N. Abels

Challenge 1

# History of Alchemy

What is Alchemy? Many people have heard of it. Many fantasy stories have included aspects of it. But most know little more of real alchemy than that a few medieval fools thought they could somehow make lead into gold. There are two main ideas on where the word alchemy comes from. Both agree that *Al* is an Arabic article, but they differ on the second part of the word. The first idea is that it comes from the word for Egypt, or Khem, which referred to the dark color of the soil near the Nile. By this etymology, alchemy means, "*The Egyptian Art."* The second idea is that it comes from the Greek *chyma* which means, to fuse or cast metal. The second would make more sense, as alchemy always includes extensive metalwork. Although there is no proof that any alchemist ever actually made a base metal into true gold, they definitely attempted to and ended up discovering several other important things in the process.

But why, if they were so smart, did they think they could make gold? After all, we know today that metals are completely different elements. With modern technology, we could make gold, down at the atomic level, with particle accelerators, but the process is so expensive it wouldn't be worth it. Ancient alchemists, though, did not have particle accelerators. Gold is simply impossible to make with the kind of technology available in medieval times. The alchemists did, however, use what they had to great effect. The only reason we know that making gold via alchemy is impossible, is because the

alchemists tried it first, with extensive trial and error. Alchemy was, in fact, not just a fantasy but a legitimate scientific process with its own beliefs, goals, and results.

## Beliefs of Alchemists

In addition to the more scientific components of alchemy, the subject included a complex worldview. It involved many beliefs that sound rather strange to us today. For example, many alchemists believed that all matter, from rocks and trees, to stars and planets, was composed of only five elements. These five elements were fire, water, earth, air, and aether. Furthermore, alchemists believed that each element, besides aether, was categorized by hot or cold, wet or dry. Aether was thought to be the substance of stars, and therefore could not be experimented with. If, alchemists thought, everything was made of only five elements in different proportions, then one should be able to change the proportions and make whatever material they wanted.

Belief wise, alchemy was actually very similar to astrology, in that practitioners of both believed that God had made the universe in such a way as to allow humans to study, control, and better it. Many alchemists were in fact astrologers as well. The difference of course, was that astrology studied the heavens while alchemy studied the earth.

Alchemists only knew of seven metals, which helps to explain how they thought they could be related. They linked each metal with one of the planets. Their connections then were: gold : sun, silver : moon, mercury : Mercury, copper : Venus, iron : Mars, tin : Jupiter, and lead : Saturn. This worked nicely because they thought there were seven

planets. These “planets” in fact included the sun and moon, and not earth, where the alchemists were, or Uranus or Neptune, which no one knew existed yet, as they can not be seen without a telescope. This is just one of alchemy’s connections with astrology.

In the same way that astrologers believed that the stars had their equivalent in man, and could therefore be used to see the future, alchemists believed that if they could unlock the secret of turning lead, and impure and useless base metal, into gold, an extraordinarily valuable and pure material, they could do the same for the human spirit. In many cases, writings on alchemical processes were merely metaphors for reaching the pinnacle of the soul through prayer and submission to God. So you see, alchemists did not practice their art just to get extra gold, but to become better people.

The alchemist’s worldview also contained an emphasis on the “spirits” of metal and other materials. Alchemists also believed that metals grew deep in the earth and that each type of metal was but one stage of development. Lead and other base metals were considered the beginning of the process and to be impure spirits. Silver and gold, however, were the end, the most advanced, the very pinnacle, and perfectly pure spirits. Although alchemy seems ridiculous now, it was merely based on a completely different set of beliefs.

## Goals of the Alchemists

Alchemy also had goals which were somewhat different from science nowadays. The main goal of alchemy was to bring everything to its best, purest, most true form. Gold, then, was only one of the alchemist's goals. They also tried to make medicine that

would cure any illness. This would be the pinnacle of health. Any kind of viable medicine would be very valuable in medieval times, when many illnesses were deadly. In the process of trying to make the ultimate medicine, alchemists made several real advances in the field of medicine.

Further attempting to purify the body, they also tried refining substances into an elixir that would grant eternal life. One alchemist, John of Rupescissa, claimed that a specific method of wine distillation would do the trick. He called the liquid Aqua Vita, or the water of life. This may sound absurd, but it had its basis in reality. Alcohol has great antibacterial properties and the alchemist had found that objects placed in the wine would be preserved for a very long time. Thus, alchemy was more than just a pursuit of gold, but an attempt at the purification of all things.

