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# Obscurity, Secrecy, and Authority:
# Transformations in English Alchemy in the late Seventeenth Century

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## Glossary

**Adept**: An alchemist who has become extremely skilled and knowledgeable of alchemy. Title reserved for famous alchemists and, in the seventeenth century, those who have knowledge of the arcana.

**Adepta**: Advanced and arcane knowledge which is the purview of adepts. Adepta included the alkahest, the Philosopher's Stone, and the ingredients thereof.

**Alkahest**: A substance able to dissolve any other substance within it. An arcana.

**Arcana**: The hidden treasures of alchemy with wonderous properties. Examples include the Philosopher's Stone and alkahest.

**Chrysopoeia**: Transmuting base metals into gold.

**Chymistry**: Another word for alchemy.

**Experimental Philosophy**: Natural philosophy that employed an empirical epistemology with the aim of procuring matters of fact rather than general laws. Experimental philosophers valued systematic observation of experiments or demonstrations that were performed in front reliable witnesses.

**High Magic**: Term referring to the esoteric domains of Astrology, Natural magic, and alchemy.

**Iatrochemistry**: The alchemy of creating medicinal cures.

**Low Magic**: Term referring to folk magic and superstitious practices and beliefs. Not systematized like High Magic.

**Natural Philosophy**: The systematic study of nature, with the aim of discovering universal laws that explained natural phenomena.

**Philosopher's Stone** a.k.a. **Elixir of life**: An arcanum that allowed the possessor to perform chrysopoeia, among a number of wonderful feats.

**Philosophical Mercury**: a special type of mercury that had to be created in a laboratory. Believed by Philalethists to be a key starting ingredient for the Philosopher's Stone.

**Preternatural**: An ontological category denoting phenomena which seemed to deviate from the natural order of things. Some preternatural phenomena are monstrous births, hermaphrodites, as well as the healing powers of various minerals and the cures and arcana of alchemy.

**Science**: Denotes knowledge that is certain and infallible, such as that derived from syllogistic demonstration or eventually, that derived from systematic observation. Alternatively, denotes systematic knowledge of a subject or knowledge acquired by skill.

# Introduction

The secret of our fiery Mercury,

So much by all the Antients conceal'd,

I have disclos'd, so that a curious eye

Shall herein find much depth of Art reveal'd;

I now proceed the practique to discover,

Which weigh with judegment ere you passe it over.

Take then our *Mercury* (which is our Moon)

And it espouse with the terrestriall Sunne,

(Thus man & wife are joyn'd) & to them soon

Adde the reviving spirit, this when done

A noble game you soon shall spy, because

You have attended Natures noble Lawes.[1]

These lyrics open the second part of *The Marrow of Alchemy*, a seventeenth century treatise written by the mysterious alchemist Eirenaeus Philalethes. The text concerns an exciting subject: the theory and practice of making a Philosopher's Stone. The Stone, sometimes called the 'Elixir of Life,' was an extremely rare and wonderous substance. Alchemists in possession of the fabled Stone would be able to transmute any metal into gold as well as produce powerful medicines, making the Stone one of the prized 'arcana' of alchemy—a secret treasure sought by alchemists for millennia. Notably, the Elixir was no natural stone; it had to be created in a

[1] Philalethes, *The Marrow of Alchemy*: Part 2, 1-2.

laboratory by an adept alchemist who had mastered the secrets of nature. In premodern England, there was a veritable research program into the arcana with the stone as its target that spanned centuries. This was the tradition in which Philalethes wrote the *Marrow of Alchemy*.

The above excerpt can tell us a lot about Philalethean alchemy. Firstly, the text concerns "the secret of our fiery Mercury," referring to a special philosophical mercury which Philalethes claimed was the true starting ingredient for creating the Philosopher's Stone. We are told as well that this is ancient, lost wisdom, a common refrain which gave alchemy a grand historical authority as well as an attractive, esoteric edge. The first section of the *Marrow* is another poem, one that gives theoretical grounds for the Stone's existence. The book's second section puts forward a practical recipe for preparing philosophical mercury, a rare substance in its own right. Alchemists interested in chrysopoeia, the transmutation of common metals into gold, sought both theoretical and practical descriptions of the Philosopher's Stone, thus the text was divided into theory and a theory-informed recipe respectively. Even in the mid-seventeenth century, alchemy had as many critics as it did believers. Thus, Philalethes advises the reader to "weigh with judegment" his practical recipe and experience the results for themselves before coming to a conclusion on his theoretical explanations. Philalethes provided an assurance of the replicability of his experiments to combat criticism of his work. In other words, he staked the reality of his alchemy on experimentalism.

I put these stanzas before the reader so that we can begin to understand more precisely what premodern alchemists studied and how they presented their knowledge. Though alchemy may be delegated a pseudoscience today, in these short lines we already see a form of empiricism and experimental verificationism that we associate with modern science. But beyond the content contained in this poem, we should also ask what insights into the rhetorical tradition

of alchemy can be drawn from the passage. For this thesis is concerned not so much with what seventeenth century English alchemists believed, but how those beliefs shaped their rhetoric and practices.

One important detail in this excerpt is that Philalethes considers his secrets accessible only to the "curious eye." The recipe he gave for philosophical mercury is hardly clear and direct; in the second stanza, he instructs us to "Take then our Mercury (which is our Moon) / And it espouse with the terrestriall Sunne, / (Thus man & wife are joyn'd)."[2] Only a reader equipped with the knowledge and diligence to track the metaphorical links between celestial bodies, copulation, and the interactions of chemicals would even be able to decipher this recipe, much less possess the skills and means to attempt and verify it. For all the gravity of the subject matter—a real Philosopher's Stone would have been the crowning achievement for any alchemist—Philalethes still imparted his wisdom in the form of allegorical poetry, only intelligible to those with the "eye" for it. And then there is the peculiar fact that Eirenaeus Philalethes was merely a pseudonym used by George Starkey, an American-born alchemist and physician living in London. All these details, both obvious and subtle, indicate that premodern alchemy existed in a vastly different rhetorical tradition than the sober prose of modern science.

The peculiar language and images of alchemy are of major interest to historians of science who study the Early Modern period and what is commonly called the Scientific Revolution. Over the last 70 years, there has been an increased interest in alchemy and other magical fields among historians of science that asserts the serious intellectual character of these now long-forgotten practices and seeks to understand them in their proper context.[3] This

[2] Ibid.
[3] For an overview of this new historiography, see Newman, "What Have We Learned from the Recent Historiography of Alchemy?": 313–21. For exemplary works of this contextualized approach applied to alchemy,

relatively recent historiographical movement deliberately avoids holding premodern science to the standards of its modern institutional descendant. One could view this trend as a response to the positivistic narrative of the Scientific Revolution that was popular in the early twentieth century, narrative which claims there was a coherent group of philosophical pioneers whose actions and ideas hoisted Europe into modernity.[4] This positivistic history would likely deem Philalethes' perplexing philosophical poem as a failure—the vague speculations of a fool who conducted no 'scientific' inquiry into nature. While it is undeniable that modern science has a characteristic method and has vastly transformed many aspects of human life, many historians now prefer to view progress in methodology and productivity as the result of gradual developments in a climate of ideological variety that was neither distinctly medieval nor distinctly modern.[5] Furthermore, these developments can often be explained by appeals to the social and material context in which science was done more so than to some intrinsic power of science itself or the actions of a few important characters.[6] Studies of premodern magic fit into this historiographical trend because they avoid resorting to a view that science itself necessitated

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see Newman and Principe, *Alchemy Tried in the Fire: Starkey, Boyle, and the Fate of Helmontian Chymistry* and Principe, *The Secrets of Alchemy*. Principe replicates the experiments described in alchemical texts in order to understand the manner in which laboratory research reaffirmed alchemical beliefs and molded alchemical theory. For a source that examines all of High Magic and situates texts and practices in proper historical context, see Copenhaver, *Magic in Western Culture: From Antiquity to the Enlightenment*.

[4] This view is associated with a number of theories that stake the essence of this revolution on processes such as the mechanization of nature, the mathematization of the sciences, the adoption of experimentalism, and the adherence to a scientific method. While it is this author's opinion that none such theories are complete accounts of what occurred in the early modern period, they are brilliant works of scholarship and philosophy. Some texts that comprise this tradition include Butterfield, Herbert. *The Origins of Modern Science, 1300-1800*; Burtt, *The Metaphysical Foundations of Modern Physical Science*; Hall, *The Scientific Revolution, 1500-1800: The Formation of the Modern Scientific Attitude*, 2nd ed; Butterfield. *The Origins of Modern Science, 1300-1800*; Dijksterhuis, *The mechanization of the world picture: Pythagoras to Newton*; and Koyré, *From the Closed World to the Infinite Universe*.

[5] A few texts that tell the history of science of the early modern period with an emphasis on intellectual variety are Daston and Park, *Wonders and the Order of Nature, 1150-1750*; Copenhaver, *Magic in Western Culture*; Shapin, *The Scientific Revolution*; and Shapin and Schaffer, *Leviathan and the Air-pump.*

[6] A seminal example of this contextualized, sociological approach is of course: Kuhn, *The Structure of Scientific Revolutions*. See as well: Shapin, *A Social History of Truth* and Shapin, *The Scientific Revolution.*

the decline of alchemy, natural magic, astrology, and the like.[7] Indeed, this view that science and research are antithetical to subjects such as magic, astrology, and alchemy conflicts with the historical record; the annals of the Royal Society of London chronicle many accounts of preternatural marvels such as apparitions, figured stones, strange lights, and monstrous creatures since its founding in the 1660s, up until such matters gradually faded as topics of scientific interest.[8]

While historians of science may relish in their provocative and counter intuitive claims—such as Steven Shapin's famous opening line of his book *The Scientific Revolution*: "There was no such thing as the Scientific Revolution"[9]—this new narrative comes with new puzzles. Magic and alchemy may have been serious endeavors in the seventeenth century, but they nonetheless were in decline by 1700 until essentially disappearing as subjects of scientific study by the 1720s.[10] This raises an important question, which has served to orient my research into seventeenth century alchemy: why was alchemy not taken up by the emerging experimental community which grew into modern science? This question is related to the larger puzzle of why alchemy declined during this period, yet its scope is confined to the frictions between the

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[7] For information on the Scientific Revolution historiographical debate, the reader may wish to look at Cohen, *The Scientific Revolution: A Historiographical Inquiry*. For a discussion of revisionist sociological histories of science and the internalist-externalist historiographical debate, see Shapin, "Discipline and Bounding: The History and Sociology of Science as Seen through the Externalism-Internalism Debate." For a discussion of the historiographic trajectory of magic studies in particular, see the introduction of Copenhaver, *Magic in Western Culture.*
For articulations of this new revisionist history, see Kuhn, *The Structure of Scientific Revolutions* as well as essays in Kuhn, *The Essential Tension: Selected Studies in Scientific Tradition and Change*, specifically "Mathematical versus Experimental Traditions in the Development of Physical Science." For a comprehensive source on the idea of the Scientific Revolution, see Shapin, *The Scientific Revolution*. For discussions of transforming views of nature and worldviews that occurred in the early modern period, see Daston, "The Nature of Nature."
For Discussions of the trajectory of magic and alchemy in particular, see William R. Newman *Gehennical Fire: The Lives of George Starkey, an American Alchemist*; Brian Copenhaver, "Magic" in *Cambridge* and *Magic in Western Culture*; Pamela H. Smith *The Business of Alchemy: Science and Culture in the Holy Roman Empire*; Jennifer M. Rampling *The Experimental Fire: Inventing English Alchemy, 1300-1700*.
[8] The fading accelerates at the turn of the century and is more or less complete by 1720. Daston, *Wonders*: 346.
[9] Shapin, *The Scientific Revolution*: 1.
[10] Daston, *Wonders*: 345-52, 346. For more information on the decline of magic see Copenhaver, "Magic."

organized scientific program of the Royal Society and the decentralized English alchemical tradition. I hope to demonstrate that English alchemy was incompatible with the emerging scientific paradigm not on the basis of being incorrect, but because of its tradition of obscurity and secrecy. This will be achieved by examining the work of the alchemist George Starkey, the real man behind the fictitious Eirenaeus Philalethes, his relationship with the chemist Robert Boyle, and both figures' relationships with the wider English intellectual world.

This paper will analyze the attitudes towards and practices of obscurity and secrecy in the writings of George Starkey and his pseudonym Eirenaeus Philalethes. By uncovering the genuine anxieties that motivated Starkey to obscure his findings despite being committed to the advancement of alchemical learning, we can understand why the larger rhetorical tradition of alchemy contrasts so greatly with the sober prose of modern science. For it was genuine belief in the reality of alchemical arcana and an associated millenarian prophecy which caused Starkey to conceal much of his knowledge. We will begin by conducting a brief preliminary survey of the nature and variety of scientific inquiry in seventeenth century England before conducting a study of Starkey's rhetoric. We will then proceed to an analysis of Robert Boyle's attitude toward alchemy, secrecy, and obscurity, a man who collaborated closely with George Starkey as a young and relatively inexperienced experimental chymist. In part due to his high social and economic position, Boyle took an idiosyncratic stance on alchemy's tendency for obscurity and attempted throughout his career to bring alchemy into the experimental community he helped to cultivate at the Royal Society of London. The tension between traditional English alchemy's demand for obscurity and the emerging science's requirements of publicity were a major hinderance to Boyle's attempts to bring alchemy under the purview of science. The nuanced story of their incompatibility sheds light on the contributions and complexity of early modern

English alchemy and the early modern intellectual world, as well as provides insight into why alchemy was left behind.

