Alchemy

Alchemy (from Arabic: *al-kīmiyā*)[1] was an ancient branch of natural philosophy, a philosophical and protoscientific tradition[2] practised throughout Europe, Africa, and Asia,[2] originating in Greco-Roman Egypt in the first few centuries .[3]

Kimiya-yi sa'ādat (*The Alchemy of Happiness*), a text on Islamic philosophy and alchemy by the Persian philosopher and mystic Al-Ghazālī (11th century)

Alchemists attempted to purify, mature, and perfect certain materials.[2][4][5][n 1] Common aims were chrysopoeia, the transmutation of "base metals" (e.g., lead) into "noble metals" (particularly gold);[2] the creation of an elixir of immortality;[2] the creation of panaceas able to cure any disease; and the development of an alkahest, a universal solvent.[6] The perfection of the human body and soul was thought to permit or result from the alchemical *magnum opus*[2] and, in the Hellenistic and Western mystery tradition, the achievement of gnosis.[5] In Europe, the creation of a philosopher's stone was variously connected with all of these projects.

In English, the term is often limited to descriptions of European alchemy, but similar practices existed in the Far East, the Indian subcontinent, and the Muslim world.[2] In Europe, following the 12th-century Renaissance[2] produced by the translation of Medieval Islamic works on science and the rediscovery of Aristotelian philosophy, alchemists played a significant role in early modern science[7] (particularly chemistry and medicine). Islamic and European alchemists developed a structure of basic laboratory techniques, theory, terminology, and experimental method, some of which are still in use today. However, they continued antiquity's belief in four elements and guarded their work in secrecy including cyphers and cryptic symbolism. Their work was guided by Hermetic principles related to magic, mythology, and religion.[8]

Depiction of Ouroboros from the alchemical treatise *Aurora consurgens* (15th century), Zentralbibliothek Zürich, Switzerland

Modern discussions of alchemy are generally split into an examination of its exoteric practical applications and its esoteric spiritual aspects, despite the arguments of scholars like Holmyard[9] and von Franz[10] that they should be understood as complementary. The former is pursued by historians of the physical sciences who examine the subject in terms of early chemistry, medicine, and charlatanism, and the philosophical and religious contexts in which these events occurred. The latter interests historians of esotericism, psychologists, and some philosophers and spiritualists. The subject has also made an ongoing impact on literature and the arts. Despite this split, which von Franz believes has existed since the Western traditions' origin in a mix of Greek philosophy that was mixed with Egyptian and Mesopotamian technology,[10] numerous sources have stressed an integration of esoteric and exoteric approaches to alchemy as far back as Pseudo-Democritus's first-century AD *On Physical and Mystical Matters* (Greek: *Physika kai Mystika*).[11]

Although alchemy is popularly associated with magic, historian Lawrence M. Principe argues that recent historical research has revealed that medieval and early modern alchemy embraced a much more varied set of ideas, goals, techniques, and practices:

> Most readers probably are aware of several common claims about alchemy—for example, ... that it is akin to magic, or that its practice then or now is essentially deceptive. These ideas about alchemy emerged during the eighteenth century or after. While each of them might have limited validity within a narrow context, none of them is an accurate depiction of alchemy in general."[12]

Contents

Etymology

The word alchemy comes from Old French *alquemie*, *alkimie*, used in Medieval Latin as *alchymia*. This name was itself brought from the Arabic word *al-kīmiyā* (الكيمياء or الخيمياء) composed of two parts: the Late Greek term *khēmeía* (χημεία), *khēmía* (χημία), meaning 'to fuse or cast a metal',[13][14] and the Arabic definite article *al-* (ال), meaning 'The'.[15] Together this association can be interpreted as 'the process of transmutation by which to fuse or reunite with the divine or original form'. Its roots can be traced to the Egyptian name *kēme* (hieroglyphic  *khmi*), meaning 'black earth' which refers to the fertile and auriferous soil of the Nile valley, as opposed to red desert sand.[15]

According to the Egyptologist Wallis Budge, the Arabic word *al-kīmiya'* actually means "the Egyptian [science]", borrowing from the Coptic word for "Egypt", *kēme* (or its equivalent in the Mediaeval Bohairic dialect of Coptic, *khēme*). This Coptic word derives from Demotic *kmỉ*, itself from ancient Egyptian *kmt*. The ancient Egyptian word referred to both the country and the

colour "black" (Egypt was the "Black Land", by contrast with the "Red Land", the surrounding desert); so this etymology could also explain the nickname "Egyptian black arts". However, according to Mahn, this theory may be an example of folk etymology.[15] Assuming an Egyptian origin, chemistry is defined as follows:

> **Chemistry**, from the ancient Egyptian word "khēmia" meaning transmutation of earth, is the science of matter at the atomic to molecular scale, dealing primarily with collections of atoms, such as molecules, crystals, and metals.

Thus, according to Budge and others, chemistry derives from an Egyptian word *khemein* or *khēmia*, "preparation of black powder", ultimately derived from the name *khem*, Egypt. A decree of Diocletian, written about 300 AD in Greek, speaks against "the ancient writings of the Egyptians, which treat of the *khēmia* transmutation of gold and silver".[16]

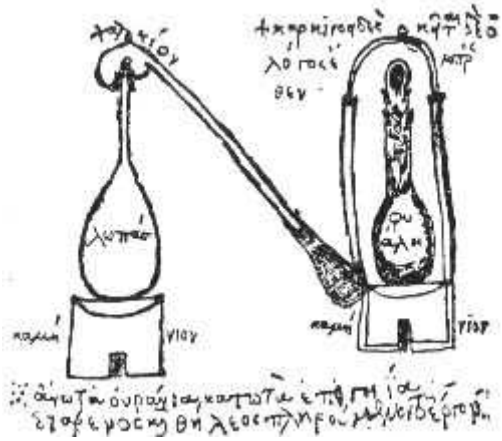
The Medieval Latin form was influenced by Greek *chymeia* (χυμεία) meaning 'mixture' and referring to pharmaceutical chemistry.[17]

History

Alchemy encompasses several philosophical traditions spanning some four millennia and three continents. These traditions' general penchant for cryptic and symbolic language makes it hard to trace their mutual influences and "genetic" relationships. One can distinguish at least three major strands, which appear to be largely independent, at least in their earlier stages: Chinese alchemy, centered in China and its zone of cultural influence; Indian alchemy, centered on the Indian subcontinent; and Western alchemy, which occurred around the Mediterranean and whose center has shifted over the millennia from Greco-Roman Egypt, to the Islamic world, and finally medieval Europe. Chinese alchemy was closely connected to Taoism and Indian alchemy with the Dharmic faiths, whereas Western alchemy developed its own philosophical system that was largely independent of, but influenced by, various Western religions. It is still an open question whether these three strands share a common origin, or to what extent they influenced each other.

Hellenistic Egypt

The start of Western alchemy may generally be traced to ancient and Hellenistic Egypt, where the city of Alexandria was a center of alchemical knowledge, and retained its pre-eminence through most of the Greek and Roman periods.[18] Here, elements of technology, religion, mythology, and Hellenistic philosophy, each with their own much longer histories, combined to form the earliest known records of alchemy in the West. Zosimos of Panopolis wrote the oldest known books on alchemy, while Mary the Jewess is credited as being the first non-fictitious Western alchemist.[19] They wrote in Greek and lived in Egypt under Roman rule.



Ambix, cucurbit and retort of Zosimos, from Marcelin Berthelot, *Collection des anciens alchimistes grecs* (3 vol., Paris, 1887–1888).

Mythology – Zosimos of Panopolis asserted that alchemy dated back to Pharaonic Egypt where it was the domain of the priestly class, though there is little to no evidence for his assertion.[20] Alchemical writers used Classical figures from Greek, Roman, and Egyptian mythology to illuminate their works and allegorize alchemical transmutation.[21] These included the pantheon of gods related to the Classical planets, Isis, Osiris, Jason, and many others.