All of these goals were said to be achievable via one source: The Philosopher's stone. Some said it was a wax, others a powder. Sill More claimed it was the elixir of life, or even a universal solvent, a substance that could dissolve anything, even gold. Ideas were even more varied on how to get the stone. The only consistency was a change of colors: the alchemist's solution was supposed to turn white, then black, then golden, and finally red. Even with this color description, explanations on how to achieve the Philosopher's Stone varied widely.

Alchemy differed in goals based on the region. The differences were mainly geographical, but different religions played a big part as well. As far as we know, alchemy was only practiced in the Far East, Mediterranean, the Middle East, and Europe.

China and India, the two most prominent cultures in the Far East, are believed to be some of the first places in which alchemy was practiced. In those countries, the main goal was always cure-all medicine and the elixir of eternal life, whereas there was almost no emphasis on gold. They never achieved eternal health and wealth, but they did discover gunpowder. Because they made so much elixir and medicine that had to be tested out, many Asian alchemists died from faulty concoctions. When someone convinced the emperor to try a potion and he sickened and died, it was just one more stroke against Far Eastern alchemy. Alchemy died out early in the Far East after too many people lost their lives drinking suspicious elixirs that were supposed to heal them.

Around the Mediterranean, the Greco-Egyptian culture was perhaps not the first to begin alchemy, it definitely made some of the biggest advances. After Alexzandria was founded, it quickly became one of the largest centers of learning in the world. The Ptolemys provided great stability in the wake of Alexander's conquest, and the city was funded by its thriving ports. The city also became a center for alchemy. The library of Alexandria contained many important volumes, including the works of Aristotle, whose ideas were alchemy’s foundation. One particular alchemist, Zosimos of Panopolis, wrote much on the subject.

Greko-Egyptian alchemists believed that appearance was the most important thing. Therefore, they found many ways to change copper and lead to silver and gold colored metals. They did not perform alchemy in order to achieve wealth, but in order to gain a deeper understanding of the world, so they did not care if they could not spend the gold they created. Neither was it important if the “gold” later corroded away; they figured the process just had not worked all the way. Even when alchemists figured out

that a metal was not gold just because it looked like it, they still paid close attention to the color of things for thousands of years. The Far East may have held the first alchemists, but Alexzandria was alchemy's origin.

In the Middle East, the Arabs were the next to attempt alchemy. Their pursuit was almost exclusively the transmutation of lead into gold. Though there is no proof any of them succeeded in making gold, they did discover several dyes and acids. We do at least have a lot more documentation from the Arabs, and much of our older texts were written by them. They came up with the system of five elements, and later added three more elements: sulphur, giving flammability or combustion, mercury, giving volatility and stability, and salt, giving solidity.

The last region to discover alchemy was Europe. Like the Egyptians, Greeks, and Arabs, their focus was usually gold, though there was some search for medicine. Although Chinese alchemists discovered gunpowder first, Europeans rediscovered it later and constructed the first guns.

One interesting thing to note is that many Christian scientists in Europe were also alchemists, and they apparently combined the two belief systems rather well. There were several cases however, when the church banned and prosecuted the art of alchemy, either not wanting there to be more gold in the world, or because they thought it was some form of dark magic. Kings were often not any kinder to the practice. King Henry IV of England proclaimed it illegal unless alchemists applied for a gold making license.

Despite misunderstandings and condemnation, alchemy continued on in the western world with increasingly more Christian tones. Many themes from Christianity were incorporated. So too were older mythologies, such as Greek stories. The Golden Fleece, for example, which was said to have been the subject of the great quest of Jason and the Argonauts, was interrupted to be a parchment bearing instructions on gold making. Latin Europe may have discovered the practice of alchemy later, but they still advanced the art significantly.

Part of the reason for these differences in goals was the different religion of each region. In the Far East, they originally believed that there was no life after death, hence the focus on immortality. Around the time the religion changed, alchemy did as well. The other peoples of the world believed in immortality through the afterlife, so they mainly focused on gold. Regardless of other factors, the common goals of gold, health, and life, were scientifically pursued by most alchemists, at least at some point.

## Results of Alchemists

Despite all their efforts, alchemists apparently never succeed at their goals. However, like good scientists, they never gave up, and discovered several useful substances beyond their goals. Medieval alchemists made numerous advances in the fields of science and more. In their studies of metal, they made leaps and bounds in the fields of mining and metallurgy. In their quest for powerful elixirs and potions, they learned much about pharmacy and medicine. In addition, alchemy was the beginning of chemistry and science and they invented the scientific method in the midst of their

experiments. Since they were mixing chemicals together, alchemists even discovered gunpowder, produced acid, and even fermented alcohol for the first time. Only a few alchemists, however, published their work. Without more, we can only guess at the rest of the alchemists' world of research.