Over the last four decades, historians of science have conducted a revision of alchemy's place in the narrative of early modern science. This paper is quite at home in the new historiography of alchemy, which views the field as a heavily experimental activity that integrated theory and practice in strikingly modern ways. These new studies attempt to understand what alchemists really experienced in their laboratories and the analytic techniques they devised within their premodern frameworks. In so doing, historians have worked to argue against entrenched notions that alchemy had no scientific value or influence on chemistry, that premodern frameworks were anti-experimental, and that alchemy was a quest for spiritual fulfillment and only incidentally interested in investigating the nature of matter.[11] Notably, they have enunciated a vital aspect of alchemy in its surprising integration of theory and practice in research. Alchemists were preoccupied with both the speculative disputations of philosophers and the practical desires of metallurgists and apothecaries, and thus their praxis involved the verification of theory through experimentation.[12] My research has led me to agree with this revised characterization of alchemy, in which experiment is central and the references to revelation and obscure imagery are treated in their proper historical context. Though the reflex of the new historiography is to assert the scientific character of alchemy, my aim is to tease out the peculiarities that followed from the beliefs of alchemists.[13]

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[11] For alchemy as a spiritual science and psychoanalytic interpretations of alchemical research, see Boa, *Robert Boyle and Seventeenth-Century Chemistry*; Noll, Richard. *The Jung Cult*; and Jung, "Die Erloesungsvorstellungen in der Alchemie." Jung's interpretations have done much damage to the study of alchemy as a science and is an important chapter in the modern historiography of alchemy.

[12] Newman, "What Have We Learned from the Recent Historiography of Alchemy?": 317.

[13] The secondary literature of this new tradition is vast. For a discussion of the new historiographic trend, see the above-cited Newman, "What Have We Learned from the Recent Historiography of Alchemy?" A few choice texts in this new tradition are: Newman and Principe, *Alchemy Tried in the Fire: Starkey, Boyle, and the Fate of Helmontian*

I do not wish to present the alchemists we will study as simply fools, and I will tend towards giving them the benefit of the doubt so long as it is appropriate. I hope to convince the reader that the strange and esoteric nature of English alchemy was not merely a charade aimed at concealing the fraudulence of their art, but that there were genuine alchemists interested in doing serious research and sharing their discoveries. Indeed, Philalethes' technique of conveying scientific information in rhyming poetic allegories may appear quite suspect to a modern reader, but by the end of this paper they will see that it was an entirely understandable practice. For all their differences, alchemy and modern chemistry share a lot more in common than is apparent on the surface.

**From Alchemy to Chemistry**

Researching alchemy, one finds a surprising amount of similarity to modern chemistry. I referenced above the experimental philosophy of Eirenaeus Philalethes, but there are more specific continuities between alchemy and chemistry than an experimental bend. It is important to recognize what aspects of alchemy have commonalities with modern experimental science so that we can proceed honestly in examining what aspects of it can be considered at odds with the emerging experimental science of the late seventeenth century. Before proceeding in our analysis of secrecy and obscurity, we ought to stamp out now any notion that alchemy's decline was necessitated by science itself.

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*Chymistry*; Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect*; Newman, *Gehennical Fire: The Lives of George Starkey*; and Rampling, *The Experimental Fire: Inventing English Alchemy*.

One marker of modernity that is perhaps given more weight than it should is the mathematical character of a discipline.[14] Nevertheless, even alchemy involved a fair amount of quantitative reasoning. In Starkey's work, scholars have observed how the technique of gravimetric or mass analysis allowed Starkey to analyze and improve upon synthetic processes in the laboratory. By measuring how much of a product remained after a reaction, or the amounts of reactants and side products involved in a process, Starkey improved upon his methods for producing chemical substances. He also applied gravimetric analysis to his work on philosophical mercury and other arcana, using it to prove that his substances could dissolve precious metals like gold and silver.[15] Not only was quantitative reasoning present in both alchemy and modern chemistry, but the laboratory itself, its furnaces, and many apparatuses were originally tools of alchemical inquiry. On both the philosophical and material level, there are striking through lines between the ancient art of alchemy and the modern discipline of chemistry.

Not only are there obvious continuities between alchemy and chemistry, but during the period in which alchemy declined, there was a muddy distinction between the practitioners of alchemy and the proponents of the emerging experimental science. Some of the most well-known alchemists were also the most well-known scientists and major characters in the seventeenth century Scientific Revolution. Robert Boyle (b. 1627 d. 1691) and Isaac Newton (b. 1643 d. 1727) are labeled the founders of modern chemistry and physics respectively, yet both

[14] The idea that mathematics is the marker of a true science can be seen in all corners of Western thought, from Plato and Aristotle to Immanuel Kant. For an overview of the mathematization thesis in the history of science, see Introduction to Gorham, *The Language of Nature.* Likely the greatest popularizer of this interpretation of the Scientific Revolution science is Koyre, *From the closed world to the Infinite Universe*.

[15] Newman, Principe, *Alchemy tried in the fire*: 118-35. Quantitative reasoning was hardly unique to George Starkey's alchemy.

thinkers vigorously studied alchemy throughout their lifetimes.[16] Though the alchemical exploits of these thinkers are often considered separately from their scientific contributions—indeed, Newton kept his alchemical research so secret its extent was not fully recognized until the early twentieth century[17]—alchemy was a vital part of their scientific worldview. Hence Robert Boyle provided explanations for the possibility of transmutation that appealed to his corpuscular matter theory.[18] Studying alchemy in this manner provides a method for disrupting the often too-solid distinction between the modern and the premodern. Notably, Boyle was peculiar for the transparency of his alchemical research, an attitude that contrasted with many alchemists including Starkey and Newton and which will be important for this paper's account of the tension between alchemy and modern science.

**A True Philosophy**

Figures like Newton and Boyle occupy a space between modern science and magic. Much of the experimental philosophy we associate with modern science ultimately has its roots in premodern High Magic. Before exploring this claim, a clarification on terminology is needed. High Magic, which encompassed astrology, natural magic, and alchemy often dealt with phenomena that are 'occult,' meaning invisible to the naked eye, and 'preternatural,' an ontological category that described matters which seemed to deviate from the natural order of things. The preternatural included wonders such as monstrous births, hermaphrodites, as well as

[16] Boyle's interest in alchemy will be developed throughout this paper. For Newton's alchemy, see White, *Isaac Newton: The Last Sorcerer.*
[17] The breath of Isaac Newton's alchemical research was made public in the mid-twentieth century through the efforts of famed economist John Maynard Keynes as a collector of Newton memorabilia.
[18] Principe, *Aspiring Adept*: 70-82; Hunter, "Alchemy, Magic and Moralism in the Thought of Robert Boyle:" 404-05.

the healing powers of various minerals and the cures and arcana of alchemy. Preternatural philosophers invoked the intervention of spirits, celestial influences, maguses who mastered nature's hidden qualities, or simply nature's inherent spontaneity to explain these phenomena.[19]

Preternatural philosophy, which included alchemy, was not incompatible with experimental philosophy. In fact, in this field, historians have observed many early instances of systematic empiricism.[20] Indeed, historians Lorraine Daston and Katherine Park argue that due to the difficulty in describing often overwhelming and perplexing magical phenomena such as alleged spiritual activity or astrological events, medieval investigations into the preternatural were built on shared descriptions of matters of fact. In this sense, the preternatural served as the origin for objectively described particulars, or facts, in the first place.[21] Early seventeenth century philosopher Francis Bacon, the father of English empiricism, held that laws of nature could only truly be universal if they could account for such preternatural particulars.[22] Bacon hardly expected High Magic to be defined out of modern science and it is apparent that early "strange facts" describing magical objects and events were likely prototypes of the modern, objective fact we take as incompatible with magical thinking.[23]

It is not surprising then that the Royal Society of London, the first national science institute which followed a Baconian scientific project and is considered a major force in the birth of modern science, contained no systematic disapproval of preternatural inquiry. Though eventually experimental philosophers drew lines around their fields that excluded magic and

[19] For a clear distinction between the premodern orders of nature—natural, supernatural, preternatural, and artificial—see Daston, "The Nature of Nature." For an extended study of preternatural science in premodern Europe, see Daston, *Wonders.*
[20] Daston, *Wonders*: 136-46.
[21] Ibid.: 215-53.
[22] Ibid.
[23] Ibid.

alchemy, the incredible variety of late seventeenth century scientific research tells us that this was hardly predetermined. It is then more likely that the experimental philosophy which became science was mainly defined by its epistemological structure, rather than the objects of its study. Even Thomas Sprat, an early Royal Society member, who did not believe inquiry should be aimed at the preternatural, defined the philosophy not by reference to its objects, but by reference to its empiricism:

> The True Philosophy must be first of all begun, on a scrupulous, and severe examination of particulars: from them, there may be some general Rules, with great caution drawn: But it must not rest there, nor is that the most difficult part of its course: It must advance those Principles, to the finding out of new effects, through all the varieties of Matter: and so both the courses must proceed orderly together; from experimenting, to Demonstrating, and from demonstrating, to Experimenting again.[24]

The experimental philosophy that got at the true principles of nature was grounded in the "severe examination of particulars" from which "general Rules" are drawn. The rules are induced through a process of experimentation and demonstration, with an emphasis on replicability. The objects of experimental philosophy need to be viewed as particulars, confined to their context of examination—a perspective that does not inherently rule out the objects of alchemy and even alchemical arcana.

One remarkable example of empiricism applied to the preternatural is the work of Joseph Glanville. An early member of the Royal Society, Glanville (b. 1636 d. 1680) conducted multiple empirical investigations into reports of demonic and spiritual activity operating in the world, intending to definitively prove their reality. In 1661, Glanvill sent a now famous account of demonic activity in the town of Tedworth, England, to Lord Brereton, one of the founders of the Royal society of London. Glanvill viewed the testimonies given by himself and many others as

[24] Sprat, *History of the Royal-Society*: 31.

"a great evidence against Sadducism, the disease of our age." Sadducism was his term for rabble-rousing atheism and intellectual challenges to prodigies and spirits. He reported in great detail how groups of visitors witnessed furniture moving about violently by their own accord, heard strange drumming and banging, and sensed an inexplicable "sulpherous smell" at the allegedly possessed house. Glanvill believed that "particulars" of demonic activity he conveyed to Lord Brereton were enough "to demonstrate that there are spirits that sometimes sensibly intermeddle in our affairs."[25]

As the seventeenth century went on, there was increasing debate over the reality of preternatural phenomena such as chrysopoeia, prodigies, witchcraft, and apparitions. It may surprise the reader to hear that Glanvill, by staunchly claiming the reality of magic as an assertion of God's existence, held the orthodox position. Glanvill wished to use seventeenth century empiricism to vindicate the preternatural, which is yet more powerful evidence against the notion that empiricism itself precluded High Magic. Due to his skeptical approach, use of plain language, and his support of the Royal Society's experimental methods, Glanvill was made a Fellow of the Society in 1664.[26] Yet despite active interest by many gentlemen, the general attitude of English educated elites towards the preternatural is really quite ambiguous. For every Joseph Glanvill and Robert Boyle, there was a Thomas Sprat or Robert Hooke to oppose serious research in the preternatural with equal fervor.[27] The controversial nature of these subjects and the strategies the Royal Society developed for working in such a polemical intellectual milieu will be discussed in the second half of this paper.

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[25] Glanvill, *A blow at modern Sadducism*.
[26] Richard H. Popkin (editor), *The Pimlico History of Western Philosophy* (1999), pp. 360–2.
[27] Hunter, *The Decline of Magic*. Yale University Press: 69, 77-80.

Because we know both the methodological similarities of preternatural philosophy and modern experimental philosophy as well as the literal interaction between the two in figures like Glanvill, Boyle, and Newton, it is then all the more likely that the reasons for alchemy's disappearance lie in areas adjacent to science, for experimental philosophy is not conducted in a vacuum.[28] Indeed, if anything this analysis of Glanvill's very direct reporting on poltergeists makes the peculiar rhetorical strategies used by George Starkey all the more perplexing: what was the purpose and motivation for the obscurity and secrecy of early modern alchemical texts? Why was Glanvill able to match his empirical methods with clear language, while Starkey was impelled to obscure his knowledge?

**A Short Linguistic Digression**

Before we proceed, we should first clarify what the terms "science," "philosophy," "natural philosophy" and "alchemy" will mean in our discussion. It is often said that natural philosophy is the pre-modern ancestor of what we now call science. The late seventeenth century characters we are concerned with largely considered themselves natural philosophers or naturalists and described their work as natural philosophy. Hence, Isaac Newton's famous 1687 book on the laws of motion is titled *Philosophiae Naturalis Principia Mathetmatica,* or "The Mathematical Principles of Natural Philosophy." So understood, natural philosophy constituted a systematic study of nature, with the aim of discovering universal laws that explained natural phenomena.

[28] No pun on Boyle's Air-pump experiments is intended.

Science was a new term in the seventeenth century. Stemming from Aristotelian metaphysics, science denoted demonstrative knowledge—that is, knowledge which is the conclusion of a valid syllogistic demonstration based on sound premises. The term entered English as late as 1600 but did not take on its modern connotation of professionalism and specialization for at least two centuries.[29] Science was technically reserved for a set of subjects in scholastic curricula, but language is hardly constrained by technicality and the term was used to denote any systematic knowledge of a subject as well as knowledge acquired by skill. By the early 1700s, knowledge derived from systemic, shared observation and experiment—that is, not fixed on syllogistic deduction—could be called scientific so as to express certainty and infallibility.[30] This new form of demonstration , while still considered the purview of natural philosophers, was opposed to scholasticism's syllogistic demonstration and it is the main activity of the intellectuals we will discuss.

In this century, philosophy was largely an avocation for the learned elite of early modern England. The best label for this group would be experimental philosophers, a term they often used to describe themselves. We should also draw a distinction between natural philosophy, which concerned natural things like growth and motion, and preternatural philosophy, which concerned preternatural matters like spirits, magic, astrology, and alchemy. It suffices for our purposes to say that "philosophy" refers to a collection of facts and postulates about a specific subject, and the difference between natural and preternatural philosophy lay in the phenomena under investigation. In this paper, science will refer to that sense of collective, empirical fact-

[29] Ross, "Scientist: The story of a word:" 69.
[30] Ibid.

gathering it held in the seventeenth century and the phrase "modern science" will be used to convey the familiar, modern meaning of a specialized profession.