The central figure in the mythology of alchemy is Hermes Trismegistus (or Thrice-Great Hermes). His name is derived from the god Thoth and his Greek counterpart Hermes. Hermes and his caduceus or serpent-staff, were among alchemy's principal symbols. According to Clement of Alexandria, he wrote what were called the "forty-two books of Hermes", covering all fields of knowledge.[22] The *Hermetica* of Thrice-Great Hermes is generally understood to form the basis for Western alchemical philosophy and practice, called the hermetic philosophy by its early practitioners. These writings were collected in the first centuries of the common era.

Technology – The dawn of Western alchemy is sometimes associated with that of metallurgy, extending back to 3500 BC.[23] Many writings were lost when the emperor Diocletian ordered the burning of alchemical books[24] after suppressing a revolt in Alexandria (AD 292). Few original Egyptian documents on alchemy have survived, most notable among them the Stockholm papyrus and the Leyden papyrus X. Dating from AD 250-300, they contained recipes for dyeing and making artificial gemstones, cleaning and fabricating pearls, and manufacturing of imitation gold and silver.These writings lack the mystical, philosophical elements of alchemy, but do contain the works of Bolus of Mendes (or Pseudo-Democritus), which aligned these recipes with theoretical knowledge of astrology and the classical elements.[25] Between the time of Bolus and Zosimos, the change took place that transformed this metallurgy into a Hermetic art.[26]

Philosophy – Alexandria acted as a melting pot for philosophies of Pythagoreanism, Platonism, Stoicism and Gnosticism which formed the origin of alchemy's character.[25] An important example of alchemy's roots in Greek philosophy, originated by Empedocles and developed by Aristotle, was that all things in the universe were formed from only four elements: earth, air, water, and fire. According to Aristotle, each element had a sphere to which it belonged and to which it would return if left undisturbed.[27] The four elements of the Greek were mostly qualitative aspects of matter, not quantitative, as our modern elements are; "...True alchemy never regarded earth, air, water, and fire as corporeal or chemical substances in the present-day sense of the word. The four elements are simply the primary, and most general, qualities by means of which the amorphous and purely quantitative substance of all bodies first reveals itself in differentiated form."[28] Later alchemists extensively developed the mystical aspects of this concept.

Alchemy coexisted alongside emerging Christianity. Lactantius believed Hermes Trismegistus had prophesied its birth. St Augustine later affirmed this in the 4th & 5th centuries, but also condemned Trismegistus for idolatry.[29] Examples of Pagan, Christian, and Jewish alchemists can be found during this period.

Most of the Greco-Roman alchemists preceding Zosimos are known only by pseudonyms, such as Moses, Isis, Cleopatra, Democritus, and Ostanes. Others authors such as Komarios, and Chymes, we only know through fragments of text. After AD 400, Greek alchemical writers occupied themselves solely in commenting on the works of these predecessors.[30] By the middle of the 7th century alchemy was almost an entirely mystical discipline.[31] It was at that time that Khalid Ibn Yazid sparked its migration from Alexandria to the Islamic world, facilitating the translation and preservation of Greek alchemical texts in the 8th and 9th centuries.[32]

India

The 2nd millennium BCE text Vedas describe a connection between eternal life and gold.[33] The use of Mercury for alchemy is first documented in the 3rd- or 4th-century BCE text *Arthashastra*. Buddhist texts from the 2nd to 5th centuries mention the transmutation of base metals to gold. Greek alchemy may have been introduced to Ancient India through the invasions of Alexander the Great in 325 BC, and kingdoms that were culturally influenced by the Greeks like Gandhāra, although hard evidence for this is lacking.[33]

The 11th-century Persian chemist and physician Abū Rayhān Bīrūnī, who visited Gujarat as part of the court of Mahmud of Ghazni, reported that they

> have a science similar to alchemy which is quite peculiar to them, which in Sanskrit is called Rasayāna and in Persian Rasavātam. It means the art of obtaining/manipulating *Rasa*: nectar, mercury, and juice. This art was restricted to certain operations, metals, drugs, compounds, and medicines, many of which have mercury as their core element. Its principles restored the health of those who were ill beyond hope and gave back youth to fading old age.

The goals of alchemy in India included the creation of a divine body (Sanskrit *divya-deham*) and immortality while still embodied (Sanskrit *jīvan-mukti*). Sanskrit alchemical texts include much material on the manipulation of mercury and sulphur, that are homologized with the semen of the god Śiva and the menstrual blood of the goddess Devī.

Some early alchemical writings seem to have their origins in the Kaula tantric schools associated to the teachings of the personality of Matsyendranath. Other early writings are found in the Jaina medical treatise *Kalyāṇakārakam* of Ugrāditya, written in South India in the early 9th century.[34]

Two famous early Indian alchemical authors were Nāgārjuna Siddha and Nityanātha Siddha. Nāgārjuna Siddha was a Buddhist monk. His book, *Rasendramangalam*, is an example of Indian alchemy and medicine. Nityanātha Siddha wrote *Rasaratnākara*, also a highly influential work. In Sanskrit, *rasa* translates to "mercury", and Nāgārjuna Siddha was said to have developed a method of converting mercury into gold.[35]

Scholarship on Indian alchemy is in the publication of *The Alchemical Body* by David Gordon White.[36] A modern bibliography on Indian alchemical studies has been written by White.[37]

The contents of 39 Sanskrit alchemical treatises have been analysed in detail in G. Jan Meulenbeld's *History of Indian Medical Literature*.[38][n 2] The discussion of these works in HIML gives a summary of the contents of each work, their special features, and where possible the evidence concerning their dating. Chapter 13 of HIML, *Various works on rasaśāstra and ratnaśāstra* (or *Various works on alchemy and gems*) gives brief details of a further 655 (six hundred and fifty-five) treatises. In some cases Meulenbeld gives notes on the contents and authorship of these works; in other cases references are made only to the unpublished manuscripts of these titles.

A great deal remains to be discovered about Indian alchemical literature. The content of the Sanskrit alchemical corpus has not yet (2014) been adequately integrated into the wider general history of alchemy.

Islamic world

After the fall of the Roman Empire, the focus of alchemical development moved to the Islamic World. Much more is known about Islamic alchemy because it was better documented: indeed, most of the earlier writings that have come down through the years were preserved as Arabic translations.[39] The word *alchemy* itself was derived from the Arabic word *al-kīmiyā* (الكيمياء). The early Islamic world was a melting pot for alchemy. Platonic and Aristotelian thought, which had already been somewhat appropriated into hermetical science, continued to be assimilated during the late 7th and early 8th centuries through Syriac translations and scholarship.

In the late 8th century, Jābir ibn Hayyān (Latinized as "Geber" or "Geberus") introduced a new approach to alchemy, based on scientific methodology and controlled experimentation in the laboratory, in contrast to the ancient Greek and Egyptian alchemists whose works were often allegorical and unintelligible, with very little concern for laboratory work.[40] Jabir is thus "considered by many to be the father of chemistry",[41] albeit others reserve that title for Robert Boyle or Antoine Lavoisier. The science historian, Paul Kraus, wrote:

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> To form an idea of the historical place of Jabir's alchemy and to tackle the problem of its sources, it is advisable to compare it with what remains to us of the alchemical literature in the Greek language. One knows in which miserable state this literature reached us. Collected by Byzantine scientists from the tenth century, the corpus of the Greek alchemists is a cluster of incoherent fragments, going back to all the times since the third century until the end of the Middle Ages.
>
> The efforts of Berthelot and Ruelle to put a little order in this mass of literature led only to poor results, and the later researchers, among them in particular Mrs. Hammer-Jensen, Tannery, Lagercrantz, von Lippmann, Reitzenstein, Ruska, Bidez, Festugiere and others, could make clear only few points of detail ....
>
> The study of the Greek alchemists is not very encouraging. An even surface examination of the Greek texts shows that a very small part only was organized according to true experiments of laboratory: even the supposedly technical writings, in the state where we find them today, are unintelligible nonsense which refuses any interpretation.
>
> It is different with Jabir's alchemy. The relatively clear description of the processes and the alchemical apparati, the methodical classification of the substances, mark an experimental spirit which is extremely far away from the weird and odd esotericism of the Greek texts. The theory on which Jabir supports his operations is one of clearness and of an impressive unity. More than with the other Arab authors, one notes with him a balance between theoretical teaching and practical teaching, between the *'ilm* and the *amal*. In vain one would seek in the Greek texts a work as systematic as that which is presented, for example, in the *Book of Seventy*.[40]

Jabir ibn Hayyan (Geber), considered the "father of chemistry", introduced a scientific and experimental approach to alchemy.

