



The magic of transformation: a comparative analysis of alchemy in *Harry Potter* and its real-world chemistry roots

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“I’ve never wanted to be a witch, but an alchemist, now that’s a different matter. To invent this wizard world, I’ve learned a ridiculous amount about alchemy. Perhaps much of it I’ll never use in the books, but I have to know in detail what magic can and cannot do in order to set the parameters and establish the stories’ internal logic.”

J. K. Rowling

Alchemy is an ancient practice that combines multiple fields of study including philosophy, mysticism, and chemistry. It is largely concerned with the transformation of matter, particularly the transformation of base metals into more valuable metals like gold or silver. Alchemists also sought to create elixirs or potions that could bring about immortality or cure diseases. The origins of alchemy date back to Ancient Egypt and Greece, with early practitioners believing that by unlocking the secrets of the universe’s workings, they could attain greater knowledge and power. Over time, alchemy evolved with the influences of various cultures and philosophies, becoming a complex blend of spiritual and scientific practices. While alchemists were unsuccessful in their attempts to transmute metals or create elixirs, their practices paved the way for modern chemistry and scientific inquiry. Today, alchemy is still studied as a historical and spiritual practice, but it is no longer

considered a legitimate scientific pursuit. (Principe, 2012; Read, 2012)

HISTORY OF ALCHEMY

Alchemy combines the philosophical view and concrete practical method with the goal of conquering absolute Wisdom and Immortality. Alchemists aimed at personal improvement and creation of various materials with unusual properties. The alchemists’ practical method evolved into the basis of modern chemistry as they created techniques for analyzing, identifying and separating substances. Also, many glassware still used in chemical laboratories today were the creations of alchemists. (Newman, 2006; Read, 2012)

Alchemy developed both in the Western world and in the East or Far East. The main difference between the ways alchemy developed was the fact that in the West, the main goal of alchemy was to transform common metals into gold, while in the Far East, the main goal was to discover substances and medicines for the common good (Szydło, 2022). The first traces of Western alchemy can be found in Ancient Egypt (Nummedal, 2012; Read, 2012). Then, alchemical knowledge was passed on to the Ancient Greeks and then to the Arabs. By the time of the Arabs, alchemy was a mixture of philosophical considerations, allegories, symbols and

coded languages. During the Arab period (i.e., the 8th century CE), alchemy began to become a recognizable practice.

In the Ancient Egyptian world, alchemy was closely tied to the practice of embalming the dead, as well as the pursuit of knowledge related to metallurgy and glass-making. The practice of alchemy spread throughout the Middle East and into Persia, where Islamic scholars translated Greek and Persian texts related to alchemy and added their own insights. During the Middle Ages in Europe, alchemy continued to evolve and became closely tied to spiritual and religious beliefs. It was believed that alchemists sought not only to transmute base metals into gold but also to achieve spiritual transcendence and immortality. Alchemical texts from this period often included descriptions of mythical creatures, astrological signs, and debates about the nature of the soul and the universe. The Renaissance saw a resurgence of interest in alchemy as a scientific pursuit, with figures like Leonardo Da Vinci and Isaac Newton engaging in the study of alchemical princi-

ples. During this time, alchemy was recognized as an important precursor to modern chemistry, with its focus on experimentation and observation. Despite its influence on modern science, alchemy gradually lost much of its scientific credibility during the Enlightenment and the rise of modern chemistry. Today, the practice of alchemy remains a fascinating reminder of ancient scientific and philosophical pursuits and continues to inspire modern thinkers who seek to understand the mysteries of the natural world. (Read, 2012; Losure, 2017; Calian, 2010; Figala, 2004)

ALCHEMY & CHEMISTRY

Alchemy and chemistry are two different fields of study, although they share some similarities. Alchemy was a philosophical and proto-scientific tradition that developed in the ancient world and continued through the medieval period up until the 17th century, while chemistry is a scientific discipline that emerged in the late 18th cen-