When it comes to the term "alchemy" in the seventeenth century, it refeed to the commonly understood branch of natural philosophy concerned with metals, matter, and transmutation. The field was quite diverse in the Early Modern period, encompassing not only metallurgical practices but also theories on the growth of metals and nature of physical substance, medicinal applications of alchemical "cures," and the pursuit of alchemical arcana including the Philosopher's Stone and the alkahest. All three major branches were of course related: understanding the nature of metals provided means of researching transmutation, transmutation allowed for the creation of "cures" from poisonous substances, and the Philosopher's Stone was often said to enable one to transmute any base metal into gold, a process called chrysopoeia. The medical aspect of alchemy was developed by Paracelsus in the fifteenth century into a coherent subfield termed iatrochemistry. "Alchemy" signified all of this in the seventeenth century, as did the more or less synonymous term "chymistry."[31] In this paper, "alchemy" and "chymistry" as well as their adjective forms will be used synonymously, as they were in the 1600s.

## Part I: *Dona Dei*

George Starkey is a remarkable figure through which to analyze the rise of modern science for a number of reasons. He was born and educated at the margins of the English Empire, worked in a field that was marginalized by historians, and yet was the most read American

[31] Newman and Principe, "Alchemy vs. Chemistry: The Etymological Origins of a Historiographic Mistake."

scientist until Benjamin Franklin.[32] Despite his absence in typical histories of science, Starkey was a major influence on protagonists of the Scientific Revolution, particularly on Robert Boyle. For our purposes, Starkey provides an invaluable opportunity to analyze experimental alchemists' public and private behaviors. In his work we observe a preoccupation with secrecy and publicity, a trait he shared with many alchemists. Even his pseudonym exemplifies these themes of subversive knowledge and social status: "Philalethes Eirenaeus Cosmopolitinus" means "cosmopolitan and peaceful lover of truth." The implication is that Philalethes studied alchemy out of a love for truth, not out of greed or desire for power. Why would a peaceful lover of truth impart that truth in such a roundabout way?

Unlike Philalethes, however, George Starkey was inclined towards straightforward clarity. Indeed, the most dramatic departure between the private correspondence of George Starkey and his public Philalethean persona is the former's lack of obscurity. In a letter written to Robert Boyle in 1651, George Starkey shares in careful detail many of the findings he later deliberately obscured in the pseudonymously published *The Marrow of Alchemy* a few years later as well as in *Secrets reveal'd*, a manuscript on George Ripley and the Philosopher's Stone, published a decade after that. The same alchemical recipes, no longer couched in obscure metaphors and analogies, were relayed to Boyle as clear and detailed laboratory observations. In particular, Starkey provided a plaintext recipe for preparing philosophical mercury, the central ingredient of Philalethean chrysopoeia. The same recipe he gives plainly in the letter appears in

[32] Newman and Principe, *Alchemy Tried in the Fire*: xiv.

the *Marrow* and *Secrets reveal'd* as a perplexing allegory involving "Diana's doves," the "Green Lion," and a "Babylonian Dragon."[33]

Starkey displayed his commitment to clear communication in this letter to Boyle through his repeated references to the Englishman gentleman's duty to honesty. Starkey states that he finds secrecy an "uncivilized" yet necessary practice, indicating that his relationship with transparency was quite complicated.[34] While we cannot be completely sure of his candidness, repeated derisive references to alchemical obscurity in both Starkey's letters and Philalethes' own writings indicate that Starkey would actually prefer to openly share his findings, but certain anxieties prevent him from doing so.[35] Therefore, George Starkey could only openly share his knowledge in private correspondences with colleagues he trusted. When publishing, however, his theories needed to be hidden under a layer of obscured language and pseudonymity. It is important to note why this openness only extended to other alchemists and not a general reading public. The stated reason that Starkey confided in Boyle and dispensed with "horrid Metaphors" despite likely knowing him for only four or five months is "because I judg your intents sincere in the prosecution of Natures designe."[36] Starkey considered Boyle a fellow peaceful lover of truth. Hence in this letter he shares "without the least face of sordid base respects"[37]—that is, with full transparency—his experiments in making the alkahest and philosophic mercury.

There are two rhetorical techniques used in Starkey's dissemination of alchemical knowledge we are concerned with: secrecy and obscurity. Starkey was secretive in that no one,

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[33] Philalethes, *Secret's reveal'd*: 5-6 cf. Starkey, *1651 Letter to Robert Boyle*. See as well: Newman, *Gehennical Fire*: 115-60.
For reproductions of Starkey's alchemical experiments, see Principe, "Apparatus and Reproducibility in Alchemy."
[34] Starkey, *1651 Letter*: 17, 21.
[35] Philalethes will lay out the secrets of alchemy "more clearly set forth by any one" before him. Philalethes, *Secrets reveal'd*: Preface of John Langius.
[36] Ibid.: 26.
[37] Starkey, *1651 Letter*: 27.

Boyle included, was aware that he was in fact Eirenaeus Philalethes.[38] He chose to continue living a modest life as an immigrant in London, while his literary creation, Philalethes, became one of the most famous seventeenth century alchemists. Starkey's obscurity refers to his use of metaphors, allegories, and *Decknamen*—specialist words that denoted ingredients, such as writing "moon" to mean silver. But despite all this secrecy and obscurity, Philalethes still claimed to be revealing secrets "So much by all the Antients conceal'd."[39] How can Starkey claim to be a clear communicator of alchemical knowledge, yet go to great lengths to obscure that same knowledge? If alchemy was really a legitimate scientific field in late seventeenth century England, why did Starkey feel the need to construct Eirenaeus Philalethes in order to disseminate his arcane alchemical wisdom in the first place? And furthermore, why exactly did he obscure that wisdom with metaphors and analogies?

**An Anonymous Alchemist**

George Starkey was born George Stirk in Bermuda to a family of Calvinist Ministers in 1628. In 1637, he moved to New England and received an A.B. and A.M. from the then very young Harvard university, where he was likely introduced to the field of alchemy and various theories of matter through his physics courses. As such, he would have been aware of both the arcane wonders of alchemy and the various explanations for their existence via corpuscular matter theory, Helmontian elemental theory, and Aristotelian elemental theory. Around this time, he became enraptured in the field of alchemy, metallurgy, and iatrochemistry and entered a correspondence with other prominent intellectuals in New England. The group, centered around

[38] Newman, *Gehennical Fire*: Introduction.
[39] Philalethes, *The Marrow of Alchemy*: Part 2, 1.

one of the founders of the Massachusetts Bay Colony, John Winthrop Jr., was a remarkable instance of early North American philosophical exchange, in which participants shared chymical wisdom as well as texts and laboratory resources.[40]

After graduating from Harvard, Starkey married, opened a medical practice, and continued to pursue his interest in alchemy[41]—specifically medical alchemy in the tradition of Flemish alchemist Jan Baptist van Helmont (b. 1580, d.1644) and the bombastic Germanic alchemist Paracelsus (b. 1493, d. 1531). Starkey would have developed a robust familiarity with the Helmontian and Paracelsian alchemical theories and honed his laboratory research practices both at Harvard and through collaborating with the Winthrop group. Starkey's Paracelsian view of matter held that all things are composed of three principles: salt, sulfur, and mercury. He also studied Paracelsian medicine, which viewed diseases as external entities that could be combated by specific chymical "cures." This medical subfield of alchemy was called iatrochemistry. In his laboratory work, Starkey sought to vindicate his matter theory by producing chemical substances and medicines with properties that matched theoretical conjectures. In his career as a physician, he similarly vindicated Paracelsian iatrochemistry by providing economical and effective cures for his cliental. Starkey the intellectual was characteristically early modern in that he challenged the dogmatic systems of old Europe. Both of his theoretical positions on matter and disease challenged traditional orthodox views: the mercury sulfur theory challenged the Aristotelian concept four elements and his iatrochemistry challenged the Galenic concept of humoral imbalance. In the research tradition of the alchemical arcana, Starkey held a mercurialist position

[40] Biographical information on George Starkey is available in Newman, "Starkey [formerly Stirk], George" and Newman, *Gehennical Fire*: "Starkey in America," and "Arcana Maiora: The Hartlib Years (1650-1754)."
[41] Unfortunately, not much is known about Starkey's personal life. Certainly not enough information to comment on how it affected his pseudonymous career as Philalethes. For the definitive book on Starkey's life and alchemy, see William R. Newman's *Gehennical Fire*.

as he believed that the main ingredients for the Philosopher's Stone were philosophical mercury and gold.

While in New England, Starkey had gained a reputation as a brilliant young chymist. He carried this status with him when he moved his family to London in 1650 to pursue the secrets of alchemy full-time.[42] The trade secrets he devised for synthesizing medicines and other chemicals funded this new life in London, but his principle interest remained alchemical research.[43] He immigrated in order to gain better access to laboratory materials as well as to be closer to the center of Western intellectual activity. In England, he quickly became a member of the Hartlib Circle, an international correspondence of natural philosophers and social reformers committed to universal learning and centered around the intelligencer Samuel Hartlib.[44] Through Hartlib he established a friendly, tutelary correspondence with a young Robert Boyle that lasted through the 1650s. Until the end of his life in 1665, Starkey produced manuscripts of pharmaceutical and medical knowledge that promoted Paracelsian medicine under his own name as well as highly influential and theoretical alchemical texts under the pseudonym Eirenaeus Philalethes.[45]

The mysterious Philalethes wrote texts that to us appear extremely arcane. His most famous work is the *Introitus apertus ad occlusum regis platium* (1667), later translated as *Secrets Reaveal'd, or, An open entrance to the shut-palace of the King: containing the greatest treasure in chymistry never yet so plainly discovered* (1669). The posthumous volume provides insights into the Philosopher's Stone, philosophical mercury, the alkahest—an arcanum that could

[42] Newman, and Principe. *Alchemy Tried in the Fire*: 58.
[43] Newman, *Gehennical*: 52-53.
[44] For more on the Hartlib Circle, see Newman, *Gehennical*: 55-58, "Arcana Maiora: The Hartlib Years (1650-1754);" as well as Greengrass, *Samuel Hartlib*. For Starkey's relationship with the Hartlib Circle in particular, see Newman, "George Starkey and the Selling of Secrets."
[45] For a bibliography of the complete works of Starkey and Philaelthes, see Newman, *Gehennical*: appendix C.

dissolve any other substance—and other chymical matters. Like van Helmont and Paracelsus, the theories and recipes in *Secrets reveal'd* were written in allegory and intentionally confounding prose. Yet despite his own style, Philalethes claimed to be revealing the secret meaning hidden in the very writings he was responding to.

The promise of clear insights into the arcana would have been extremely attractive to chymists and philosophers everywhere. As the English title indicates, *Secrets reveal'd* was a type of alchemical key, a vehicle by which careful readers could enter the hidden realm of alchemical secrets—the "shut-palace" of the almighty God. Knowing these secrets would enable readers to decipher the even more esoteric writings of George Ripley, Paracelsus, and van Helmont. In this way, the text had two purposes: on the one hand, it served as a practical guide for researching the Philosopher's Stone and on the other hand it vindicated and clarified the opaque theories and opaquer practices of legendary adepts. There is an aesthetic element to this esotericism that must be noted here: the air of exclusivity, of ancient secrets recovered, and even the reader's enjoyment in teasing out the meanings of poetic recipes and allegories was an attractive aspect of alchemical writings like *Secrets reveal'd*. Yet these books were indeed seen as important sources of knowledge; the knowledge offered by Philalethes not only allowed readers to make rare and remarkable substances, but also to uncover the true nature of matter. In this way, alchemical writings such as Philalethes' *Secrets reveal'd* were of value to any investigator of nature but were particularly attractive to ambitious alchemists.

Most important for the present investigation is that *Secrets reveal'd* is brimming with colorful allegories and deliberately obscured recipes, as well as justifications for alchemy's esotericism that give us insight into Philalethes' motivations for writing in such an obscure manner. First, we will examine a vital aspect of arcane alchemical knowledge, one that is very

foreign to modern sensibilities: in Starkey's alchemy there is a distinct idea that some knowledge can only be gained through divine revelation.

**The Millenarian Prophecy of Elias Artista**

The dedicatory letter in *Secrets reveal'd* underscores Philalethes' early prominence as a uniquely bright young adept and attributes his successes in alchemy to divine blessing. It reads:

> "to pick out the Roses from the most thorny Bushes of Writings, and to make the true *Elixir* of Philosophers by his own Industry, without any Tutor, and at Twenty three years of Age; this perchance hath been granted to none, or (as is said) to most few hitherto. Who will gainsay but that in a perticular manner God hath poured down this occult Science into such a wit through the open windows of Heaven."[46]

Philalethes was a young and industrious adept who, armed only with his wit and the "thorny" insights of obscure alchemist, successfully made the Elixir of Life. Philalethes was a marvel in his own right, for he was one of the lucky few granted a type of divine alchemical wisdom. We will see how this concept of revealed knowledge was fundamental to Starkey's epistemology and motivated much of his obscurity practices. In the above passage, it serves to lend authority to Philalethes while also expressing Starkey's view that the "occult Science" had to ultimately be "poured down" by God, not discovered by mortal investigation into nature. Starkey believed that the deepest secrets of nature could only be obtained by contact with divinity and he meant this quite literally. Of course, the adept had to be a vigorous scholar to be worthy of such a blessing in the first place, but the greatest and most arcane treasures in nature were revealed rather than discovered. In order to depict himself as worthy of divine knowledge, Philalethes and his editors

[46] Philalethes, *Secrets reveal'd*: Preface of John Langius.

went to great lengths to portray him as an archetypal alchemical adept. But why exactly was Starkey a worthy recipient of divine alchemical wisdom?

In Paracelsian and Helmontian alchemy, there was a millenarian prophecy associated with the alchemical arcana and the adepts who mastered their secrets. The prophecy promised that a new *saeculum* would arrive, a golden age in which humankind, at last free of greed and wickedness, understood and basked in the greatest secrets of nature. Under this theory, the principles of the 'True Philosophy'—a title sought by Aristotelianism, Neo-Platonism, Mechanical Philosophy, Corpuscularism, and other proposed early modern knowledge systems—were ultimately to be revealed by God rather than induced from particulars, as Sprat's experimental methodology dictated.[47] These secrets were simply too great for a mortal to formulate on their own.