Jabir himself clearly recognized and proclaimed the importance of experimentation:

> The first essential in chemistry is that thou shouldest perform practical work and conduct experiments,
> for he who performs not practical work nor makes experiments will never attain to the least degree of mastery.[42]

Early Islamic chemists such as Jabir Ibn Hayyan, Al-Kindi ("Alkindus") and Muhammad ibn Zakarīya Rāzi ("Rasis" or "Rhazes") contributed a number of key chemical discoveries, such as the muriatic (hydrochloric acid), sulfuric and nitric acids, and more. The discovery that aqua regia, a mixture of nitric and hydrochloric acids, could dissolve the noblest metal, gold, was to fuel the imagination of alchemists for the next millennium.

Islamic philosophers also made great contributions to alchemical hermeticism. The most influential author in this regard was arguably Jabir. Jabir's ultimate goal was *Takwin*, the artificial creation of life in the alchemical laboratory, up to, and including, human life. He analyzed each Aristotelian element in terms of four basic qualities of *hotness*, *coldness*, *dryness*, and

moistness.[43] According to Jabir, in each metal two of these qualities were interior and two were exterior. For example, lead was externally cold and dry, while gold was hot and moist. Thus, Jabir theorized, by rearranging the qualities of one metal, a different metal would result.[43] By this reasoning, the search for the philosopher's stone was introduced to Western alchemy. Jabir developed an elaborate numerology whereby the root letters of a substance's name in Arabic, when treated with various transformations, held correspondences to the element's physical properties.

The elemental system used in medieval alchemy also originated with Jabir. His original system consisted of seven elements, which included the five classical elements (aether, air, earth, fire, and water) in addition to two chemical elements representing the metals: sulphur, "the stone which burns", which characterized the principle of combustibility, and mercury, which contained the idealized principle of metallic properties. Shortly thereafter, this evolved into eight elements, with the Arabic concept of the three metallic principles: sulphur giving flammability or combustion, mercury giving volatility and stability, and salt giving solidity.[44] The atomic theory of corpuscularianism, where all physical bodies possess an inner and outer layer of minute particles or corpuscles, also has its origins in the work of Jabir.[45]

From the 9th to 14th centuries, alchemical theories faced criticism from a variety of practical Muslim chemists, including Alkindus,[46] Abū al-Rayhān al-Bīrūnī,[47] Avicenna[48] and Ibn Khaldun. In particular, they wrote refutations against the idea of the transmutation of metals.

East Asia

Whereas European alchemy eventually centered on the transmutation of base metals into noble metals, Chinese alchemy had a more obvious connection to medicine. The philosopher's stone of European alchemists can be compared to the Grand Elixir of Immortality sought by Chinese alchemists. However, in the hermetic view, these two goals were not unconnected, and the philosopher's stone was often equated with the universal panacea; therefore, the two traditions may have had more in common than initially appears.

Taoist alchemists often use this alternate version of the taijitu.

Black powder may have been an important invention of Chinese alchemists. As previously stated above, Chinese alchemy was more related to medicine. It is said that the Chinese invented gunpowder while trying to find a potion for eternal life. Described in 9th-century texts and used in fireworks in China by the 10th century, it was used in cannons by 1290. From China, the use of gunpowder spread to Japan, the Mongols, the Muslim world, and Europe. Gunpowder was used by the Mongols against the Hungarians in 1241, and in Europe by the 14th century.

Chinese alchemy was closely connected to Taoist forms of traditional Chinese medicine, such as Acupuncture and Moxibustion.In the early Song dynasty, followers of this Taoist idea (chiefly the elite and upper class) would ingest mercuric sulfide, which, though tolerable in low levels, led many to suicide. Thinking that this consequential death would lead to freedom and access to the Taoist heavens, the ensuing deaths encouraged people to eschew this method of alchemy in favor of external sources (the aforementioned Tai Chi Chuan, mastering of the qi, etc.)

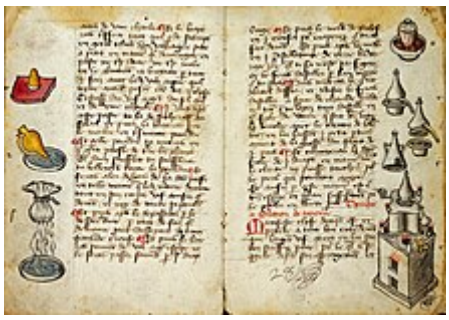
Medieval Europe

The introduction of alchemy to Latin Europe may be dated to 11 February 1144, with the completion of Robert of Chester's translation of the Arabic *Book of the Composition of Alchemy*. Although European craftsmen and technicians preexisted, Robert notes in his preface that alchemy was unknown in Latin Europe at the time of his writing. The translation of Arabic texts concerning numerous disciplines including alchemy flourished in 12th-century Toledo, Spain, through contributors like Gerard of Cremona and Adelard of Bath.[49] Translations of the time included the Turba Philosophorum, and the works of Avicenna and al-Razi. These brought with them many new words to the European vocabulary for which there was no previous Latin equivalent. Alcohol, carboy, elixir, and athanor are examples.[50]

Meanwhile, theologian contemporaries of the translators made strides towards the reconciliation of faith and experimental rationalism, thereby priming Europe for the influx of alchemical thought. The 11th-century St Anselm put forth the opinion that faith and rationalism were compatible and encouraged rationalism in a Christian context. In the early 12th century, Peter Abelard followed Anselm's work, laying down the foundation for acceptance of Aristotelian thought before the first works of Aristotle had reached the West. In the early 13th century, Robert Grosseteste used Abelard's methods of analysis and added the use of observation, experimentation, and conclusions when conducting scientific investigations. Grosseteste also did much work to reconcile Platonic and Aristotelian thinking.[51]

The Alchemist in Search of the Philosopher's Stone, by Joseph Wright, 1771

Through much of the 12th and 13th centuries, alchemical knowledge in Europe remained centered on translations, and new Latin contributions were not made. The efforts of the translators were succeeded by that of the encyclopaedists. In the 13th century, Albertus Magnus and Roger Bacon were the most notable of these, their work summarizing and explaining the newly imported alchemical knowledge in Aristotelian terms.[52] Albertus Magnus, a Dominican friar, is known to have written works such as the *Book of Minerals* where he observed and commented on the operations and theories of alchemical authorities like Hermes and Democritus and unnamed alchemists of his time. Albertus critically compared these to the writings of Aristotle and Avicenna, where they concerned the transmutation of metals. From the time shortly after his death through to the 15th century, more than 28 alchemical tracts were misattributed to him, a common practice giving rise to his reputation as an accomplished alchemist.[53] Likewise, alchemical texts have been attributed to Albert's student Thomas Aquinas.



"An illuminated page from a book on alchemical processes and receipts", ca. 15th century.