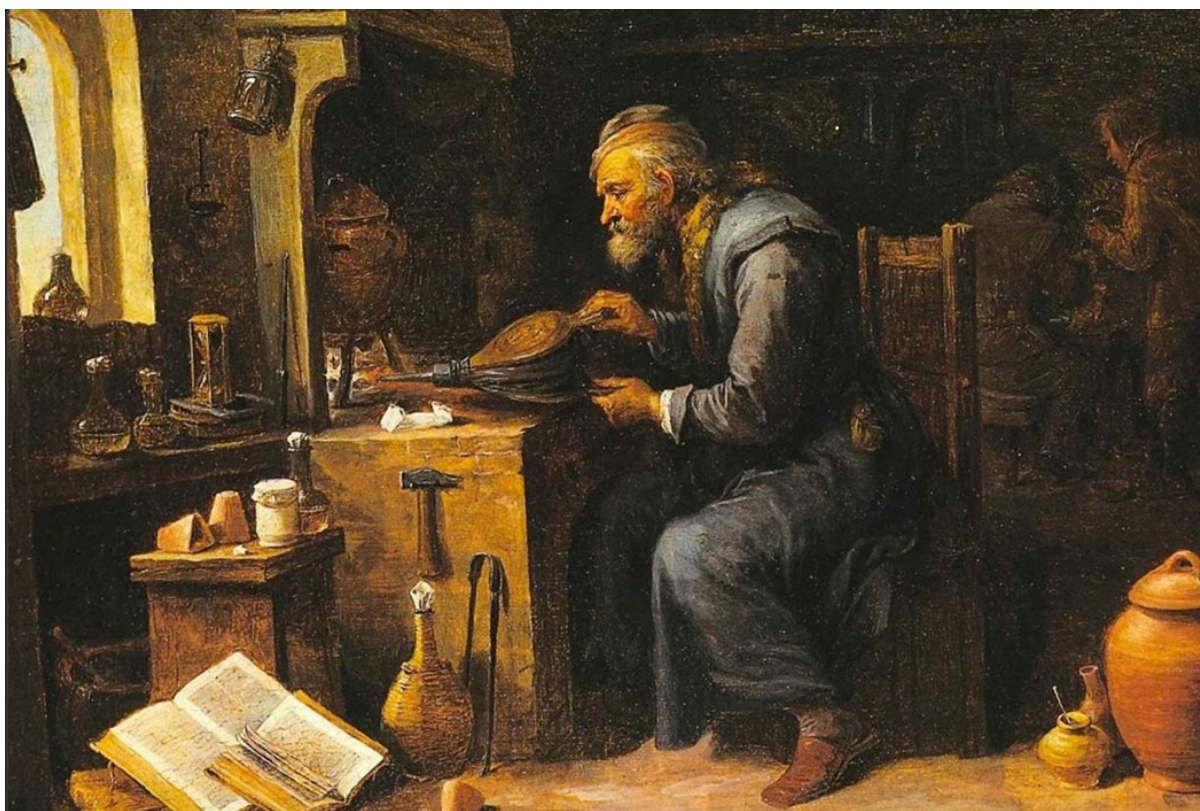


Figure 1. *Alchemist Heating a Pot*, by David Teniers the Younger (1610-1690), oil on canvas (public domain).

ture. The main difference between alchemy and chemistry is in their goals and methods. Alchemy was primarily concerned with transforming matter and achieving spiritual transformation, while chemistry focuses on understanding the properties, composition, and behavior of matter. Alchemists worked with mysterious substances like the Philosopher's Stone and elixirs of immortality, often using symbolism and mysticism to explain their work. In contrast, chemists aim to observe and explain the physical phenomena they study, using quantitative data and experimental evidence to support their theories. Another difference between alchemy and chemistry is the level of rigor in their methods. Alchemists generally did not have access to the level of instrumentation and quantitative measurement that chemists have today, leading to less rigorous experimentation and greater reliance on intuition and anecdotal evidence. By contrast, modern chemistry relies extensively on precise measurements and experimental data. (Greenberg, 2007; Moran, 2005)