Alchemists believed that though the transmutation of baser metals had been already achieved by some, the ultimate knowledge of chrysopoeia and the Philosopher's Stone was to remain hidden until the arrival of Elias Artista or "Elias the Artist," the biblical angel Elijah who was considered a magus and adept alchemist. In the meantime, there would be a period of great instability and wickedness throughout Europe, during which enlightened adepts would crop up having been blessed with fragmented knowledge of the secrets of nature. In the sixteenth and seventeenth centuries, Paracelsian and Helmontian alchemists believed there were various signs that deeper secrets were being uncovered and that Elias Artista had indeed arrived.[48] This prophecy, like the Rosicrucian prophecy also popular at the time,[49] gave believers the exciting impression that ancient secrets were currently being revived by individuals all across Europe.

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[47] Pagel, "The Paracelsian Elias Artista and the Alchemical Tradition."
[48] Ibid.; Newman, *Gehennical Fire*: 2-6.
[49] For information on the Rosicrucian conspiracy, see: Yates, *The Rosicrucian Enlightenment*.

Belief in the millenarian prophecy—and alchemical arcana in general—was mostly sustained by written accounts. Historian of magic Brian Copenhaver describes a 'cannon' of evidence that was circulated through Europe via written testimony and vivid illustrations, sustaining belief in magic at all levels of society during the late middle ages.[50] These stories were granted authority by intellectuals who provided plausible explanations for the magical phenomena described with appeals to Christian demonology, astrology, neoplatonic Renaissance philosophy, and other respected frameworks.[51] Vivid stories—both written accounts and verbal rumors—described adepts who had unlocked the secrets of the arcana, constructing an image in the cultural imagination of mysterious alchemists hiding out in the far corners of Europe.[52] Especially among alchemists, these stories provided a sense that real adepts were at work in the world.

Through tales of alchemists performing feats of chrysopoeia or possessing metals with peculiar properties, belief in the existence of the preternatural alchemical arcana and the millenarian prophecy was sustained. Unlike Joseph Glanvill's written reports on the demon at Tedworth, these tales were dynamic, their details shifting as they spread from place to place, and there was little effort to defend the credibility of a source beyond the use of vivid details and visual aids to create an authoritative air. Glanvill's pointed efforts to procure credible testimony are a sign that these tales were taken with a pinch of incredulity in learned circles; throughout this period, many people did desire a more solid basis for deciding the veracity of preternatural phenomena than anecdotes of dubious origin. But for seventeenth century alchemists steeped in a

[50] Copenhaver, *Magic in Western Culture*: 127-53; Copenhaver, "Magic."
[51] Ibid.
[52] Newman, *Gehennical*: Introduction.

tradition of prophecy and the premodern world of viral anecdotes, these stories served as powerful evidence.

We can see how these prophetic signs function as evidence for alchemical arcana in a 1648 correspondence between intellectuals Robert Child and John Winthrop in New England. Child writes, "Its reported by diverse, that the Emperour of Germany hath found a secret to turne <silver> into <gold> by the which he pays his Army. The Duke of Holstein is turned a great Chymist. Some say (that have good intelligence) that Helia Artista is borne. I saw letters that came to a learned Dr. from the Fratres R.C. to that purpose, but he is not of our nacion."[53] Not only was evidence of legitimate transmutation reported, a connection was drawn between alchemical evidence and the Paracelsian prophecy of Elias Artista's ("Helia Artista's") messianic birth, which was given authority by the Rosicrucians (the "Frates R. C."). It is very likely that such a story reached Starkey when he was still in New England and helped to convince him that the Paracelsian prophecy was real and even that he could be one such early adepts foreshadowing an alchemical golden age.

It should be noted that these stories took it for granted that their audience believed in the possibility of phenomena like chrysopoeia. They sought instead to establish the reality of objects like the Philosopher's Stone, as opposed to their mere theoretical possibility.[54] In addition to this magical cannon, belief in alchemy was reaffirmed by the experiences of alchemists in their laboratories. Both Starkey and Boyle told stories in which they personally witnessed demonstrations of chrysopoeia, and there is little reason to deny that they truly believed what

[53] Ibid.: 42.
[54] Debate over the metaphysical possibility of transmutation will be discussed later in this paper in the section "Excuses of Philaletha."

they had witnessed.[55] While alchemy itself was sustained by many modalities of evidence, belief in the millenarian prophecy of Elias Artista and the divinity of arcane knowledge, especially its grand narrative of scattered alchemists, was sustained by stories.

The millenarian prophecy was believed by the Hartlib Circle, the very people Starkey was interested in collaborating with upon arriving in England in the early 1650s.[56] In order to fulfill the role of an alchemist in this community, Starkey would have needed to embrace the idea of revelatory knowledge and millenarian prophecy. To Samuel Hartlib, the central figure of the Hartlib Circle, bits of alchemical gossip, like that discussed between Winthrop and Child, indicated that the utopian intellectual society of the golden age was nearly realized—the alchemists who comprised it were just scattered across Europe due to political turmoil.[57] Part of the mission of international correspondences such as the Hartlib Circle was to connect such disparate adepts and usher in the golden age. Indeed, Philalethes characterizes the lifestyle of seventeenth century alchemists according to the prophetic narrative: "We Travel through many Nations, just like Vagabonds, and dare not take upon us the Care of a Family, neither do we possess any certain Habitation."[58] While this is hardly an accurate description of Starkey's biography, it is apparent that Starkey intentionally wrote Philalethes into the narrative of Elias Artista's return in order to accord with the interests of the intellectual climate he was working in. He similarly concentrated on subjects of particular interest to the Hartlib Circle when writing *Secrets reveal'd*.[59] As we shall soon see, it is more than likely that Starkey believed himself to be

[55] Starkey, *1651 Letter*: 19-20; Philalethes, *Secrets reveal'd*: 51-53; Principe, *Aspiring Adept*:72-76, 102-12; and Hunter, "Alchemy, Magic and Moralism in the Thought of Robert Boyle:" 404-05.
[56] Newman, "George Starkey and the selling of secrets:" 197, 201.
[57] The name of this society was "Macaria," meaning "that which is blessed." Clucas, "In search of 'The True Logick:'" 56.
[58] Philalethes, *Secrets reveal'd*: 33.
[59] Newman, "George Starkey and the selling of secrets:" 201.

a genuine adept and therefore a worthy recipient of divine revelation. For now, it suffices to say that belief in the millenarian prophecy of Elias Artista influenced the ways alchemists approached privacy and publicity

**The Revelation Epistemology**

The viral alchemical stories that bolstered belief in the millenarian prophecy have some common tropes: often the adepts are described as completely pure in their pursuit of knowledge and this is contrasted with the wickedness of others who seek to steal their knowledge for personal gain. Obviously, the image of the pious adept and the wicked common folk accorded with the millenarian prophecy. It is then not surprising that Starkey would construct an alchemical persona who was a "peaceful lover of truth" and a "cosmopolitan" wanderer. But if alchemists believed that a golden age was eminent, why would they not publicize their knowledge as clearly as possible in an attempt to accelerate its arrival? The answer is due to the nature of divine revelation and how it accorded with the predictions of the millenarian prophecy.

In one popular tale, an English clergyman who has uncovered the secret of *chrysopoeia* is falsely arrested for transmutation fraud and then brutally tortured, starved, and questioned by the Elector of Saxony who wants to find out the recipe for the Philosopher's Stone. The man does not give up his knowledge and is left to heal before being tortured again. In many versions of the story, Polish alchemist Michael Sendivogius is said to have rescued the man and taken him to Poland in exchange for some pieces of the Philosopher's Stone. The man dies having refused to tell Sendivogius the secret of the elixir's preparation. All that Sendivogius can get is a book from the mysterious adept's wife which would become the famous alchemical text, *Novum lumen chemicum* ("The new light of chemistry"). Sendivogious then squanders the rest of his powdered

elixir while attempting to multiply it. Having failed to uncover the secrets hidden in the *Novum*, he falls into poverty.[60]

The tale encapsulates many of the anxieties experienced by alchemists during the 1600s and the bearing these concerns had on the dissemination of knowledge. This particular version of the Sendivogious story was popular in the latter half of the century, and was very likely familiar to Starkey, Boyle and other English intellectuals. Indeed, the similarity between the story of Philalethes and Sendivogious' adept is even commented upon by John Langius in the preface of *Secrets reveal'd*.[61] The context of the story's creation is similar as well, as Sendivogious was the real author the *Novum* but wished to obscure his authorship behind a fictional alchemist. In the above story, we see an ideal adept, who is so pure in his pursuit of knowledge that he withstands unimaginable torture to guard it from bad actors motivated by greed. The passively resistant adept is a worthy vessel for the secrets of the "occult Science," because he is pure of heart, nonviolent, and unyielding in his protection of arcane knowledge. He fits nicely into the millenarian narrative for he is godly, travels around Europe, and is a testament to the idea that the common man is not yet ready for alchemy's secrets. This real anxiety prompted alchemists to go to great lengths to protect their wisdom.

In particular, the tale of Sendivogious' adept vindicates a strategy of protecting knowledge through obscurity. The adept was able to block the greedy Sendivogius from accessing his alchemical secrets by deliberately obscuring them in the *Novum*. But by still preserving that knowledge in written form, he retained the possibility of other good-intentioned adepts—ones clever enough to decipher his language—picking up where his research left of. Just

[60] This particular account was described by Pierre Borrel. Newman, *Gehennical*: 6-7.
[61] Philalethes, *Secrets reveal'd*: author's preface.

as Philalethes in *Secrets reveal'd* and *The Marrow* revealed his wisdom to those with a "curious eye," obscurity practices like allegories and Decknamen were meant to convey meaning only to those already steeped in the esoteric tradition. If there really was an invisible college of adept alchemists who possessed the fractured pieces of nature's secrets, deliberate obscurity could both preserve this wisdom and at the same time regulate its access, thereby protecting it and preserving it.

In this way, Helmontian alchemists like Starkey considered deliberate obscurity and claims to revelatory knowledge not as a sign of intellectual dishonesty, but of legitimacy. These obscurity practices are present throughout the alchemical tradition Starkey was working in, in authors such as George Ripley, Alexander van Helmont, Paracelsus, and others. Knowledge of the arcana was considered a *donum dei*, a "gift of God," which had to be revealed to individuals.[62] Hence the dedicatory letter of *Secrets reveal'd*, that famous 1667 manuscript on the Philosopher's Stone, presents Philalethes as a wonderous figure and the recipient of divine knowledge, a depiction which already smacks of the millenarian prophecy. Finding "the World placed in a most wicked posture" where honest alchemists are abused by greedy and enthusiastic common folk,[63] Philalethes declares just a few pages later in the Author's Preface that "God compelled me to write" this text and disseminate the knowledge to other worthy adepts who

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[62] Principe, *Secrets*: 192-95. While it is true that Starkey and other alchemists did believe that their knowledge—especially knowledge of the arcana—was divinely revealed, it should be noted that they did not take this revelation as a supernatural rupture nor consider all alchemical knowledge as necessarily holy. It is rather the case that most usage of the term *donum dei* intended to acknowledge God's constant presence in the process of research and discovery. When one stumbled upon a successful experiment, they had God to thank for being led in the right direction. This attitude is apparent even in the etymological origins of the medieval word "laboratorium" which comes from the Latin *laborare* and *oratorium* meaning "to work" and "a place of prayer," evoking an image of an alchemist kneeling beside his alembic, praying for a fruitful result. In the case of arcane knowledge specifically and considering the very real belief in the millenarian prophecy of Elias Artista, the arcane *dona dei* were of a higher class than other knowledge. *Merriam-Webster.com Dictionary*, s.v. "Laborare est orare."
For information on the differences between the supernatural, natural, preternatural, and artificial, see Daston, "Nature of Nature."

[63] Philalethes, *Secrets reveal'd*: 34.

"will become Blessed in this last Age of the World with this Arcanum."[64] In this manner, the text immediately situates Philalethes in the prophetic narrative, lending it authority and justifying the obscurity techniques the author will employ.