Roger Bacon, a Franciscan friar who wrote on a wide variety of topics including optics, comparative linguistics, and medicine, composed his *Great Work* (Latin: *Opus Majus*) for Pope Clement IV as part of a project towards rebuilding the medieval university curriculum to include the new learning of his time. While alchemy was not more important to him than other sciences and he did not produce allegorical works on the topic, he did consider it and astrology to be important parts of both natural philosophy and theology and his contributions advanced alchemy's connections to soteriology and Christian theology. Bacon's writings integrated morality, salvation, alchemy, and the prolongation of life. His correspondence with Clement highlighted this, noting the importance of alchemy to the papacy.[54] Like the Greeks before him, Bacon acknowledged the division of alchemy into practical and theoretical spheres. He noted that the theoretical lay outside the scope of Aristotle, the natural philosophers, and all Latin writers of his time. The practical, however, confirmed the theoretical thought experiment, and Bacon advocated its uses in natural science and medicine.[55] In later European legend, however, Bacon became an archmage. In particular, along with Albertus Magnus, he was credited with the forging of a brazen head capable of answering its owner's questions.

Soon after Bacon, the influential work of Pseudo-Geber (sometimes identified as Paul of Taranto) appeared. His *Summa Perfectionis* remained a staple summary of alchemical practice and theory through the medieval and renaissance periods. It was notable for its inclusion of practical chemical operations alongside sulphur-mercury theory, and the unusual clarity with which they were described.[56] By the end of the 13th century, alchemy had developed into a fairly structured system of belief. Adepts believed in the macrocosm-microcosm theories of Hermes, that is to say, they believed that processes that affect minerals and other substances could have an effect on the human body (for example, if one could learn the secret of purifying gold, one could

use the technique to purify the human soul). They believed in the four elements and the four qualities as described above, and they had a strong tradition of cloaking their written ideas in a labyrinth of coded jargon set with traps to mislead the uninitiated. Finally, the alchemists practiced their art: they actively experimented with chemicals and made observations and theories about how the universe operated. Their entire philosophy revolved around their belief that man's soul was divided within himself after the fall of Adam. By purifying the two parts of man's soul, man could be reunited with God.[57]

In the 14th century, alchemy became more accessible to Europeans outside the confines of Latin speaking churchmen and scholars. Alchemical discourse shifted from scholarly philosophical debate to an exposed social commentary on the alchemists themselves.[58] Dante, Piers Plowman, and Chaucer all painted unflattering pictures of alchemists as thieves and liars. Pope John XXII's 1317 edict, *Spondent quas non exhibent* forbade the false promises of transmutation made by pseudo-alchemists.[59] In 1403, Henry IV of England banned the practice of multiplying metals (although it was possible to buy a licence to attempt to make gold alchemically, and a number were granted by Henry VI and Edward IV[60]). These critiques and regulations centered more around pseudo-alchemical charlatanism than the actual study of alchemy, which continued with an increasingly Christian tone. The 14th century saw the Christian imagery of death and resurrection employed in the alchemical texts of Petrus Bonus, John of Rupescissa, and in works written in the name of Raymond Lull and Arnold of Villanova.[61]

Nicolas Flamel is a well-known alchemist, but a good example of pseudepigraphy, the practice of giving your works the name of someone else, usually more famous. Although the historical Flamel existed, the writings and legends assigned to him only appeared in 1612.[62][63] Flamel was not a religious scholar as were many of his predecessors, and his entire interest in the subject revolved around the pursuit of the philosopher's stone. His work spends a great deal of time describing the processes and reactions, but never actually gives the formula for carrying out the transmutations. Most of 'his' work was aimed at gathering alchemical knowledge that had existed before him, especially as regarded the philosopher's stone.[64] Through the 14th and 15th centuries, alchemists were much like Flamel: they concentrated on looking for the philosophers' stone. Bernard Trevisan and George Ripley made similar contributions. Their cryptic allusions and symbolism led to wide variations in interpretation of the art.

Renaissance and early modern Europe

During the Renaissance, Hermetic and Platonic foundations were restored to European alchemy. The dawn of medical, pharmaceutical, occult, and entrepreneurial branches of alchemy followed.

Page from alchemic treatise of Ramon Llull, 16th century

In the late 15th century, Marsilo Ficino translated the Corpus Hermeticum and the works of Plato into Latin. These were previously unavailable to Europeans who for the first time had a full picture of the alchemical theory that Bacon had declared absent. Renaissance Humanism and Renaissance Neoplatonism guided alchemists away from physics to refocus on mankind as the alchemical vessel.

Esoteric systems developed that blended alchemy into a broader occult Hermeticism, fusing it with magic, astrology, and Christian cabala.[65][66] A key figure in this development was German Heinrich Cornelius Agrippa (1486–1535), who received his Hermetic education in Italy in the schools of the humanists. In his *De Occulta Philosophia*, he attempted to merge Kabbalah, Hermeticism, and alchemy. He was instrumental in spreading this new blend of Hermeticism outside the borders of Italy.[67][68]

Philippus Aureolus Paracelsus, (Theophrastus Bombastus von Hohenheim, 1493–1541) cast alchemy into a new form, rejecting some of Agrippa's occultism and moving away from chrysopoeia. Paracelsus pioneered the use of chemicals and minerals in medicine and wrote,

"Many have said of Alchemy, that it is for the making of gold and silver. For me such is not the aim, but to consider only what virtue and power may lie in medicines."[69]

His hermetical views were that sickness and health in the body relied on the harmony of man the microcosm and Nature the macrocosm. He took an approach different from those before him, using this analogy not in the manner of soul-purification but in the manner that humans must have certain balances of minerals in their bodies, and that certain illnesses of the body had chemical remedies that could cure them.[70] Paracelsian practical alchemy, especially herbal medicine and plant remedies has since been named spagyric (a synonym for alchemy from the Greek words meaning *to separate* and *to join together*, based on the Latin alchemic maxim: *solve et coagula*).[71] Iatrochemistry also refers to the pharmaceutical applications of alchemy championed by Paracelsus.

John Dee (13 July 1527 – December, 1608) followed Agrippa's occult tradition. Although better known for angel summoning, divination, and his role as astrologer, cryptographer, and consultant to Queen Elizabeth I, Dee's alchemical[72] *Monas Hieroglyphica*, written in 1564 was his most popular and influential work. His writing portrayed alchemy as a sort of terrestrial astronomy in line with the Hermetic axiom *As above so below*.[73] During the 17th century, a short-lived "supernatural" interpretation of alchemy became popular, including support by fellows of the Royal Society: Robert Boyle and Elias Ashmole. Proponents of the supernatural interpretation of alchemy believed that the philosopher's stone might be used to summon and communicate with angels.[74]

The red sun rising over the city, the final illustration of 16th-century alchemical text, *Splendor Solis*. The word rubedo, meaning "redness", was adopted by alchemists and signalled alchemical success, and the end of the great work.

Entrepreneurial opportunities were common for the alchemists of Renaissance Europe. Alchemists were contracted by the elite for practical purposes related to mining, medical services, and the production of chemicals, medicines, metals, and gemstones.[75] Rudolf II, Holy Roman Emperor, in the late 16th century, famously received and sponsored various alchemists at his court in Prague, including Dee and his associate Edward Kelley. King James IV of Scotland,[76] Julius, Duke of Brunswick-Lüneburg, Henry V, Duke of Brunswick-Lüneburg, Augustus, Elector of Saxony, Julius Echter von Mespelbrunn, and Maurice, Landgrave of Hesse-Kassel all contracted alchemists.[77] John's son Arthur Dee worked as a court physician to Michael I of Russia and Charles I of England but also compiled the alchemical book *Fasciculus Chemicus*.

Alchemist Sendivogius (1566–1636) by Jan Matejko, 1867

Although most of these appointments were legitimate, the trend of pseudo-alchemical fraud continued through the Renaissance. *Betrüger* would use sleight of hand, or claims of secret knowledge to make money or secure patronage. Legitimate mystical and medical alchemists such as Michael Maier and Heinrich Khunrath wrote about fraudulent transmutations, distinguishing themselves from the con artists.[78] False alchemists were sometimes prosecuted for fraud.