Despite these differences, there are some similarities between alchemy and chemistry. Both fields involve working with matter and creating new substances, and both have contributed to our understanding of the world around us. Additionally, some of the terminology and symbolism of alchemy has been carried over into modern chemistry, such as the use of symbols to represent elements and the idea of transmutation. Additionally, the development of chemistry owes a great deal to the work of alchemists, who developed many of the laboratory techniques and procedures that are still used today. (Abbri, 2000; Read, 2012)

MODERN ALCHEMISTS

Researchers from University of Michigan state that some bacteria act as modern alchemists to turn a toxic liquid into gold. The groundbreaking study, which the researchers themselves refer to as "Microbial Alchemy", is based on a type of bacteria with the scientific name *Cupriavidus metall-*

idurans. These bacteria have the ability to be particularly resistant to heavy, toxic metals, up to 25 times stronger than common bacteria. However, what is even more fascinating is that these particular bacteria, according to the researchers, have the unexpected property of transforming gold chloride (a toxic liquid found in nature) into gold. The process of converting the liquid chloride into gold takes approximately one week, during which the bacteria reproduce. In the end, the chloride is transformed into solid 24-karat gold. (Reith et al., 2006; Brown & Kashefi, 2012).

ALCHEMY IN HARRY POTTER

Alchemy has been a significant part of the *Harry Potter* series (J.K. Rowling, 1997, 1998, 1999, 2000, 2003, 2005, 2007) since its inception. From Nicholas Flamel's creation of the Philosopher's Stone to the elusive Elixir of Life, the concept of alchemy has been woven into the narrative. In the *Harry Potter* universe, alchemy is a branch of magic that involves the transmutation of matter and the manipulation of the elements to create potions and elixirs that can achieve various effects. This has allowed alchemy to be an essential feature of both the plot and the magic system of the *Harry Potter* series.

Philosopher's Stone: The Philosopher's Stone is a central element in alchemy and is a key plot point in the first *Harry Potter* book. The stone is said to have the power to turn any metal into gold and create the Elixir of Life.

Horcruxes: The creation of Horcruxes is a dark and twisted form of alchemy in which the soul is split in order to achieve immortality. Voldemort uses this procedure to create seven Horcruxes, each containing a piece of his soul, making him nearly impossible to kill.

Polyjuice Potion: The Polyjuice Potion is an example of alchemy used for transformative purposes. The potion allows the drinker to assume the appearance of another person, but requires a variety of ingredients and some advanced knowledge of alchemy to create.



Figure 2. The potions classroom. Screen capture from *Harry Potter and the Philosopher's Stone* (Warner Bros. Pictures, 2001).

Mandrake Restorative Draught: The Mandrake Restorative Draught is an alchemical potion that is used to revive petrified individuals. The potion requires the use of mature Mandrake roots, which are extremely dangerous to handle and require special knowledge of alchemical procedures.

Nicholas Flamel: One of the most significant references to alchemy in the *Harry Potter* series is Nicholas Flamel, a real-life alchemist who is also a character in J.K. Rowling's books. In the novels, Flamel is famous for creating the Philosopher's Stone, a substance that can turn any metal into gold and produce the Elixir of Life that grants immortality to those who consume it. This concept is central to the first book, "Harry Potter and the Philosopher's Stone" where the villainous Voldemort seeks the Stone to regain his form and wreak havoc on the world.

Draco Malfoy: According to J.K. Rowling, Draco Malfoy, after the Battle of Hogwarts, was fascinated by alchemical manuscripts. His obsession with alchemy was pure as he wished to use it to become a better man.

In addition to the examples mentioned above, there are several other instances of alchemy in the Harry Potter series.

The symbolism of the colors red, white,

and black, which are traditionally associated with alchemy. These colors are significant in the series, particularly in reference to the philosopher's stone and the colors of the Hogwarts houses.