Many claimed to have succeeded in making the philosopher's stone, or sorcerer's stone. This was not an actual stone, but more a wax, liquid, or powder. Nevertheless, stone or not, it was said to be able to accomplish all the goals of alchemy. It could turn base metals, like lead, into glorious, gleaming, gold, heal any kind of sickness, and grant complete immortality. Unfortunately, they did not provide easily repeated recipes, so their is no way to prove their supposed discovery. Overall, alchemy had many surprising results, but only some were useful.

Alchemists often wrote their notes in an extremely cryptic way, and many were written as allegories, or otherwise flowery statements that were very hard to translate. For example, the alchemist Zosimos of Panopolis, after breaking a piece of metal apart into a powder and then heated it, causing it to melt back together wrote:

*"I fell asleep and saw before me a priest standing upright before a bowl-shaped altar, which was approached by fifteen steps. The priest remained standing, and I heard a voice from on high which said to me, 'I have accomplished the action of descending the fifteen steps towards the darkness, and the action of ascending the steps towards the light. The sacrifice renews me, rejecting the dense nature of the body. Thus consecrated by necessity, I become a spirit.' Having heard the voice of him who stood upon the altar, I asked him who he was. In a feeble voice he answered me, 'I am Ion,*

*priest of the sanctuary, and I have suffered intolerable violence. For one came quickly in the morning, cleaving me with a sword, and dismembering me systematically. He removed all the skin from my head with the sword that he held; he mixed my bones with my flesh and burned them with the fire of the treatment. It is thus, by the transformation of the body, that I have learned to become spirit.'"*

As you can see, this sort of thing would be rather hard to decipher, and makes it difficult to know exactly what the alchemist did.

Here is another example of an alchemist's coded language. Say he was working with Salammoniac, or ammonium chloride, a volatile white salt, he might call it "the white eagle," because an eagle flies just as the salt is volatile. If he used nitric acid, he might instead write, "red dragon," because it devours other substances and, on heating, it creates red vapors that look sort of like a dragon breathing fire. Thus, rather than saying, "Put the Salammoniac in the nitric acid," he would instead write, "Allow the red dragon to devour the white eagle." He might even just draw a picture of a dragon eating an eagle! While this makes for a very cool picture, it would be rather hard for a modern scholar to decode as a science experiment.

In fact, learning the secrets of alchemy would be quite dangerous. After all, what monarch or otherwise powerful person would want someone making gold under their nose without being in on the deal? Medicine making was not exempt either. One alchemist was stormed by a mob during a wave of sickness because they thought he had discovered the elixir of life. Many too, were found strangled in bed under the mere suspicion of their discoveries, when they, in fact, knew no more than their killers. Even if

alchemists were often greedy themselves, they were often in grave danger due to the avarice and false assumptions of others.

The prevalence of Alchemy waned in the 19th century. There were several reasons for this, one being the increase in people who claimed to be alchemists, but were really just scammers. These pseudo-alchemists continually made the entire art seem charlatan. The most important problem, however, was a flawed understanding of the world. After all, we know that there are a lot more than 5 elements, and metals are completely different substances.

In addition, alchemists were so secretive that they rarely passed their work on, or even left their work in any understandable format, often inventing complex codes to make stealing their work impossible. Unfortunately, that made it hard for them to work together, and even harder for scholars today to figure out what exactly they were doing. This means that as alchemists died, so did alchemy itself.

Today, alchemy is widely considered to be fodder for fantasy novels and nothing more. You would be considered foolish to strive for the transformation of lead into gold today, however, in medieval times it was actually a legitimate enterprise. Alchemists of old had some worthy goals, but some very strange beliefs. They wished to turn lead into gold, to heal the sick, and unravel the secrets of immortality. They thought the world was composed of but a handful of elements, and that metals grew deep under the earth. None of these beliefs helped them, however, and no proof has been found that any of them succeeded in making the philosopher's stone. They did discover many other

useful substances, and most importantly, invented and followed the scientific method. This, if nothing else, made them scientists. We only know their ideas were incorrect because they tried them out and told us. As Isaac Newton wrote in 1675, “If I have seen further, it is by standing on the shoulders of giants.” We, like Newton, stand on the shoulders of the alchemists.

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