The terms "chemia" and "alchemia" were used as synonyms in the early modern period, and the differences between alchemy, chemistry and small-scale assaying and metallurgy were not as neat as in the present day. There were important overlaps between practitioners, and trying to classify them into alchemists, chemists and craftsmen is anachronistic. For example, Tycho Brahe (1546–1601), an alchemist better known for his astronomical and astrological investigations, had a laboratory built at his Uraniborg observatory/research institute. Michael Sendivogius (*Michał Sędziwój*, 1566–1636), a Polish alchemist, philosopher, medical doctor and pioneer of chemistry wrote mystical works but is also credited

with distilling oxygen in a lab sometime around 1600. Sendivogious taught his technique to Cornelius Drebbel who, in 1621, applied this in a submarine. Isaac Newton devoted considerably more of his writing to the study of alchemy (see Isaac Newton's occult studies) than he did to either optics or physics. Other early modern alchemists who were eminent in their other studies include Robert Boyle, and Jan Baptist van Helmont. Their Hermeticism complemented rather than precluded their practical achievements in medicine and science.

Late modern period

The decline of European alchemy was brought about by the rise of modern science with its emphasis on rigorous quantitative experimentation and its disdain for "ancient wisdom". Although the seeds of these events were planted as early as the 17th century, alchemy still flourished for some two hundred years, and in fact may have reached its peak in the 18th century. As late as 1781 James Price claimed to have produced a powder that could transmute mercury into silver or gold. Early modern European alchemy continued to exhibit a diversity of theories, practices, and purposes: "Scholastic and anti-Aristotelian, Paracelsian and anti-Paracelsian, Hermetic, Neoplatonic, mechanistic, vitalistic, and more—plus virtually every combination and compromise thereof."[79]


Robert Boyle

Robert Boyle (1627–1691) pioneered the scientific method in chemical investigations. He assumed nothing in his experiments and compiled every piece of relevant data. Boyle would note the place in which the experiment was carried out, the wind characteristics, the position of the Sun and Moon, and the barometer reading, all just in case they proved to be relevant.[80] This approach eventually led to the founding of modern chemistry in the 18th and 19th centuries, based on revolutionary discoveries of Lavoisier and John Dalton.


An alchemist, pictured in Charles Mackay's *Extraordinary Popular Delusions and the Madness of Crowds*.

Beginning around 1720, a rigid distinction was drawn between "alchemy" and "chemistry" for the first time.[81][82] By the 1740s, "alchemy" was now restricted to the realm of gold making, leading to the popular belief that alchemists were charlatans, and the tradition itself nothing more than a fraud.[79][82] In order to protect the developing science of modern chemistry from the negative censure of which alchemy was being subjected, academic writers during the scientific Enlightenment attempted, for the sake of survival, to divorce and separate the "new" chemistry from the "old" practices of alchemy. This move was mostly successful, and the consequences of this continued into the 19th and 20th centuries, and even to the present day.[83]

During the occult revival of the early 19th century, alchemy received new attention as an occult science.[84][85] The esoteric or occultist school, which arose during the 19th century, held (and continues to hold) the view that the substances and operations mentioned in alchemical literature are to be interpreted in a spiritual sense, and it downplays the role of the alchemy as a practical tradition or protoscience.[81][86][87] This interpretation further forwarded the view that alchemy is an art primarily concerned with spiritual enlightenment or illumination, as opposed to the physical manipulation of apparatus and chemicals, and claims that the obscure language of the alchemical texts were an allegorical guise for spiritual, moral or mystical processes.[87]

In the 19th-century revival of alchemy, the two most seminal figures were Mary Anne Atwood and Ethan Allen Hitchcock, who independently published similar works regarding spiritual alchemy. Both forwarded a completely esoteric view of alchemy, as Atwood claimed: "No modern art or chemistry, notwithstanding all its surreptitious claims, has any thing in common with

Alchemy."[88][89] Atwood's work influenced subsequent authors of the occult revival including Eliphas Levi, Arthur Edward Waite, and Rudolf Steiner. Hitchcock, in his *Remarks Upon Alchymists* (1855) attempted to make a case for his spiritual interpretation with his claim that the alchemists wrote about a spiritual discipline under a materialistic guise in order to avoid accusations of blasphemy from the church and state. In 1845, Baron Carl Reichenbach, published his studies on Odic force, a concept with some similarities to alchemy, but his research did not enter the mainstream of scientific discussion.[90]

In 1946, Louis Cattiaux published the Message Retrouvé, a work that was at once philosophical, mystical and highly influenced by alchemy. In his lineage, many researchers, including Emmanuel and Charles d'Hooghvorst, are updating alchemical studies in France and Belgium.[91]

Women in alchemy

Several women appear in the earliest history of alchemy. Michael Maier names Mary the Jewess, Cleopatra the Alchemist and Taphnutia as the four women who knew how to make the philosopher's stone.[92] Zosimos' sister Theosebia (later known as Euthica the Arab) and Isis the Prophetess also played a role in early alchemical texts.

The first alchemist whose name we know is said to have been Mary the Jewess (c. 200 A.D.).[93] Early sources claim that Mary (or Maria) devised a number of improvements to alchemical equipment and tools as well as novel techniques in chemistry.[93] Her best known advances were in heating and distillation processes. The laboratory water-bath, known eponymously (especially in France) as the bain-marie, is said to have been invented or at least improved by her.[94] Essentially a double-boiler, it was (and is) used in chemistry for processes that require gentle heating. The tribikos (a modified distillation apparatus) and the kerotakis (a more intricate apparatus used especially for sublimations) are two other advancements in the process of distillation that are credited to her.[95] The occasional claim that Mary was the first to discover hydrochloric acid is not accepted by most authorities.[96] Although we have no writing from Mary herself, she is known from the early-fourth-century writings of Zosimos of Panopolis.[97]

Due to the proliferation of pseudepigrapha and anonymous works, it is difficult to know which of the alchemists were actually women. After the Greco-Roman period, women's names appear less frequently in the alchemical literature. Women vacate the history of alchemy during the medieval and renaissance periods, aside from the fictitious account of Perenelle Flamel. Mary Anne Atwood's *A Suggestive Inquiry into the Hermetic Mystery* (1850) marks their return during the nineteenth-century occult revival.

Modern historical research

The history of alchemy has become a significant and recognized subject of academic study.[98] As the language of the alchemists is analyzed, historians are becoming more aware of the intellectual connections between that discipline and other facets of Western cultural history, such as the evolution of science and philosophy, the sociology and psychology of the intellectual communities, kabbalism, spiritualism, Rosicrucianism, and other mystic movements.[99] Institutions involved in this research include The Chymistry of Isaac Newton project at Indiana University, the University of Exeter Centre for the Study of Esotericism (EXESESO), the European Society for the Study of Western Esotericism (ESSWE), and the University of Amsterdam's Sub-department for the History of Hermetic Philosophy and Related Currents. A large collection of books on alchemy is kept in the Bibliotheca Philosophica Hermetica in Amsterdam. A recipe found in a mid-19th-century kabbalah based book features step by step instructions on turning copper into gold. The author attributed this recipe to an ancient manuscript he located.[100]

Journals which publish regularly on the topic of Alchemy include 'Ambix', published by the Society for the History of Alchemy and Chemistry, and 'Isis', published by The History of Science Society.

Core concepts

Western alchemical theory corresponds to the worldview of late antiquity in which it was born. Concepts were imported from Neoplatonism and earlier Greek cosmology. As such, the Classical elements appear in alchemical writings, as do the seven Classical planets and the corresponding seven metals of antiquity. Similarly, the gods of the Roman pantheon who are associated with these luminaries are discussed in alchemical literature. The concepts of prima materia and anima mundi are central to the theory of the philosopher's stone.

Mandala illustrating common alchemical concepts, symbols, and processes. From *Spiegel der Kunst und Natur*.