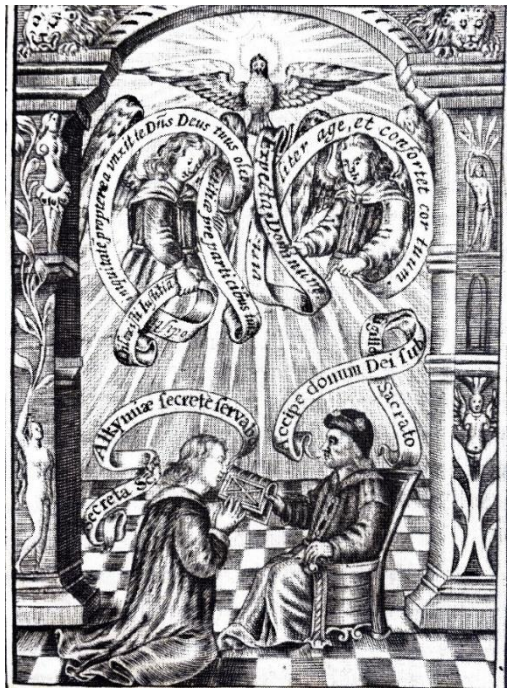


*Figure 1. An adept hands down the secrets of alchemy to his student, who promises to preserve them in secrecy. Necessary esotericism is quite a ubiquitous idea in English Alchemy. Fig. 1, Norton, Thomas, "Ordinall of Alchimy," wood engraving,* Theatrum chemicum britannicum *(London, 1652) in Principe,* Secrets of Alchemy, *193.*

George Starkey settled in England in 1651, the same year that the English Civil War ended. He had Eirenaeus Philalethes immigrate from North America around the same time. It is likely, then, that certain readers interpreted Philalethes' arrival in unstable, war-racked England as further evidence of the Paracelsian prophecy. Given the evidence that his belief in the prophecy was genuine, it is reasonable to imagine that Starkey believed himself to be an adept whose own fate fit into this prophetic narrative. He would have been predisposed to such a fatalistic belief, as he was raised by a Calvinist minister, which would have instilled in him a strong Christian faith. At the time the George Starkey attends Harvard in the 1640s, the school

[64] Philalethes, *Secrets reveal'd*: author's preface.

has a strong Calvinist presence of its own, which may have given Starkey the impression that industrious work in the laboratory would reaffirm his position as an adept, a sort of member of the alchemical 'elect.' Furthermore, recall that he began his life in Bermuda at the margins of the British world and eventually moved to London. When this migration is ascribed to Philalethes, it becomes the story of a scattered alchemist gravitating towards the center of the English intellectual world. Though we cannot be certain on whether Starkey believed he personally heralded a new age, Starkey's attitude towards obscurity did follow from his genuine belief in the millenarian prophecy and the divine revelation of knowledge

Indeed, in his private correspondences and laboratory notebooks, Starkey often framed his chymical discoveries as literal blessings from God.[65] In some instances, Starkey even claimed to have research breakthroughs via dream revelation. In a letter to Robert Boyle, Starkey describes falling asleep in the laboratory when an ephemeral figure calling himself Starkey's Eugenius appears and tells him that God supports his labors:

> I asked him what the alkahest of Paracelsus and Helmont was, and he responded that they used salt, sulfur, and an alkalized body, and though this response was more obscure than Paracelsus himself, yet with the response an ineffable light entered my mind, so that I fully understood. Marveling this, I said to him, "Behold! Your words are veiled, as it were by fog, and yet they are fundamentally true." He said "This is so necessarily, for the things said by one's Eugenius are all certain [*scientifica*], while those just said by me are the truest of all."[66]

The incident casts Starkey in the role of the archetypal adept in the Paracelsian tradition once again: a dedicated scholar, naturally gifted and earnest in his pursuit of nature's secrets, receives a blessing from God to penetrate deeper than any mere manuscript or experiment could allow. The Eugenius or 'good genius,' a kind of personal agent for intellectuals, materializes in order to

[65] Newman, "George Starkey and the Selling of Secrets": 65
[66] Ibid.: 197. Translation by William R. Newman. Brackets are my own.

provide understanding as well as to reaffirm Starkey's hidden identity as an adept and lend legitimacy to his arcane research. Here we also witness a new expansion of the term *scientifica*: certain knowledge can be acquired by traditional syllogism, disciplined observation, and now from the author of nature Himself—the highest authority a Helmontian and Christian like Starkey could hope for. The method of obtaining knowledge by dream revelation was hardly constrained to alchemy and High Magic; René Descartes for one believed that his dreams provided essential philosophic revelations early in his career.[67] Because Starkey attributed his revelations to God in not only his published works and letters, but his entirely private notebooks, it is extremely likely George Starkey genuinely believed in the experiences he relayed.

This epistemology of revelation and the accompanying Paracelsian prophecy created an air of exclusivity around alchemical knowledge that for Starkey and others functioned like a self-fulfilling prophecy. Because the millenarian prophecy dictated that knowledge of arcana was inherently rare and meant only for the worthiest alchemists and naturalists, authors went to great lengths to curb the accessibility of their written works. Those who acquired such knowledge did so by first deciphering the obscure works of Paracelsus, van Helmont, Ripley, Philalethes, and others and then allegedly grasping the entire arcane puzzle through the gift of individual divine revelation. When those adept alchemists wished to disseminate their knowledge, they needed to assert its divine quality and deliberately obscure it through metaphors to protect against the abuse predicted by the millenarian prophecy. The result is that knowledge of arcana was by definition esoteric—only accessible to a select group of intellectuals, who often happened to be at the top of the social hierarchy.

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[67] Browne, Alice. "Descartes's Dreams." Some 16th and 17th century alchemists even sought to incite revelatory dreams through prayer and ritual worship of spirits: Principe, *Secrets*: 118.

Nevertheless, alchemists employed the rhetorical technique of obfuscation as a practical measure. The millenarian prophecy stated that the golden age would be preceded by an age in which mankind is in a state of profound wickedness. Yet for the golden age to arrive, the scattered alchemists had to bring their wisdom together and transcend their geographic and linguistic barriers. Therefore, authors such as Starkey via Philalethes published in Latin, an accessible *lingua franca*, yet wrote in obscure metaphors and allegories that could only be decoded by extremely dedicated and industrious peers. They could feel assured that their metaphors both controlled access to the knowledge enclosed and provided useful insights to those clever enough to decipher them. The revelation epistemology regarded arcane wisdom as inherently exclusive, but one may still wonder what real danger would have resulted from writing clearly or at least using real identities. The reason has to do with vulgarization and the exaggerated dangers alchemists believed that they really faced.

**Vulgarization and Obscurity**

> But let me advise thee of one thing; when thou comest to the possession of the [alchemical key], that thou glut not thy self with the pleasures of this World, and forget God or thy Neighbour, lest with Midas thou turn thy covetous Eyes into longer or larger Ears, and so by enjoying, or rather misemploying, the present things, lose thy future happiness of and in the Kingdom of Heaven.[68]

The first pages of Eirenaeus Philalethes' *Secrets reveal'd* include a warning. The alchemist author, the editor, and the publisher state openly that the knowledge held in this book is not meant to be used for personal gain, be it fame or wealth, lest the possessor scorn God and lose their place in the "Kingdom of Heaven." Thankfully, according to the revelation

[68] Philalethes, *Secrets reveal'd*: The publishers epistle to the English reader.

epistemology, such an occurrence would be paradoxical, for Philalethes tells us that "such trifles are not esteemed by those who have this Art [of making the alchemical arcana], nay rather they despise them."[69] The possessor of the stone should avoid "vulgar applause" and instead focus on serving God. While Philalethes does not tell us exactly what serving God would entail, he gives some suggestions: transmuting "into perfect Gold and Silver all the imperfect Metals that are in the whole World," making precious stones and gems "such as cannot be paralelled in Nature," and curing "all the sick People in the World."[70] Ambitious and noble aims that would launch the world into a new age indeed.

Philalethes' writings and rhetorical strategies appear to be motivated by a fear of the vulgar: the majority of people were wicked and unworthy of the secrets of nature, yet Philalethes felt he must publish his wisdom for the sake of those honest philosophers who would benefit from it and fulfill the Paracelsian prophecy.[71] To prevent the unworthy from learning the secrets of nature, Philalethes encoded his knowledge in metaphors and obscure language. Hence Starkey found secrecy and obscurity uncouth but necessary practices.[72] In addition to the misuse of wisdom, there was fear of the violent potential of the vulgar masses—stories like the tale of Michael Sendivogious' adept promoted the idea that alchemists could be targets of opportunistic individuals if their identities were known. Both of these anxieties had rhetorical effects: fear of the vulgarization of knowledge compelled Starkey to obscure his chymical wisdom in order to control access to it. Fear of the vulgar crowd's violent potential motivated alchemists to be secretive of both their identities and their achievements.

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[69] Ibid.:118.
[70] Ibid.: 118-19.
[71] Recall that Philalethes states that God compelled him to write *Secrets reveal'd*. Ibid.: author's preface.
[72] Starkey, *1651 Letter*: 17, 21.

This attitude towards secrecy and obscurity, despite its fantastical subject matter, is in a certain sense distinctly early modern. On the one hand, it stems from genuine belief in arcane objects and millenarian prophecy, beliefs we associate with a pre-modern worldview. On the other hand, Starkey's efforts to balance a gentlemanly desire to publish his knowledge with a fear of that knowledge's dangerous potential is quite reminiscent of the challenges modern science must face in the realms of artificial intelligence, 3D printing, and other developing fields. The solution for Starkey was to publish texts that claimed to be simultaneously transparent and obscure—hence the ironically titled *Secrets reveal'd* abounds in metaphor and Decknamen. One could even draw an apt comparison between modern science's inaccessible jargon and alchemical Decknamen, but alchemy's obscurity does go a little further than modern science in terms of intentional obscurity. In the second part of our this paper, we will see how Starkey's resulting strategies of secrecy and obscurity unfortunately created certain impediments to the modernization of alchemy. Before exploring those impediments, we must examine more closely how the fears of vulgarization and physical harm motivated Starkey's rhetorical techniques, beginning with the dangers associated with making arcane knowledge common.

Starkey found secrecy an uncivil, but necessary tactic. Though the true alchemist only had an intellectual interest in creating gold, bad actors driven by greed would do whatever it took to get their hands on a recipe for the Stone, even threaten adepts' lives. While alchemists established an intellectual tradition of obfuscation to protect the secrets of alchemy, state powers in England attempted to legislate the practice. When Starkey moved to London, there was a centuries-old law criminalizing transmutation still in effect. In 1404, King Henry IV enacted the code, called the Act Against Multipliers, such "that none from henceforth shall use to multiplie gold or silver, nor use the craft multiplication, and if any the same doe, that he incurre the paine

of felonie in this case."[73] While some interpret this measure as a stance against alchemy's possible contradiction with religious teachings, the fact that later courts issued alchemical licenses and appointed alchemists of their own indicates that it was more likely an action taken to curb fraud and ensure the monarchy's control over currency.[74] By banning transmutation, the monarchy gave it a legal reality which indicates that the state was not only interested in alchemy but shared the concerns of many alchemists that such knowledge was dangerous when in the wrong hands.[75] In this light, it appears that the state prohibited transmutation as a practical measure, predicated on belief in a magical phenomenon—or, at least the possibility of its existing. Both the alchemists who couched their secret knowledge in enigmas and the legislators who prohibited transmutation with laws were responding to genuine concerns over the supposedly widespread greed of vulgar mankind.

An individual who could successfully create the Philosopher's Stone could transmute as much wealth as they pleased, potentially making gold and therefore currency worthless. Thus, the ability to transmute gold posed a major threat to the economic stability of nations. However, Philalethes appears to endorse this devaluation in many instances, recommending that the possessor of the stone transmute all the base metals on the planet to more perfect gold and silver. He even remarks in *Secrets reveal'd*, "I could wish, That Gold and Silver would at last be of as mean in esteem as Dirt."[76] However, this should be interpreted more as a desire for the coming golden age, rather than a call to action. He wishes that gold and silver had no monetary value because it would free him from the anxiety that greed would drive people to use the stone for

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[73] Qtd. in Principe, *Aspiring Adept*: 105.
[74] White, *Isaac Newton: The Last Sorcerer*: 115.
[75] In the late seventeenth century, Robert Boyle was a part of a successful lobbying effort to repeal this act. Principe, *Aspiring Adept*: 104-105.
[76] Philalethes, *Secrets revealed*: 32.

personal gain. Additionally, in the theoretical framework of alchemy, gold was considered to be most perfect or noble metal, thus many alchemists believed it was their task to perfect nature by transmuting all the baser metals into noble gold and silver.[77] Once the golden age has arrived, everyone would be enlightened to the art of chrysopoeia, and there would be no need for currency in any case. We can observe this attitude towards vulgarization in Starkey's correspondence with Boyle as well, in which he admonishes the "selling of Secrets" for profit, as an expression of his opinions that alchemists must have pure intentions and that the divine wisdom of alchemy is precious and only meant for the worthy.[78] From these twin notions that chrysopoeia attracted nefarious individuals and could threaten the status quo, alchemists concluded that chrysopoeiac knowledge had to be obscured from general understanding.

**Anxiety, Secrecy, and Leverage**

But fear of the vulgarization of knowledge and the millenarian prophecy do not clearly necessitate that Starkey concoct an entire fictional persona. The secrecy present in Starkey's alchemy is likely due to the imminent threat perceived in the vulgar crowds themselves. In the minds of seventeenth century alchemists, a particularly dangerous consequence of open alchemical knowledge was violent individuals who would try to force the secrets out of them. George Starkey certainly had such an anxiety, as he includes in *Secrets reveal'd* an amusing story in which Philalethes, after curing a number of townspeople with the Elixir of Life, must flee the area due to rumors of his good feats attracting too much attention. Forced to quickly

[77] For references on alchemy as a perfecting art, see: Newman, "What Have We Learned from the Recent Historiography of Alchemy?": 314-15.
[78] Starkey, *1651 Letter*: 26-27.

disguise himself in a wig and new clothes before fleeing in the middle of the night, Philalethes simply had to go to such great troubles "else I had fallen into the hands of wicked Men, that lay in wait for me." [79] For Philalethes, anonymity was a necessary consequence of the threats of greedy individuals.

This fear of dangerous individuals extended to both Starkey and Philalethes. In the 1651 letter to Robert Boyle, Starkey claimed that he was able to produce a functional alkahest that could extract silver from a base metal. He recounts how he stirred up much excitement among the goldsmiths and refiners to whom he showed it. The smiths urged him to do a demonstration at the "publique hal" to gain further assurance it was genuine, but Starkey was unwilling "for some of my friends advised me that it was dangerous to have it bruted about abroad, that any one Could extract <gold> and <silver> out of inferior Mettals." [80] Interestingly, the germ of this fear is passed to Starkey through the advice of friends. The influence of anecdotal evidence in the construction of this complex of anxieties and bizarre beliefs surrounding seventeenth century alchemy has been a constant theme of this analysis. In this environment of danger and divine revelation, what could distinguish one alchemist as genuine and another as fraudulent?

This was a difficult question for alchemists, but we observe in the relationship between Starkey and Boyle an assessment of the latter's credibility. Starkey trusted Boyle because he was introduced to him via the Hartlib Circle, a group he trusted in turn due to their relationship with his American friend John Winthrop Jr.[81] Boyle himself held that he was immune from the gluttonous temptations that could lead an alchemist astray because he was so wealthy that he was incapable of greed: "being a Batchelor, and through Gods Bounty furnish'd with a Competant

[79] Philalethes, *Secrets reveale'd*: 34-35.
[80] Starkey, *1651 Letter*: 20.
[81] Principe, *Aspiring Adept*: 159-62; Newman, *Gehennical Fire*: 50-58.

