

Renaissance Alchemy ^[1]

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Part I - The Roots of Chemistry

Few scientific disciplines defined the complexity of the Renaissance as much as alchemy, an area where philosophy, science, occultism and theology came together. Alchemy, a genuine protoscience?, displayed the transformation from theoretical dogma to the observation and practice based methods that gradually developed during this period of the history of science.

Renaissance Alchemy - The Roots of Chemistry Part II ^[3]

Introduction – Alchemy and Dreaming of Gold

The mysterious, occult side of alchemy still captures the imagination of the modern public, with Harry Potter chasing the elusive Philosopher's Stone and names such as John Dee spawning thousands of occult sites studying the esoteric symbolism behind alchemical symbols. Most of the modern interpretations have a basis in historical fact, and writers such as Chaucer, Ben Jonson, and Dante gleefully included alchemists as shady charlatans and figures of parody.

However, this comedic touch should not detract from the idea that Renaissance alchemists were often bona fide scientists, searching for truth and often applying the scientific method to their research. In fact, it can be argued that, in terms of the development of science ^[4], the alchemists were further ahead than many other disciplines. For example, natural science and physics were still largely observational ^[5] and theoretical, whereas alchemists already used a method involving inductive ^[6] and deductive ^[7] reasoning to arrive at conclusions ^[8].

Renaissance Alchemy and the Scientific Method

Many alchemists during the Renaissance Era conducted controlled experiments and used trial and error to discover the nature of substances, studying how they reacted, interacted and changed under new conditions. The alchemists not only laid the foundations for chemistry, but they contributed to the practical side of physics, creating gases, solids, and liquids that later scientists could study, directly influencing the great physicists of the Age of Enlightenment, from the late 17th century onwards.

As with most academic disciplines, the practice of alchemy was aided by Gutenberg's

invention of the printing press, in 1440, alongside the increased tendency of people and ideas to migrate, allowing knowledge to spread across Europe and beyond. Archaeologists have found alchemical artifacts across Europe, showing the popularity of this proto-science [9], although the potential for riches offered by the transmutation of base metals into gold probably lay behind the popularity. Certainly, great minds such as John Dee (1527–1608) spent a lot of time in this pursuit, often attracting the patronage of rich sponsors.

To add to this shift towards a rigorous scientific method, one can look at the textbooks produced at the time. In the majority of cases, the alchemists of the late 16th and early 17th centuries still held to the Aristotelian worldview [10], where all metals were derived from mercury and sulfur. For example, a book by a German chemist, Andreas Libau (c1550–1616) was very thorough and undoubtedly acted as a great teaching aid, relating detailed methodology, calculations, and instructions for preparing compounds, but it also promoted this old idea, one that would persist until Boyle (1627-1691) tore it apart.

The Spark of the Renaissance – Persecution and Rebirth

Alchemy [11] was a discipline that originated with the Greeks, although the Chinese [12] and Egyptians were also instrumental in developing the foundations, and it spread to Europe via the Islamic world [13]. From 1147, the Almohads took control of the previously open Islamic empire in Al Andalus, in modern day Spain, leading to an intellectual decline.

During this period, Christian and Jewish scholars fled to Europe, bringing knowledge with them in the form of Arabic and Jewish texts, and many of these learned men landed in Northern Italy, where they formed part of the fledgling Renaissance that challenged the prevailing medieval thought. Gerard of Cremona (1114 – 1187) and Robertus Castrensis (c1150) were just two of the translators who made the original Arabic texts available in Latin.

Alchemy was already a well-established discipline, influencing metallurgy and medicine and, as with many branches of science, it became tied to the religious establishment with which it would share an uneasy alliance over the next few centuries.

As was the case with the Islamic scholars, Medieval and Renaissance alchemists followed the Aristotelian tradition of four elements as the basis of substance, a view that would not be challenged until the later Renaissance, when the findings of Newton, Boyle, and their contemporaries dragged European science and philosophy into the modern age.

The Early Alchemists

One of the first recorded European alchemists was Gerbert of Aurillac (946-1003), who became Pope Sylvester from 999–1003, and was tainted with the reputation of studying the dark arts. Another was the infamous Michael Scott (1175–1232), a Scottish mathematician and alchemist who earned a place in history, with many stories telling of his legendary powers, including the ability to control disease. Gerbert of Aurillac/Pope Sylvester (Public Domain) Toledo, in Spain, and Northern Italy, Scott translated many Arabic works into Latin, including the work of Aristotle, and he gained a position as the Royal Astrologer of Frederick II of Spain.

Scott dedicated a treatise, *De Secretis*, to his patron, although he, like many alchemists, was accused of practicing black magic and summoning demons. These accusations of occultism

would plague alchemy for a long time; he was excommunicated, yet was later offered a position as a bishop, such was his love/hate relationship with the church.

The Dominican monk, Albertus Magnus (1193/1206–1280), is still regarded as one of the great names in alchemy; a man looked up to by great scholars such as Roger Bacon and Thomas Aquinas. He became a bishop but eventually gave this up so that he could devote more time to his studies, concerning the alchemical staples of finding the Philosopher's Stone [11] and the Elixir of Life, processes for which he wrote a detailed treatise, *De Alchemia*. Magnus was meticulous in describing his equipment and the processes he used, and he wrote down what he knew about the properties of various substances.

His pupil, the great philosopher-monk Thomas Aquinas (1225-1274), carried on the work and also tried to look at the underlying principles of alchemy, theologically and philosophically analyzing the discipline to establish whether the pursuit was acceptable to Christian doctrine. He determined that investigating and observing phenomena was not the work of the devil and he hinted at a division between white and black alchemy, no doubt driven by the accusations of fraud that hung around a pursuit attracting so many charlatans and tricksters.

Roger Bacon (1214–1294) followed in the footsteps of Aquinas and devoted much of his study to alchemy, with the third book of his epic *Compendium Philosophiae* relating much about his tireless search for the Philosopher's Stone. He reinforced the idea that alchemy was a pursuit of creating substances from elements, a definition that can be crudely applied to modern chemistry.

The work of these medieval scholars, although rooted in classical thought, laid the foundations for the further development of the science. Alchemy would explode into popular culture during the Renaissance, beginning with the work of the flamboyant and influential Paracelsus.

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