Hermeticism

In the eyes of a variety of esoteric and Hermetic practitioners, alchemy is fundamentally spiritual. Transmutation of lead into gold is presented as an analogy for personal transmutation, purification, and perfection.[101] The writings attributed to Hermes Trismegistus are a primary source of alchemical theory. He is named "alchemy's founder and chief patron, authority, inspiration and guide".[102]

Early alchemists, such as Zosimos of Panopolis (c. AD 300), highlight the spiritual nature of the alchemical quest, symbolic of a religious regeneration of the human soul.[103] This approach continued in the Middle Ages, as metaphysical aspects, substances, physical states, and material processes were used as metaphors for spiritual entities, spiritual states, and, ultimately, transformation. In this sense, the literal meanings of 'Alchemical Formulas' were a blind, hiding their true spiritual philosophy. Practitioners and patrons such as Melchior Cibinensis and Pope Innocent VIII existed within the ranks of the church, while Martin Luther applauded alchemy for its consistency with Christian teachings.[104] Both the transmutation of common metals into gold and the universal panacea symbolized evolution from an imperfect, diseased, corruptible, and ephemeral state toward a perfect, healthy, incorruptible, and everlasting state, so the philosopher's stone then represented a mystic key that would make this evolution possible. Applied to the alchemist himself, the twin goal symbolized his evolution from ignorance to enlightenment, and the stone represented a hidden spiritual truth or power that would lead to that goal. In texts that are written according to this view, the cryptic alchemical symbols, diagrams, and textual imagery of late alchemical works typically contain multiple layers of meanings, allegories, and references to other equally cryptic works; and must be laboriously decoded to discover their true meaning.

In his 1766 *Alchemical Catechism*, Théodore Henri de Tschudi denotes that the usage of the metals was merely symbolic:

> Q. When the Philosophers speak of gold and silver, from which they extract their matter, are we to suppose that they refer to the vulgar gold and silver?
> A. By no means; vulgar silver and gold are dead, while those of the Philosophers are full of life.[105]

Magnum opus

The Great Work of Alchemy is often described as a series of four stages represented by colors.

- *nigredo*, a blackening or melanosis
- *albedo*, a whitening or leucosis
- *citrinitas*, a yellowing or xanthosis
- *rubedo*, a reddening, purpling, or iosis[106]

Modern alchemy

Due to the complexity and obscurity of alchemical literature, and the 18th-century disappearance of remaining alchemical practitioners into the area of chemistry; the general understanding of alchemy has been strongly influenced by several distinct and radically different interpretations.[107] Those focusing on the exoteric, such as historians of science Lawrence M. Principe and William R. Newman, have interpreted the 'decknamen' (or code words) of alchemy as physical substances. These scholars have reconstructed physicochemical experiments that they say are described in medieval and early modern texts.[108] At the opposite end of the spectrum, focusing on the esoteric, scholars, such as George Calian[109] and Anna Marie Roos,[110] who question the reading of Principe and Newman, interpret these same decknamen as spiritual, religious, or psychological concepts.

Today new interpretations of alchemy are still perpetuated, sometimes merging in concepts from New Age or radical environmentalism movements.[111] Groups like the Rosicrucians and Freemasons have a continued interest in alchemy and its symbolism. Since the Victorian revival of alchemy, "occultists reinterpreted alchemy as a spiritual practice, involving the self-transformation of the practitioner and only incidentally or not at all the transformation of laboratory substances",[79] which has contributed to a merger of magic and alchemy in popular thought.

Traditional medicine

Traditional medicine can use the concept of the transmutation of natural substances, using pharmacological or a combination of pharmacological and spiritual techniques. In Ayurveda, the samskaras are claimed to transform heavy metals and toxic herbs in a way that removes their toxicity. These processes are actively used to the present day.[112]

Spagyrists of the 20th century, Albert Richard Riedel and Jean Dubuis, merged Paracelsian alchemy with occultism, teaching laboratory pharmaceutical methods. The schools they founded, *Les Philosophes de la Nature* and *The Paracelsus Research Society*, popularized modern spagyrics including the manufacture of herbal tinctures and products.[113] The courses, books, organizations, and conferences generated by their students continue to influence popular applications of alchemy as a New Age medicinal practice.

Psychology

Alchemical symbolism has been important in depth and analytical psychology and was revived and popularized from near extinction by the Swiss psychologist Carl Gustav Jung. Initially confounded and at odds with alchemy and its images, after being given a copy of the translation of *The Secret of the Golden Flower*, a Chinese alchemical text, by his friend Richard Wilhelm, Jung discovered a direct correlation or parallels between the symbolic images in the alchemical drawings and the inner, symbolic images coming up in dreams, visions or imaginations during the psychic processes of transformation occurring in his patients. A process, which he called "process of individuation". He regarded the alchemical images as symbols expressing aspects of this "process of individuation" of which the creation of the gold or lapis within were symbols for its origin and goal.[114][115] Together with his alchemical *mystica soror*, Jungian Swiss analyst Marie-Louise von Franz, Jung began collecting all the old alchemical texts available, compiled a lexicon of key phrases with cross-references[116] and pored over them. The volumes of work he wrote brought new light into understanding the art of transubstantiation and renewed alchemy's popularity as a symbolic process of coming into wholeness as a human being where opposites brought into contact and inner and outer, spirit and matter are reunited in the *hieros gamos* or divine marriage. His writings are influential in psychology and for persons who have an interest in understanding the importance of dreams, symbols and the unconscious archetypal forces (archetypes)[115][117][118] that influence all of life.

Both von Franz and Jung have contributed greatly to the subject and work of alchemy and its continued presence in psychology as well as contemporary culture. Jung wrote volumes on alchemy and his magnum opus is Volume 14 of his Collected Works, *Mysterium Conuinctionis*. *Ralph Metzner, speaking to CG Jung Society of Seattle, 2014, sees the historical emergence of psychedelics (https://www.youtube.com/watch?v=GtegKVkpxw8) in the work of alchemists.*

Literature

Alchemy has had a long-standing relationship with art, seen both in alchemical texts and in mainstream entertainment. *Literary alchemy* appears throughout the history of English literature from Shakespeare to J. K. Rowling, and also the popular Japanese manga *Full Metal Alchemist*. Here, characters or plot structure follow an alchemical magnum opus. In the 14th century, Chaucer began a trend of alchemical satire that can still be seen in recent fantasy works like those of Terry Pratchett.

Visual artists had a similar relationship with alchemy. While some of them used alchemy as a source of satire, others worked with the alchemists themselves or integrated alchemical thought or symbols in their work. Music was also present in the works of alchemists and continues to influence popular performers. In the last hundred years, alchemists have been portrayed in a magical and spagyric role in fantasy fiction, film, television, novels, comics and video games.

See also

- Alchemical symbol
- Biological transmutation in Corentin Louis Kervran
- Cupellation
- Historicism
- History of chemistry
- List of alchemists
- List of topics characterized as pseudoscience
- Nuclear transmutation
- Outline of alchemy
- Porta Alchemica
- Superseded theories in science
- Synthesis of precious metals

Notes

1. For a detailed look into the problems of defining alchemy, see Linden 1996, pp. 6–36
2. To wit, the *Ānandakanda, Āyurvedaprakāśa, Gorakṣasaṃhitā, Kākacaṇḍeśvarīmatatantra, Kākacaṇḍīśvarakalpatantra, Kūpīpakvarasanirmāṇavijñāna, Pāradasaṃhitā, Rasabhaiṣajyakalpanāvijñāna, Rasādhyāya, Rasahṛdayatantra, Rasajalanidhi, Rasakāmadhenu, Rasakaumudī, Rasamañjarī, Rasamitra, Rasāmṛta, Rasapaddhati, Rasapradīpa, Rasaprakāśasudhākara, Rasarājalakṣmī, Rasaratnadīpikā, Rasaratnākara, Rasaratnasamuccaya, Rasārṇava, Rasārṇavakalpa, Rasasaṃketakalikā, Rasasāra, Rasataraṅgiṇī, Rasāyanasāra, Rasayogasāgara, Rasayogaśataka, Rasendracintāmaṇi, Rasendracūḍāmaṇi, Rasendramaṅgala, Rasendrapurāṇa, Rasendrasambhava, Rasendrasārasaṅgraha, Rasoddhāratantra* or *Rasasaṃhitā*, and *Rasopaniṣad*.