Estate for a younger Brother, and freed from any ambition to leave my Heirs rich, I had no need to pursue Lucriferous Experiments."[82] Though Boyle did not ascribe to the millenarian prophecy or the practice of intentional obscurity, he did believe it was important for chymists to have curiosity rather than greed as their true motivation. In any case, while Starkey trusted Boyle enough to relay alchemical knowledge in clear detail, he never did reveal himself as Philalethes—to Boyle or anyone else.[83] Some secrets, perhaps, were just too dangerous to be revealed.

These anxieties indicate once again that the strategies of obscurity and secrecy are the solution to a problem which stems from genuine belief in the existence of alchemical arcana, rather than as a veiled excuse to hide experimental failures. Eirenaeus Philalethes, the "peaceful lover of truth," needed to be kept separate from George Starkey or else put Starkey in danger. Although they anticipated a dramatically transformed future for mankind, Alchemists like George Starkey kept their pursuits and theories under layers of obscurity both to protect themselves so they could carry out their research in peace and in order to preserve the status quo.

Secrecy provided other advantages to George Starkey besides protection from harm. By positioning himself as an intermediary between Philalethes and the intellectual world of the Hartlib Circle, Starkey made himself an essential interlocutor for those who wished to learn more about Philalethean alchemy. Starkey was never found out to be Philalethes, and was known to have a close relationship with the fictional adept.[84] For readers who wished to learn of Philalethes' alleged demonstrations, and perhaps learn more about what a successful

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[82] Principe, *Aspiring Adept*: 185.
[83] Newman, *Gehennical Fire*: 116.
[84] George Starkey is the editor of Philalethes' manuscripts and thus the only person known to have contact with the mysterious adept. Additionally, Philalethes tells readers that Starkey can be contacted for testimony to his arcana and medicine's effectiveness. Philalethes, *Secret's reveal'd*.

philosopher's stone consisted of, they could go to George Starkey and ask for his testimony. As the sole connection to Philalethes available to the London alchemists, Starkey was able to leverage his valuable access to the adept in order to establish good standing in intellectual circles. The disadvantage Starkey had with his relatively low wealth and social standing was not small; as we have seen, alchemy was widely considered to be esoteric and unfit for mass consumption. The financial costs involved in doing alchemical research were not negligible either: not only did materials and apparatuses cost money, but to be able to devote one's time to alchemy was a privilege reserved mostly for the elite.

It is then unsurprising that the supposedly dangerous common folk were such a persistent anxiety among chymists in the seventeenth century—the esoteric and exclusive status of alchemical knowledge that made it so attractive was contingent on the idea that it was incompatible with the vulgar. Indeed, Philalethes in *Secrets reveal'd* set out to correct "vulgar errours," meaning mistaken alchemical theories that were the result of them being made common, in addition to warning adepts not to seek "vulgar applause."[85] The common folk were unworthy of arcane knowledge both because they would fail to grasp God's most guarded secrets and because they would abuse it due to their greedy nature. However, these elitist ideas conflicted with George Starkey's financial reality: Starkey was actually sent to debtor's prison on multiple occasions during his life in London.[86] Unlike wealthy Robert Boyle, George Starkey could not claim that some alchemical gold would have had meant nothing to him. Therefore, Philalethes provided a more palatable means of disseminating his knowledge.

[85] Philalethes *Secrets reveal'd*: 52, 118.
[86] Newman, *Gehennical Fire*: 189-91.

Historian of science William R. Newman believes that leverage was a principle reason why Starkey created Philalethes in the first place.[87] However, it is not just that privileged access to an adept would render Starkey a valuable intellectual peer, but also that alchemical secrets were granted legitimacy precisely because they were *dona dei* and revealed through revelation. Given the legitimate grounds for fearing a public life as an alchemist, I do not believe that Starkey's motivation for creating Philalethes needs to be so cynical as him purely needing leverage; it is sufficient that Starkey was afraid of people finding out his advancements and was genuinely devoted to the exclusive status of alchemical knowledge. As we have seen, Starkey himself often claimed in both written correspondences and entirely private laboratory notebooks that God had revealed certain wisdom to him during experimentation. If Starkey truly believed himself to be a recipient of *dona dei* and feared such knowledge becoming public, it makes sense that he would choose to create an adept who fit with the popular transmutation discourse as a vehicle for spreading his knowledge safely.

All of these anxieties, metaphysical convictions, and social concerns account for Starkey's penchant for secrecy and obscurity and help explain the existence of Eirenaeus Philalethes. Despite Starkey's professed desire to disseminate his knowledge freely and clearly, evidently these anxieties prevented him from doing so in a manner we would today consider "transparent." He is able to achieve both the protection of his knowledge through the use of metaphors and Decknamen, as well as spread alchemical learning by providing texts like *Secrets reveal'd* which served as tools for other alchemists to navigate the world of alchemical allegory. While Newman stresses the role of Philalethean secrecy in securing Starkey's access to intellectual circles, I prefer to focus on what motivated his entry into a tradition of obscurity in

[87] Ibid.: 71-72.

the first place. Given the very genuine anxieties faced by Starkey, Philalethes was far more than a leveraging tool, but rather enabled Starkey to research alchemy in safety.

## Part II: Transmutation

In our analysis of George Starkey and Eirenaeus Philalethes' use of obscurity and secrecy, I hoped to show not only that Starkey's alchemy was empirical and serious, but that he obscured his knowledge due to understandable anxieties that follow from certain beliefs concerning the status of alchemical knowledge. There remains, however, a glaring incongruity between the rhetorical tradition of seventeenth century English alchemy and that of modern science. I believe that this incongruity can help to explain the fact that by the turn of the eighteenth century, alchemy was losing favor among experimental philosophers and the nascent institutions that came to dominate scientific culture in England.

What remains is the task of laying out how these rhetorical practices, despite having their roots in understandable anxieties and beliefs, were a hinderance to alchemy's inclusion in the modern experimental philosophical community. This will begin with an examination of how alchemy's rhetorical practices entailed certain consequences for the praxis of alchemy. I propose that the obscurity practices expressed by George Starkey presented distinct obstacles for a transition of alchemy into the new experimental movement that becomes modern institutional science. We will examine this tension through an analysis of the rhetorical practices of Robert Boyle and the Royal Society of London in the late seventeenth century. I hope to uncover certain trajectories among alchemists in the late 1600s and present a narrative not of extinction, but rather of evolution.

**Nullius in Verba**

Founded in 1660, the Royal Society of London for Improving Natural Knowledge was the first national science institute in Western Europe. A principle goal of the early Royal Society was the promotion of experimental philosophy and the group functioned as a space for scientific discussion and experimentation. Historian Steven Shapin argues that the Royal Society served as the paradigm for a modern scientific discourse characterized by civility,[88] but the Society in the late 1600s was situated in the diverse atmosphere of early modern experimental philosophy and was not yet an authority on scientific culture.

The Royal Society had explicit rules concerning its proceedings. Discussions were to pertain to the matters of fact in particular experiments and empirical accounts, rather than speculative metaphysical matters. Recall that Thomas Sprat characterized the Royal Society's experimental philosophy as being rooted in the "severe examination of particulars" and that any discussions of plausible explanations for a given demonstration had to be "orderly."[89] The order imposed here was intended to confine discussion to matters of fact—practitioners of experimental philosophy who deviated from the content of the experiments towards speculation or *ad hominem* were not fit for membership.[90] The society strove for consensus on the matters of fact contained in the demonstration. The belief was that a true science could only be built upon sound foundations, and this was the stated goal of the Royal Society's communal experimental philosophy.

[88] Shapin, *A Social History of Truth*.
[89] Sprat, *The History of the Royal-Society*: 31.
[90] Shapin and Schaffer, *Leviathan and the Air-pump*: 74-75.

In Thomas Sprat's 1667 *History of the Royal Society*, we can see how the founding members of the Society crafted procedural rules to center clarity and consensus in the natural knowledge production.[91] First of all, the Society held that public communication of discoveries was necessary and in service of the greater good, in contrast to the alchemists who consistently feared their knowledge falling into the wrong hands.[92] Secondly, rather than discussing natural marvels and anomalies, the subjects of inquiry were intentionally mundane. Sprat tells us that the society sought to examine "the *plainest* things, and those that may appear at *first* the most inconsiderable" because such mundane particulars were often neglected in favor of the more exciting phenomena reported in unverifiable stories.[93] One can imagine Sprat had the alchemical arcana in mind with this reference to distracting tall tales. Even the structure of the Society's meetings reveal that the goal was consensus among members: meetings began with a preliminary discussion of a topic, then an experimental demonstration, after which the assembly finally met "to judge and resolve upon the matter of Fact."[94] The meeting would not adjourn until consensus was reached concerning either a causal explanation for the experimental phenomenon, or the rejection of a proposed explanation.

The Society was so focused on consensus in part because it sought to better the public image of natural inquiry in general. By the late seventeenth century, the traditional frameworks of scholasticism and Aristotelianism as well as Alchemy were the targets of widespread sceptical criticism. Knowledge produced in these fields was often the result of tricks in linguistics and

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[91] Sprat, *The History of the Royal-Society.* The reader should take note that this is a history of a very young Royal Society according to one prominent member. These rules were ideals Sprat projected onto the group, and while they are quite accurate as to the intentions behind Society procedure, we can imagine that reality was quite a bit messier than Sprat admitted.
[92] Sprat, *History*: 75. Cf. subsection "Vulgarization and Obscurity."
[93] Sprat, *History*: 90.
[94] Ibid.: 97-99.

logic that only proved the cleverness of intellectuals and not truths of nature, critics claimed. In addition to anti-intellectualism, sceptics claimed that the inherent unreliability and subjectivity of experience itself cast doubt on the very possibility of systematic knowledge of the natural world.[95] The performance and practice of consensus addressed both anti-intellectual ridicule and philosophical criticism. To cultivate a good public image, the Royal Society invited prominent members of society to participate in scientific consensus as witnesses to demonstrations.[96] The requirement of consensus was also able to address sceptical doubts; Sprat describes how consensus could curb "the universal inclination of mankind, to be mis-led by themselves" and approach a sense of scientific objectivity (in the modern sense of the word).[97]

This attitude is exemplified by the Society's motto, "*nullius in verba*" meaning "take nobody's word for it." To this day, the Royal Society of London holds that *nullius in verba* "is an expression of the determination of Fellows to withstand the domination of authority and to verify all statements by an appeal to facts determined by experiment."[98] Experimentalism was to oppose dogmatism and this was ensured by regulating discourse. Here is where the first conflict with English alchemy arises, as alchemical texts garnered much authority from their authors' claims to being genuine adepts. Though alchemy valued verification through experiment, its esoteric dogmatism happened to entail obscurity, which made the possibility of judging texts purely on their content extremely difficult.

The rhetorical practices of seventeenth century English alchemy had concrete effects both on the practice of alchemy and the contributions of alchemists to the field. Alchemy was highly

[95] For a thorough and compelling intellectual history of scepticism in early modern Europe, see Popkin, *The History of Scepticism*. In particular, chapter 13 treats the philosophers of the Royal Society.
[96] Shapin, *Scientific Revolution*: 107.
[97] Sprat, *History*: 103.
[98] "History of the Royal Society."

experimental, as we observe in Starkey's meticulously detailed laboratory notebooks. These notebooks, penned sometime before 1653, also reveal a preoccupation with replicability, as Starkey includes a multitude of "conjectural" notes in which he speculates on the meanings of various recipes for arcana given in Helmontian texts or through Hartlib correspondences. In particular, Starkey extrapolated various experiments for determining a recipe for antimony, a crystalline metallic substance which he believed revealed key insights into the Philosopher's Stone. Because these conjectures were designed to be verifiable through experiment, we see that Starkey believed theory had to be verified by practice. His attitude towards replicability is further revealed by the fact that he shared some of these recipes with Boyle to carry out for himself. These conjectures acted as potential general rules, which would be vindicated by the observation of particulars in the laboratory. In contrast Sprat's strict process of starting with a solid foundation of particulars and then proceeding to general rules, it is understandable that Starkey practiced alchemy in this way as he needed to employ theoretical reasoning in order to decipher recipes in the first place.

There is an incompatibility between the discursive traditions of alchemy and that of the Society's institutional experimental philosophy. Due to the rhetorical tactics of alchemical writers, much of the work of alchemists concerned textual interpretation, and this speculative reasoning was precisely what the Royal Society sought to avoid. As described above, Starkey's laboratory notebooks display that a great amount of his alchemical practice involved analyzing and commenting on the works of van Helmont, Paracelsus, and others. Because of the allegorical language and opaque descriptions in these texts, Starkey had to determine not only what substances were being discussed in recipes, but also what metrics could be used to judge the success of an experiment. Hence his most popular work, *Secret's reveal'd,* was to serve as a key

to interpreting the language of van Helmont and George Ripley. Starkey contributed to alchemy not only his original ideas, but also tools for navigating alchemy's world of metaphors and Decknamen. This contribution to the corpus of alchemical works aligns with his insistence that he does indeed prefer clarity, as he provides a tool with which others can decipher arcane texts. The necessity for interpretation can perhaps explain why the Philalethean school of chrysopoeia, which turns on the notion that philosophical mercury is the starting ingredient of the Philosopher's Stone, is but one of many conflicting alchemical schools.[99] In any event, this discussion takes it for granted that the possibility of transmutation is a settled fact, which was hardly the case among Royal Society members. The multitude of interpretations that one could have not only of van Helmont and Paracelsus but of the Philalethean works that build upon them impede consensus on even the possibility of alchemical phenomena and do not allow for debates to turn solely on readily available matters of fact.

The Royal Society did not wish for such ambiguity to be a feature of their experimental philosophy. The key to combatting this problem would seem to be a focus on demonstrative experiments rather than theoretical texts, which invite ambiguity. As historians of early modern science Steven Shapin and Simon Schaffer put it, "the entry fee to the experimental community was to be the communication of a candidate matter of fact."[100] While Philalethes may claim that he is providing a clear recipe for philosophical mercury, the absence of a clearly communicated experiment available for public scrutiny would disqualify many aspects of this approach from the halls of the Royal Society. The language of theory was only to be contingently related to the

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[99] For example, Robert Boyle ascribed to a corpuscular matter theory and explained transmutation through that framework.
Starkey himself was no stranger to controversy, entering into many contests over the efficacy of Helmontian medicine and priority disputes over chymical cures, often landing him in legal trouble. Newman, *Gehennical*: 189-96.

