophy in Boehme, it would require rather radical revision of current understanding of Newton's methodology, but happily this is not true. Stephen Hobhouse, a student of William Law, has established that Law only had an untrustworthy oral tradition for his statements, and has shown furthermore that Boehme's thought stands in complete contradistinction to Newton's.[20] The evidence against Law's position is clearly summarized by McLachlan who further notes the absence of any large extracts from Boehme in the Newton theological manuscripts.[21] And the present writer can testify likewise to Boehme's absence from the alchemical manuscripts.

But at the time the first major biography of Newton was undertaken around the middle of the nineteenth century by Sir David Brewster, no one had yet searched through Newton's papers to establish the fact that Boehme was really not one of his favorite authors. Furthermore, Brewster had seen among Newton's papers a number of items which seemed quite as bad to him: an autograph transcript of *The Metamorphosis of the Planets* by John de Monte Snyders which ran to sixty-two quarto pages, page after page of alchemical verse from Thomas Norton's *Ordinall of Alchimy* and Basilius Valentinus' *Mystery of the Microcosm*, and a copy of Eirenaeus Philalethes' *Secrets Reveal'd, or an Open Entrance to the Shut Palace of the King*, heavily annotated in Newton's own hand.[22]

There were other alchemical papers too, many, many of them. Their extent was indeed hardly indicated by Brewster, for they comprised about 650000 words, almost all in Newton's hand.[23] Although Brewster was hagiographic in his approach to Newton's biography, he was too honest a researcher to pretend he had not seen that "damaging" evidence, and he was consequently forced into the position of distinguishing the alchemy of Newton – and of his great contemporaries John Locke (1632–1704) and

[19] Arthur Edward Waite, *Alchemists Through the Ages. Lives of the Famous Alchemistical Philosophers from the year 850 to the close of the 18th century, together with a Study of the Principles and Practice of Alchemy, including a Bibliography of Alchemical and Hermetic Philosophy*, introd. by Paul M. Allen (Reprint of the London edn. of 1888; Blauvelt, N.Y.: Rudolf Steiner Publications, 1970), pp. 161–66, hereinafter referred to as Waite, *Lives*.

[20] William Law, *Selected Mystical Writings of William Law edited with Notes and Twenty-four Studies in the Mystical Theology of William Law and Jacob Boehme and an Enquiry into the Influence of Jacob Boehme on Isaac Newton by Stephen Hobhouse*, foreword by Aldous Huxley (2nd edn., revised; New York and London: Harper and Brothers, 1948), pp. 397–422.

[21] Herbert McLachlan, "Introduction," in Newton, *Theological MSS*, pp. 20–21 (1, n. 12).

[22] Brewster, *Memoirs*, II, 371–72 (1, n. 2).

[23] Newton's alchemical papers are listed in Appendix A and the collection will be discussed below. The estimated number of words was made at the time of their sale in 1936 and was published in the unpaginated "Foreword" to the sale catalogue cited below at note 31.