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In the Western world alchemy presented itself at its advent as a sacred art. But when, after a long detour via Byzantium and Islamic culture, it came back again to Europe in the twelfth century, adepts designated themselves philosophers. Since then alchemy has confronted natural philosophy for several centuries."
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- Media related to Alchemy at Wikimedia Commons
- SHAC: Society for the History of Alchemy and Chemistry (http://www.ambix.org/)
- ESSWE: European Society for the Study of Western Esotericism (http://www.esswe.org/)
- Association for the Study of Esotericism (http://www.aseweb.org/)
- The Alchemy Website. (http://www.alchemywebsite.com/) – Adam McLean's online collections and academic discussion.
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Chinese alchemy

Chinese alchemy is an ancient Chinese scientific and technological approach to alchemy, a part of the larger tradition of Taoist body-spirit cultivation developed from the traditional Chinese understanding of medicine and the body. According to original texts such as the Cantong qi, the body is understood as the focus of cosmological processes summarized in the five agents, or wu xing, the observation and cultivation of which leads the practitioner into greater alignment with the operation of the Tao, the great cosmological principle of everything. Therefore, the traditional view in China is that alchemy focuses mainly on the purification of one's spirit and body in the hopes of gaining immortality through the practice of Qigong and/or consumption and use of various concoctions known as alchemical medicines or elixirs, each of which having different purposes.

Crystals of cinnabar, crystals of barite, crystals of quartz, crystals of calcite : Wanshan Mine, Wanshan District, Tongren Prefecture, Guizhou Province, China, an example of material historically associated with Chinese alchemy

Pao zhi (*Pao chi*) cites the pharmacological processing (of Chinese materia medica) as used in the practice of Traditional Chinese Medicine, such as honey or wine frying and roasting with toxic metals such as mercury, lead, and arsenic.[1]

Taoism had two distinct parts, the classical Tao Chia, which was mystical and stemmed primarily from Laozi and Zhuangzi, and the more popular Tao Chiao, which was the popular, magical and alchemical side of Taoism. A common viewpoint is that "classical Taoism [Daoism] was the original but was too austere and rarefied for the general populace ... [but] Tao Chiao fulfilled the day-to-day needs of the people."[2]

Contents

Process and purpose

By refining bases into gold and ingesting the "fake" or synthetic gold, the alchemist believed that immortal life would be delivered. The idea that fake gold was superior to real gold arose because the alchemists believed the combination of a variety of substances (and the transformation of these substances through roasting or burning) gave the final substance a spiritual value, possessing a superior essence when compared to natural gold.[2] Gold and cinnabar (*jindan*) were the most sought-after substances to manipulate and ingest, believed to have longevity and thus able to elongate the life of the consumer.

Cinnabar is a mineral with a reddish-brown colour and is the most common source of mercury in nature.[3] The significance of its red colour and difficulty with which it was refined implied to alchemists its connection with the search for immortality. The colour was significant to symbolic belief as well, red being considered in Chinese culture to be the "zenith of the colour representing the sun, fire, royalty and energy."[2] Cinnabar could also be roasted, which produced a liquid form of silver known as quicksilver, now known as mercury. This substance was ingested but it could also be combined with sulphur and burned again to return to its natural form of cinnabar, the solid seen as the yang to quicksilver's yin.[2] In China, gold was quite rare, so it was usually imported from other surrounding countries. However, cinnabar could be refined in the mountains of Sichuan and Hunan provinces in central China.

Although the majority of *xian* (immortality) elixirs were combinations of *jindan*, many other elixirs were formed by combining metallic bases with natural herbs or animals bi-products. The rhinoceros' horn was commonly used in medicines and elixirs and was held to have fertility-increasing abilities. Elixirs were composed of metallic compounds such as gold and silver, but could also be made of more lethal components like arsenic, and sulphur.

Eastern vs Western views

Both the Eastern practice and the later Western practice of alchemy are remarkably similar in their methods and ultimate purpose. To be sure, the desire to create an elixir of immortality was more appealing to the Taoists, but European alchemists were not averse to seeking out formulas for various longevity-boosting substances. The secret of transmuting one element into another, specifically base metals into gold or silver, was equally explored by both schools for obvious reasons.

In the European outlook, the ability to turn relatively worthless materials into gold was attractive enough to allow medieval alchemy to enjoy extensive practice long after the Chinese form had been forgotten. Alternatively, transmutation was also a means of accruing the precious metals that were key in making life-extending elixirs, and were otherwise expensive and difficult to obtain. Alchemical knowledge in the East and West favored different opinions of the true form of alchemy due to different theological views and cultural biases, however these disputes do not lessen the integrity of alchemy's canonical nature.

Chinese alchemy specifically was consistent in its practice from the beginning, and there was relatively little controversy among its practitioners. Definition amongst alchemists varied only in their medical prescription for the elixir of immortality, or perhaps only over their names for it, of which sinology has counted about 1000. Because the Chinese approach was through the fundamental doctrine of *Yin* and *Yang*, the influence of the *I Ching*, and the teachings of the Five Elements, Chinese alchemy had its roots considerably more in obtaining a higher mental-spiritual level.

In the West, there were conflicts between advocates of herbal and "chemical" (mineral) pharmacy, but in China, mineral remedies were always accepted. In Europe, there were conflicts between alchemists who favored gold-making and those who thought medicine the proper goal, but the Chinese always favored the latter. Since alchemy rarely achieved any of these goals, it was an advantage to the Western alchemist to have the situation obscured, and the art survived in Europe long after Chinese alchemy had simply faded away.

Origins

Despite much research, many scholars are still unable to marshal conflicting evidence in order to determine when exactly Chinese alchemy started. It was thought that China was making gold about one thousand years before Confucius' time, but this is contradicted by other academics stating that during the 5th century BCE there was no word for gold and that it was an unknown metal in China.[4]

However, despite the uncertain origins, there are enough similarities in the ideas of practices of Chinese alchemy and the Daoist tradition so that one can conclude that Laozi and Zhang Daoling are the creators of this tradition. In her article, Radcliffe tells that Zhang rejected serving the Emperor and retreated to live in the mountains. At this time, he met Laozi and together they created (or attempted to create) the Elixir of Life (Radcliffe, 2001), by creating the theory that would be used in order to achieve the making of such an elixir. This is the starting point to the Chinese tradition of alchemy, whose purpose was to achieve immortality.

One of the first evidence of Chinese alchemy being openly discussed in history is during the Qin's First Emperor's period when Huan Kuan (73-49 BC) states how modifying forms of nature and ingesting them will bring immortality to the person who drinks them.[5] Before Huan Kuan, the idea of alchemy was to turn base metals into gold. Conflicting research on the origins of alchemy are further demonstrated by Cooper, who claims that alchemy "flourished well before 144 BCE, for at that date the Emperor issued an edict which ordered public execution for anyone found making counterfeit gold".[2] This suggests that people were well aware of how to heat the metals in order to change them into a desired form. A further counter to Pregadio from Cooper is the latter's contention that an emperor in 60 BCE had hired "a well-known scholar, Liu Hsiang, as Master of the Recipes so that he could make alchemical gold and prolong the Emperor's life." All of these conflicting origins considered, it is nearly impossible to claim any absolute knowledge on the origins of Chinese alchemy. However, historical texts of Daoist teaching include alchemical practices, most of which posit the existence of an elixir or the Golden Elixir that, when ingested, gives the drinker eternal life.