[100] Shapin and Schaffer, *Leviathan and the Air-pump*: 71.

language of matters of fact, a *post hoc* formulation of metaphysics rather than directly observable reality, but alchemists (as well as other criticized disciplines such as Aristotelian natural philosophy) heavily mixed theory and observation in their writings.[101]

Robert Boyle was a key figure in the early Royal Society and was perhaps its greatest propogandist and promoter. Far from excluding alchemy on the basis of obscurity, Boyle attempted to assimilate alchemy into the experimental community by purging it problematic rhetorical practices. It is not unreasonable that he felt that such an assimilation was possible, as he well knew from his decades-long research into alchemy that it was a discipline genuinely committed to laboratory experiment as a source of knowledge. However, late seventeenth century alchemy did not produce the types of disputes deemed acceptable in the Royal Society.

In Boyle's unpublished *Dialogues on Transmutation*, he simulates how alchemy might be treated in an experimental community such as the Royal Society. The tract, which exists only in fragments, has an unknown date of origin, though Lawrence Principe places it sometime after the *Skeptical Chymist* was published in 1662.[102] The first dialogue consists of a group of philosophers discussing a piece of gold that group member Phileta claims is transmuted. Another member, Erastus, insists that transmutation by projection has never been proven, and that alchemical texts are largely fictions. The members of the group physically divide themselves into three factions: pro-transmutation "Lapidists" like Phileta, anti-transmutation "anti-Lapidists" like Erasmus, as well as a third neutral party. A vehement debate ensures, with fierce insults, bald assertions, and acrid words thrown back and forth between the parties.

[101] Ibid.: 72.
[102] Principe, *Aspiring Adept*: 63-64.

Eventually, a consensus is reached which asserts the real possibility of chrysopoeia. Because the anti-Lapidists will not accept the speculative theories of adepts as permissible evidence, the Lapidists must provide worthy testimony of its possibility and plausibility. In the dialogues, Boyle conveys through the character Philoponus an account of transmutation which he himself had witnessed,[103] as well as other reports of experiments and substances with remarkable properties that would indicate that chrysopoeia is possible. Recall that among alchemists, the possibility of chrysopoeia was an assumption to be explained by theory. This simulated debate was thus a necessary prerequisite for alchemy to be studied in a community akin to the Royal Society—discussions in the Society did not pertain to large theoretical problems, such as the above transmutation debate, but rather demonstrable particulars upon which theories could potentially be built. If the metaphysical possibility of transmutation is settled, perhaps a process of alchemical fact-gathering could follow.

In these dialogues, as well as those published in the *Sceptical Chymist*, a model of scientific discourse is put forward whose principle virtue is the production of consensus through discussion. Truth is emergent from disputation and discussion, so long as that dispute is confined to matters of fact and solid testimony. Far from vindicating the adepts, the *Dialogues on Transmutation* actually expressed Boyle's own consternation at trying to interpret chrysopoeia writings. Hence the dramatized argument is decided not by the presentation of a compelling allegory or theoretical proposition but rather by a plain description of a demonstrations. Boyle disagreed both with those who would abandon alchemy altogether, like Thomas Sprat and Thomas Hobbes, and those who would insist it remain obscure and secretive, like George

[103] Ibid.: 98-99.

Starkey and Isaac Newton.[104] Likewise, the anti-Lapidists' arguments hinged on *a priori* assumptions about the impossibility of transmutation, which is why they are ultimately defeated in the fictional debate.[105] Alchemists such as Philalethes offered the possibility of experiment, and doubtless from these experiments Boyle built his belief in alchemy and transmutation. Nevertheless, the adepts' methods as they stood did not accord with standards of the Royal Society.

**Excuses of Philaletha**

George Starkey, with his repeated desire to share his knowledge candidly, may not have been entirely opposed to Boyle's criticisms of alchemy and obfuscation. However, there were real motivations for obscurity which we examined in the first part of this thesis. Was alchemy, then, an exception to the standards of Boyle's experimental community because of the real dangers that would result from non-obscurity?

Robert Boyle certainly did not think so, as is apparent in his "Excuses of Philaletha," a text that catalogs the Philalethean arguments for obscurity and provides a systematic rebuttal of each point. It is apparent that Boyle did not ascribe to the millenarian prophecy of Elias Artista, as he dismisses the arguments for "rendering [the arcana] common" not as a concern for greedy common folk, but rather as an expression of the alchemists' own envy and mistaken assumption of who is and who isn't worthy. "Those whom they pretend to be unworthy they may make worthy if they please," a process that could perhaps occur through civil public discourse. Of

[104] Ibid.: 71. Recall that Isaac Newton kept his alchemy so secretive that its extent was not fully uncovered until the mid-1900s.
[105] Principe, *Aspiring Adept*: 92.

course, from Starkey's perspective, in the time preceding the golden age most of mankind was wicked and thus unworthy of the arcana and could not be made worthy by any mortal act. Nevertheless, Boyle refuted the idea that the divine status of alchemical knowledge was grounds for exclusivity, a stance Boyle can easily take as he viewed fact rather than divine authority as the ultimate foundation of natural knowledge.

Concerning the physical danger to alchemist that could result from transparency, Boyle again accuses Philalethes of exaggeration. He argues "that the danger the *Adepti* may run as to their persons, need not be so great as they do, or would have Others fancy, and Some danger may wel be ventur'd upon by persons so prosperous as they, and for doing so great good." In other words, the good that would result from a community that researched alchemical arcana from a position of consensus would outweigh and negate any danger they faced as individuals. Boyle both thought that the element of personal danger was overstated and that what little danger was present was a worthy price to pay "for doing so great good." While Boyle certainly understood the reasoning behind this fear—it is almost certain that he heard the same stories of harassed adepts as George Starkey and read Philalethes' own account of fleeing from a mob in the dead of night—he was apparently less inclined to take such stories at face value.

And finally, to the point that social unrest would follow the vulgarization of the alchemical arcana, "that it would much disorder the affairs of Mankind, Favour, Tyranny, and bring a general Confusion, turning the world topsy turvey," Boyle replies that this is again an exaggeration. In fact, Boyle considered the secrets of transmutation "the greatest humane Talent in the World" and believed that wisdom should be shared openly shared. He wonders why the adepts do not at least give the public a few "profitable Particulars" which would not only vindicate the alchemists work but be a benefit to mankind. For knowledge of transmutation and

arcane medicines could be fuel for advancements in society, if only the Philalethists would allow it. In Starkey's defense, he was an adamant public protenant of iatrochemical cures which were choice fruits of his alchemical labor. He often defended their use in treatises and participated in multiple public disputes concerning the advantages of the iatrochemical approach to curing disease over the traditional, humoral medical scheme.[106]

Ultimately, Boyle's "arguments against Philaletha" do not sufficiently addresses one of Starkey's reasons for secrecy: the leveraging of Philalethes to grant him access to intellectual circles. Boyle, for whom wealth was no concern, took it for granted that the adepts were "prosperous," however the real Philalethes, George Starkey, was of exceedingly modest means. He was not an elite with scientific interests he could liberally entertain; he was a practitioner and husband, who had decided to pursue the secrets of alchemy out of a passion for discovery. A major obstacle for Starkey's access to alchemical circles was not only his outsider status, but also the real financial expenses involved in performing experiments: laboratory space, custom instruments, and rare ingredients were very expensive, and thus only available to those who could afford them. The pseudonymous Philalethes not only provided Starkey access to an elite community of scholars but preserved the authority of his alchemy by staking it on a wonderous adept rather than a modest physician from Bermuda.[107]

For alchemy to mesh with the Royal Society's experimental community, it had to be geared towards the production of general rules. In this chymical context, that meant providing a replicable recipe for the Philosopher's Stone or universal instructions for transmutation. These techniques would need to be communicated clearly to avoid multiple interpretations. Therefore,

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[106] Fletcher, *Starkey Revived.*
[107] From the Robert Boyle Papers, Royal Society Library (BP 19, 187v-188r) in Newman, *Gehennical*: 254-55.

Boyle attacked not the content or structure but the obscurity of Philalethean alchemy in an attempt to bring alchemy into the nascent experimental institution he was helping to cultivate. Whether Boyle was able to accurately redress the sources for this obscurity or rather circumvent them due to his social position is ambiguous, but ultimately his opinion on their superfluity has won out. How much these arguments are honest criticisms of obscurity as a practice or more an expression of Boyle's personal frustration that Philalethes had contact with Starkey and not himself, we cannot say. However, it is apparent that it was the obscurity of discourse itself which prevented a smooth incorporation of alchemy into what would become modern experimental science.

**Controversy**

By the late seventeenth century, Alchemy had an ambiguous status not only among intellectuals but among the general public. The following two seventeenth century paintings display the polarized cultural attitudes towards alchemy in this time period. In the first painting by Flemish artist David Teniers (*figure 2.*) c. 1650, we see a cleanly dressed and focused alchemist performing an experiment in an orderly, well-lit laboratory. His reference books at the ready, the alchemist uses empirical tools to verify alchemical theories and recipes, a testament to alchemy's intellectual legitimacy. He even has an assistant who can provide technical aid and act as an additional witness to the experiment. Furthermore, the money pouch attached to his hip indicates that he is not unwealthy, and that alchemy is an acceptable practice for wealthy people or perhaps even a respectable means of making a living.

In the second painting by another Dutch artists, Cornelis Pietersz Bega (*figure 2.*), painted in 1663, we see a much more uncharitable depiction of an alchemist. This alchemist is squatting amid the dim chaos of his laboratory, surrounded by manuscript pages, overturned equipment, and broken containers. With a glazed-over expression, he somberly weighs some red powder, but seems to be preforming no kind of systematic experiment. His clothes are unkempt, ripped, and dirty. This depiction conveys an idea of squandered, fruitless work. This alchemist is young and alone in his hovel-like laboratory, while it would be more proper for him to be raising a family and providing for them. The painting expresses the view that alchemy is a route to self-destruction with no value: neither can it produce real knowledge nor can it provide stable income.

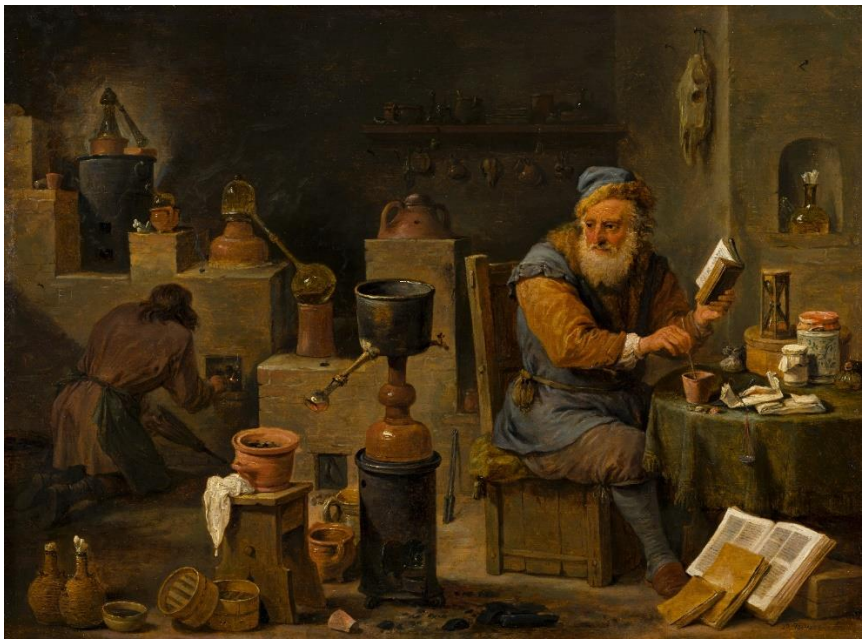

*Figure 2. David Teniers the Younger,* The Alchemist, *c. 1650. A concentrated alchemist stirs something in his bowl while holding a reference book. Fig.2 Teniers the Younger, David,* The Alchemist, *painting, c. 1650, https://www.mauritshuis.nl/en/explore/the-collection/artworks/the-alchemist-261/#.*

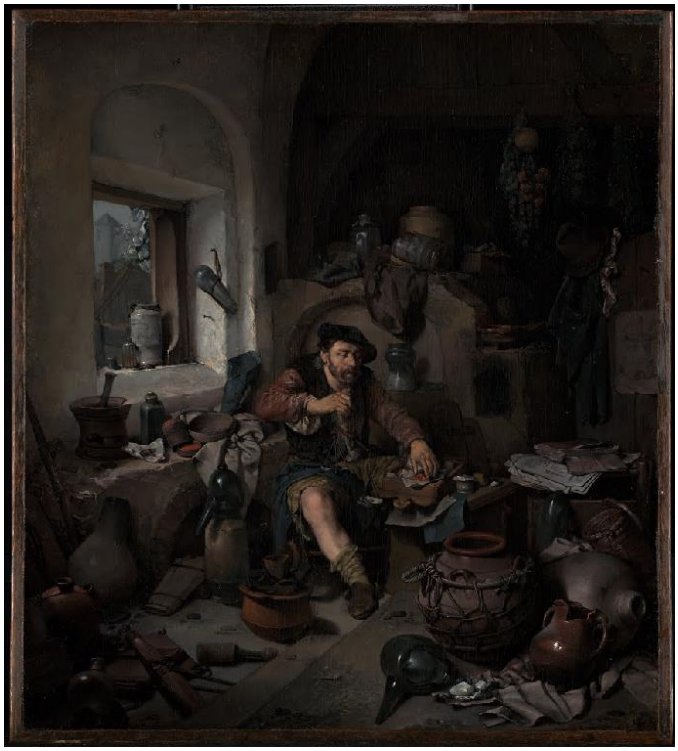

*Figure 1. Cornelis Pietersz Bega,* The Alchemist, *1663. An oblivious alchemists sits amid the chaos of his slovenly laboratory. Fig. 3, Bega, Cornelis,* The Alchemist, *Oil on panel, 1663, (The J. Paul Getty Museum), https://www.getty.edu/art/collection/objects/734/cornelis-bega-the-alchemist-dutch-1663/..*

Given the ambiguous status of alchemists at all levels of European society, it is no wonder that Boyle could only imagine alchemical discourse in his experimental community as coming to controversy and polemical debate as demonstrated by his *Dialogues on Transmutation.*[108] Lawrence Principe believes that the *Dialogues* went unpublished for that very reason; the parallels between Boyle's fictionalized society and the Royal Society are so obvious, that he would not dare insinuate that the fellows have agreed on the reality of transmutation, as it was such a controversial topic.[109]

[108] The public perception of alchemists in seventeenth century Europe was determined by a multitude of factors. Witness testimony to transmutation, the effectiveness of chymical medicines, and the productivity of metallurgists are just a few sources of positive belief in alchemy. Testimonies of alchemical fraud and general anti-intellectualism should be counted among evidence for negative belief in alchemy. As should be apparent to the reader, an account of alchemy's decline cannot be measured purely by the public perception of alchemy. For the purposes this paper, I consider it sufficient to demonstrate the ambiguous image of alchemist through an analysis of the above paintings.
[109] Principe, A*spiring Adept*: 71.