The role of the Hogwarts founders, who are associated with aspects of alchemical symbolism. Godric Gryffindor is associated with fire, Rowena Ravenclaw with air, Helga Hufflepuff with earth, and Salazar Slytherin with the element of water, which is often connected to emotions and intuition in alchemical lore.

Furthermore, the use of magical creatures, such as phoenixes, dragons, and unicorns, which have long been associated with alchemical symbolism. These creatures represent transformation, regeneration, and spiritual purity.



Figure 3. The Founders of Hogwarts with their Elements.

Another interesting example of alchemy in the *Harry Potter* series is the use of the

Deathly Hallows. The three hallows – the Elder Wand, the Resurrection Stone, and the Invisibility Cloak – represent a powerful tool for those seeking mastery over death. This theme is similar to the alchemical concept of transmutation, which was ultimately aimed at achieving immortality. Additionally, the idea of the Invisibility Cloak reflects the alchemical concept of the mystical veil, which acted as a barrier between the physical and the spiritual worlds. The veil was often described in alchemical texts as a symbol of the division between life and death, and the Invisibility Cloak in the *Harry Potter* series similarly represents a way to move between these two realms. The symbolism of the Deathly Hallows also incorporates the themes of duality and balance, which are central to alchemical philosophy. The Elder Wand represents power and domination, while the Resurrection Stone represents life and the afterlife, and the Invisibility Cloak represents secrecy and protection. Together, the three hallows symbolize the balance of opposing forces in alchemical philosophy.

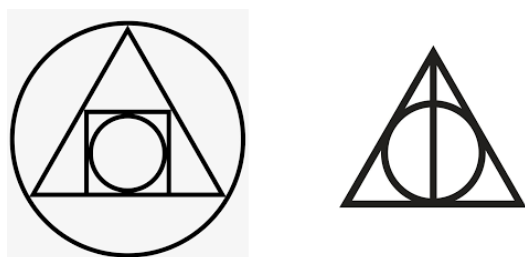


Figure 4. Left: the symbol of the Philosopher's stone. Right: The Deathly Hallows symbol.

Another critical aspect of alchemy in the *Harry Potter* series is its link to the idea of transformation and self-improvement. In alchemical lore, the process of transmuting matter is thought to be an analogy for spiritual transformation. The *Harry Potter* books explore this concept in several ways, most notably through the character of Severus Snape, who is a presumed alchemist as well as a complex and flawed individual. Snape's story is one of redemption and growth, as he transforms from a bitter and resentful person into a hero willing to sacrifice himself for the greater good.

DISCUSSION

Alchemy is a critical element of the *Harry Potter* series and adds a layer of complexity and depth to the fictional world. From the creation of the Philosopher's Stone to the theme of transformation and growth, alchemy is a powerful force in the magical universe crafted by J.K. Rowling. Its use in the series demonstrates how fantasy can draw on real-world mythos and traditions to create a captivating and fully realized narrative.

Chemistry can be regarded as the scientific discipline intertwined with alchemy. Chemistry also plays a significant role in the *Harry Potter* series, particularly in the creation of potions. Potions are a fundamental aspect of magic, and they are used for a wide range of purposes, from healing to transforming objects and animals. Potions require precise measurement, careful mixing, and specific preparations, much like chemistry does. Throughout the series, various characters create and use potions to accomplish their goals. Correctly brewing a potion requires an understanding of the properties of different substances, chemical reactions, and changes in states of matter, all of which fall under the realm of chemistry.

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ABOUT THE AUTHOR

Athina Stavroulaki M.Sc. is a big fan of Harry Potter, Doctor Who, Sherlock, Marvel and DC Comics. Her favourite character in comics is Poison Ivy. She is a postgraduate student from the Department of Chemistry in the University of Crete, and her Master thesis in Physical Chemistry was in collaboration with the Laboratory of Toxicology and Forensic Sciences, Medical School in the University of Crete. Her research interests focus on the development and application of chromatographic and immunochemical methods for analysis of food and biological samples. Currently, she is working as a scientist in a Biopathology Laboratory.