As there is a direct connection between Daoism and Laozi, some suggest he played a major role in the creation of Chinese alchemy. Zhou Dynasty philosopher Zou Yan is said to have written many of the alchemical books, although none of them have ever been found, nor have the existing ones been credited to him.[4] The likeliest proponents of Chinese alchemy are as previously stated, Laozi, and Zhang Daoling as well as Zhuangzi. Each of these men are major icons in Daoist teachings. Although these three are credited with the creation of alchemy, there is no definitive proof to suggest or dispute that they were responsible for its creation.

Chinese women alchemists

With the rise of alchemy in Chinese civilization, it came to be seen as an art. Among many practitioners, a significant number of women were known to have mastered this art. The earliest recorded woman alchemist had the family name of Fang (Chinese: 方), and lived around the first century B.C.[6] Raised in a scholarly family skilled in the alchemical arts, she studied alchemy with one of the Emperor Han Wu Ti's spouses, and therefore had access to the highest levels of society. Fang was credited with the discovery of the method to turn mercury into silver. It was believed that she may have used the chemical technique of silver extraction from ores using mercury, where pure silver residue is left behind from the boiled mercury. Fang's husband Cheng Wei (simplified Chinese: 程伟; traditional Chinese: 程偉) was known to have physically abused her trying to obtain the secret procedure, although she refused to give it to him. Fang eventually went insane and killed herself. Details of Fang's life were recorded by author and alchemist Ge Hong.[6]

Keng Hsien-Seng (circa A.D. 975)[7] was another female alchemist who, according to the science writings of Wu Shu "mastered the art of the yellow and white [alchemy] with many other strong transformations, mysterious and incomprehensible".[6] Wu Shu also described Keng as being acquainted with other Taoist techniques and was believed able to control the spirits. She also mastered the transformation of mercury and "snow" into silver, probably using the technique of extraction of silver from its ores, as well as using a primitive type of Soxhlet process to continuously extract camphor into alcohol.[6]

Other female alchemists who have been recognized in Chinese literature are Pao Ku Ko (third century A.D.), Li Shao Yun (11th century),[8] Thai Hsuan Nu,[9] Sun Pu-Eh (12th century), and Shen Yu Hsiu (15th century).[6]

Yin and Yang

The concept of yin-yang is pervasive throughout Chinese alchemical theory. Metals were categorized as being male or female, and mercury and sulphur especially were thought to have powers relating to lunar and solar respectively.[2]

Prior to Taoist tradition, the Chinese already had very definitive notions of the natural world's processes and "changes", especially involving the *wu xing*: Water, Fire, Earth, Metal and Wood.[10] These were commonly thought to be interchangeable with one another; each were capable of becoming another element. The concept is integral, as the belief in outer alchemy necessitates the belief in natural elements being able to change into others. The cyclical balance of the elements relates to the binary opposition of yin-yang, and so it appears quite frequently.

Outer and inner alchemy

Chinese alchemy can be divided into two methods of practice, *waidan* or "external alchemy" and *neidan* or "internal alchemy". Doctrine can be accessed to describe these methods in greater detail; the majority of Chinese alchemical sources can be found in the Daozang, the "Taoist Canon".

Chinese woodblock illustration of a *waidan* alchemical refining furnace, 1856 *Waike tushuo* (外科圖説, Illustrated Manual of External Medicine)

Outer alchemy (Waidan)

The meaning of *waidan* derives from *wai* (outside, exterior) and *dan* referring to alchemical operations, such as the preparation of chemical elixirs, made from cinnabar, realgar, and other substances generally involving mercury, sulfur, lead, and arsenic or else the animal and botanical products which are found in Chinese herbology and Traditional Chinese medicine. Waidan refers to practices relating to the process of making an elixir often containing herbal or chemical substances found outside of the body. This process involves esoteric oral instructions, building a laboratory, kindling and sustaining the special fires used in the production process, rules of seclusion and purification for the alchemist to follow, and various practices including the performance of ceremonies to protect the self and the ritual area. Waidan can also include following a dietary regimen which prescribes or proscribes certain foods. Preparing medicines and elixirs can be referred to as outer practices or waidan as these practices occur outside of the body until they are verified by the ingestion of medicines, herbs, and pills to bring about physical changes within the body, separate to the soul.

Inner alchemy (Neidan)

The term Neidan can be divided into two parts: Nei, meaning inner, and Dan, which refers to alchemy, elixir, and cinnabar (mercury). Neidan uses techniques such as: composed meditation techniques, visualization, breathing and bodily posture exercises. Breathing exercises were used to preserve jing or "life essence" and bodily postures were used to improve qi or "energy" flow in the body. Neidan comprises the elixir from the principles of Traditional Chinese Medicine and the cultivation of substances already present in the body, in particular the manipulation of three substances in the body known as the "Three Treasures".

The three treasures are:

1. Jing which can be translated as "life essence". A person is born with Jing and it governs the developmental growth processes in the body. Since people are born with a certain amount of Jing, it is taught that a person can increase their Jing through dietary and lifestyle practices.

2. Qi which can be translated as "energy" or "vital energy". Qi energy results from the interaction of yin and yang. A healthy body is constantly circulating Qi.
3. Shen can be translated as "spirit" or "mind". Shen is the energy used in mental, spiritual and creative functioning (Lu, 30).

The three treasures are also associated with locations in the body where the alchemical process takes place. These locations include major organs and energy centers, called dantians.

1. Jing or "life essence" is found in the Kidneys and possibly the adrenal glands.
2. Qi or "vital energy" resides in Lower Dantian or "elixir field" and it is located about an inch down from navel.
3. Shen or "spiritual energy" is seated in the Middle Dantian, which is the Heart.

Chinese woodblock illustration of *neidan* "Cleansing the heart-mind and retiring into concealment", 1615 *Xingming guizhi* 性命圭旨 (Pointers on Spiritual Nature and Bodily Life)

Associated risks

When ingested, these compounds did not always result in the desired outcome. Many individuals died or had psychological difficulties after taking certain elixirs. However, the loss of life may not have seemed a large risk, when compared with the promise of the afterlife. Although these elixirs were lethal or dangerous, there is some contention that these individuals were not ignorant of the fatality of some of the materials they were ingesting.

There were certain grades of immortality, so if the practiced alchemist died, the level of immortality they achieved was determined by their corpse. If their corpse was sweet-smelling, it was said that they had achieved immortality in an ephemeral state. Likewise, if their corpse disappeared, leaving behind only the clothes, such as in the death of an adept named Ko Hung, this was another form of immortality known as *shih chieh hsien* (corpse-free immortals) (Cooper, 14).

Conception of medicine

Medicines can be used to heal ailments on the exterior or interior of the body, to control the ageing of the body, or even to prevent death. The term medicine and elixir are virtually interchangeable because of the array of ailments they can influence. The difference between defining an elixir from a medicine was that many medicines were composed mainly of all natural products like herbs and animal products. Never the animals themselves, only their products, which could consist of dung or fur. Although metal compounds are more potent when curing ailments, herbs were used because they were easier to combine and more abundantly available. To make medicines one would use ingredients like: Kolo nuts, which would be used in famous longevity pills like "Fo-Ti-Ti"; Asparagus, which was used because it was known to increase strength; sesame, which prevents senility; and pine which has over 300 different uses. (Cooper, 1990. Pg. 62) Mushrooms were and still are very popular, they are known as the "magic fungus" (Ganoderma) and have thousands of purposes within Chinese alchemy.

See also

- Alchemy and chemistry in medieval Islam
- Cold-Food Powder
- *Yellow Court Classic*

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External links

- Taoist Alchemy (http://www.goldenelixir.com/jindan.html) — Fabrizio Pregadio.

- Science and magic in Ge Hong's Baopu-zi nei pian (http://www.levity.com/alchemy/ge_hong.html) — Evgueni A. Tortchinov
- (in Chinese) Annotated Book of Alchemy by Tao Zhi (http://www.wdl.org/en/item/4695)
- Chinese Alchemy (https://www.youtube.com/watch?v=JS4CDA8wBPA)