Alchemy was not only controversial because it lacked a clearly delineated experimental program. The crowning glories of alchemy—the major arcana like the Philosopher's Stone and alkahest—were controversial in themselves because they had momentous metaphysical and theological stakes. In part due to the necessity of textual interpretation, when an alchemist wished to assert the reality of the philosopher stone, they had to simultaneously assert a metaphysical framework that allowed for its plausibility. In *Secrets reveal'd*, Starkey set up a metaphysical foundation for justifying his belief that philosophical mercury was the starting ingredient of the Elixir, namely the Helmontian elemental theory that air and water are the primary elements of matter.[110] In the *Dialogues* Boyle had to provide the same metaphysical framework, explaining the possibility of transmutation of metals through a corpuscular theory of matter.[111] This is a metaphysical debate, unable to confined to particulars—for when the phenomena at hand are invisible to the naked eye as they are in chemical analyses, metaphysics provides a framework through which particulars can be factually understood. Because the metaphysics of matter and substance were still hotly debated in the late seventeenth century, they were not the proper subjects for discussion in the Royal Society of London.

Steven Shapin and Simon Schafer identify how in the Royal Society, Boyle explicitly avoided addressing metaphysical questions, which were extremely difficult to settle based on experiment. Instead, he adopted a strategy of sticking solely to the demonstration at hand to pursue consensus on the matters of fact of experiment, rather than entertain a fruitless, speculative discussion of an experiment's metaphysical implications.[112] This did not disqualify alchemy from the Royal Society's experimental community, for surely the matters of fact of a

[110] Philalethes, *Secrets reveal'd*:4-5.
[111] Principe, A*spiring Adept*: 91.
[112] Shapin and Schaffer, *Leviathan and the Air-pump*: 44-46.

demonstrated transmutation, for example, would be feasible grounds for discussion. However, due to the absence of clear and consistent experiments in the obscure alchemical writings and the general reluctance for alchemists to reveal themselves publicly, it is unsurprising that no discussion of transmutation is known to be held at the Royal Society. English alchemists jumped back and forth between experiment and theoretical speculation, interpreting allegories through a framework to perform experiments and refining that framework from observations of those experiments. By allowing both theory and practice to inform one another, they adopted a methodology that was incompatible with the Royal Society's confinement of discussion to matters of fact.

**Publicity and Privacy**

Alchemical experiment was fundamentally a private practice, but the Royal Society demanded demonstrations be carried out in a "public space." This public space was not one of complete accessibility, but rather a controlled setting in which trusted witnesses who were admitted to Society proceedings could testify to the veracity of experiments preformed and lend authority to the claims presented to the Public. Like the alchemists, these experiments were performed in a laboratory setting, however the alchemical laboratory was characterized by its privacy. The Royal Society on the other hand required the laboratory to be a restricted but public space: "a disciplined space, where experimental, discursive, and social practices were collectively controlled by competent members," to borrow Shapin and Schaffer's words.[113] In this way, the alchemical laboratory was transformed into a public space by the Royal Society,

[113] Ibid.: 39.

but still maintained an air of exclusivity; only disciplined natural philosophers were fit to be expert witnesses.

The issue of whether a laboratory should be a public or private setting was intensely debated in the mid-seventeenth century.[114] The alchemical laboratory was a site of "slovenly worke not befitting any but a Chemist," and a vital hermetic chamber that could protect alchemical knowledge from the public eye.[115] The privacy of the laboratory was necessitated by the revelation epistemology and millenarian prophecy present in Philalethean alchemy. Because only the pure of heart were fit to receive knowledge of the arcana, and because this divine knowledge was granted through revelation in the empirical space of the laboratory (such as when Starkey received a visit from his 'good genius' while researching the Elixir), the laboratory had to remain exclusive. This fundamental privacy was incompatible with the Royal Society's epistemology of consensus, which demanded a public experimental space. Because of this divergence in privacy and publicity, the alchemical and the communal traditions of philosophy took different approaches to determining the credibility of collaborators. In both the Royal Society and the Hartlib Circle, for example, the worthiness of an interlocutor or collaborator was largely determined by their social standing and familiarity. But in the much more esoteric field of alchemy, the stakes of misjudging the credibility of a fellow alchemist had considerably greater consequences. In any case, the modern laboratory was a "public space insisted upon by experimental philosophers… a space for collective witnessing."[116] To make this demand of alchemy was to demand a fundamental overhaul of its discursive tradition.

[114] Ibid.: 335.
[115] Starkey, *1651 Letter*: 39.
[116] Shapin and Schaffer, *Leviathan and the Air-pump*: 335.

**Conclusions**

We can see the version of alchemy Boyle wished would take hold in his famous 1661 text *The Sceptical Chymist*. The text presents another series of theatrical discussions between gentlemen, but unlike the peppery debates of *The Dialogues on Transmutation*, these interlocutors refrain from personal insults and never lose their temper. *The Sceptical Chymist* privileges the rhetorical modes of civility and consensus as valuable tools for arriving at scientific truth.[117] The subject of this text is namely Boyle's corpuscular matter theory, and its veracity is asserted through a series of discussions in which all sides present experiments for collective scrutiny, rather than mere metaphysical arguments.[118] Civility, clarity, and consensus are privileged rhetorical modes in Boyle's world, and they were deliberately connected with an experimental epistemology. The interlocutors in the *Sceptical Chymist* opt for demonstrative experiments over logical syllogisms to decide matters, because "dialectical subtleties… are wont much more to declare the wit of him that uses them, than increase the knowledge or remove the doubts of sober lovers of truth."[119] *The Sceptical Chymist* is often famed for presenting the first modern description of atomist chemical theory, but its privileging of consensus and free, civil discourse were just as modern as its theoretical content.

Ultimately, the credibility of alchemists and alchemy continued to decline during the early eighteenth century. Despite the methodological and empirical compatibility of alchemy and communal experimental philosophy, alchemy could not be assimilated into what would become the hegemonic science unless it abandoned its obscure and secret practices. The obscurity and

[117] The air of genteel civility is immediately asserted as Boyle's mouthpiece, Carneades, is welcomed into a lush garden. Boyle, *The Sceptical Chymist*: 9-13.
[118] The three sides of this argument are the Aristotelians, the Paracelsians, and the corpuscularists. Each side presents an experiment which the other two scrutinize, all striving to arrive at common agreement. Ibid.: 21-28.
[119] Ibid.:17.

secrecy practices of English alchemists like George Starkey were surprisingly reasonable tactics when placed into their proper historical context, however they do present significant impediments for a smooth transition to modern science's chemistry.

There were a handful of anxieties which motivated chymical obscurity and secrecy generally as well as in Starkey's particular case. This paper has established that George Starkey's rhetorical obfuscations were primarily motivated by four things: Firstly, the Revelation Epistemology and belief in the millenarian prophecy dictated that knowledge of the secrets of nature was only meant for the worthiest philosophers of nature. Secondly, it was perceived dangerous for an adept's identity to be publicly known. Third, the alchemical arcana, specifically the Philosopher's Stone, were potentially disruptive to the social, political, and religious order of English society by their potential to upset the stability of currency. And fourth, George Starkey could leverage his relationship with Philalethes to gain credibility and access to English intellectual elites such as the Hartlib Circle.

Because Alchemy had to abandon such practices to live on in modern experimental science, the identity of both alchemy and alchemists underwent massive transformations in the period stretching from the second half of the seventeenth century to the early eighteenth century. The trajectory of this change is evident in Robert Boyle's attempts to change the rhetorical structure of alchemical discussions and privilege the modern epistemic value of consensus rather than the premodern epistemic value of personal, divinely revealed knowledge. The narrative presented in this thesis is a story of changing rhetorical practices but also of changing epistemological values, as the secrecy and obscurity entailed by the revelation epistemology eventually gave way to the clarity and public scrutiny of communal experimental science.

The unflattering image of alchemy as a pseudoscience was already being constructed in the eighteenth century. *Figure 4.* shows a frontispiece for the 1744 and 1772 editions of Boyle's *Works*. To the left of Boyle and the female figure are medieval laboratory instruments for studying fire, such as a furnace and an alembic. To the right are equipment for studying air, namely Boyle's famous air-pump for creating a vacuum chamber. Steven Shapin and Simon Schafer interpret the image as commenting on the trajectory of early modern science: the female figure, who rests on a pile of books which symbolize natural knowledge, is turned away from the old, alchemical instruments and towards novel demonstrative equipment. It is not meant to criticize alchemy, but rather to show "the relative value of the two programs and their resulting intellectual products."[120] The old way had its value, especially in the context of experiment, but the novel, modern way was better capable of producing sound knowledge.

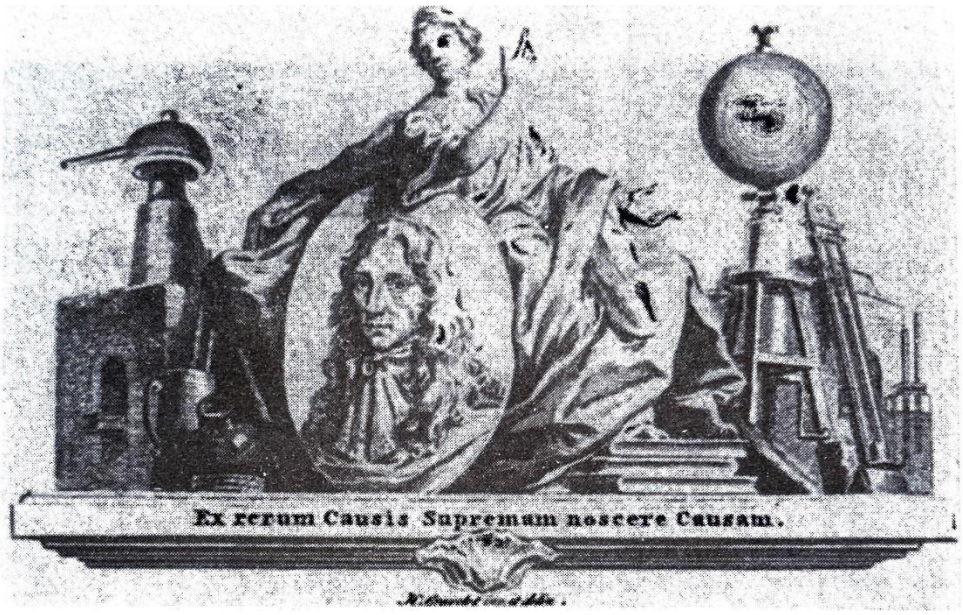


*Figure 4. This eighteenth-century frontispiece for Boyles's* Works *depicts Boyle situated between two sets of experimental instruments Fig. 4, Gravelot, Hubert Francois, Frontispiece, print, 1774 and 1772, in Shapin and Schaffer,* Leviathan and the Air-pump: 34.

[120] Shapin and Schaffer, *Leviathan and the Air-pump*: 34.

Robert Boyle, situated as he was at the intersection of the old tradition of alchemy and the novel experimental philosophy, is an important actor in this transformation of alchemy into modern chemistry. Neither a premodern alchemist nor a modern chemist, Boyle's chymistry displays the experimental virtues of alchemy and vindicates its hunt for the arcana. Nonetheless he criticized and eschewed the obscurity practices of seventeenth century alchemy in favor of a new epistemology grounded in consensus and matters of fact, rather than interpretation and revelation.

Indeed, the tension between obscurity and the requirements of organized science was already being felt by Starkey in the late 1600s. This is evident in his numerous announcements of frustration that he had to keep his wisdom hidden, and Philalethes' insistence that he was providing unprecedently clear descriptions of arcana. One wonders whether Starkey would have been more open with his alchemical knowledge if he had secure social and economic standing like Boyle. For Boyle could claim immunity from greed and ill-intentions, while Starkey had to leverage his relationship with a fictitious adept just to meaningfully participate in London's intellectual culture.

When delineating between alchemy and chemistry in the eighteenth century, we should be wary of taking its sudden decline as a sign of alchemy's illegitimacy. Alchemy shared much in common with experimental philosophy and its achievements and contributions to early modern science were not small. It appears that alchemy hardly disappeared, but rather underwent a gradual change in discursive practice to assimilate into the new scientific culture. This trajectory towards clarity is apparent in the progression of rhetorical styles seen in the unabashedly obscure Paracelsian and Helmontian texts, the reluctantly obscure Philalethean corpus, and the transparent chymistry of Robert Boyle in the *Skeptical Chymist*. Put another way,

alchemy itself underwent a transmutation into a “nobler” sort of science, one fit for the noblemen of the Royal Society and forged by the hands of Robert Boyle and others.

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