

On the shoulders of magic giants

The process of transforming alchemy into chemistry was longer and smoother than is commonly thought

Carlos Haag

It took a lot of courage for Einstein, right in the middle of the modern age, to say, “Science without religion is lame, religion without science is blind.” The first part of the quote still brings a shudder to many scientific minds that, in orthodox fashion, associated science with the idea of progress: thus, the ancient scientists knew less than medieval scientists, who in turn knew less than modern scientists, who had been totally freed from any religious “obscurantism.” “The passage from alchemy to chemistry, between the mid-1600s and the end of the 1700s, is seen as especially narrow. The landmarks of this passage were the publication of *The Skeptical Chemist*, by Boyle, a book that marked the start of modern chemistry in 1661, and the grand finale by Lavoisier in his *Elementary Treatise of Chemistry*, in 1789,” explained Professor Ana Alfonso-Goldfarb, of the Simão Mathias History of Science Study Center (Cesima), at Pontifical Catholic University of São Paulo (PUC-SP).

“It is not possible to disassociate the development of science from religious aspects, just as alchemistic knowledge and hermetic tradition were not eliminated by the scientific revolution, but co-existed side by side for many centuries. This was not a matter of ruptures, but of continuation and slow transformation of old knowledge,” the researcher concluded. Alongside Márcia Ferraz, also from Cesima, Alfonso-Goldfarb brought to the forefront an important network of

OEDIPVS
CITHMICVS.



Concordance of the... to find a...
analysis of the... to be found
... of ...

The... of... of...
... the... and...
... in... to...
... from...
... in...
... of... and...
... the...
... for...
... of...
... of...

Recipe for Alkahest found
by Brazilians

The... that may be...
... of...
... of...

discussions on the principles of this topic that continued into at least the 18th century, in the thematic project *Revealing natural processes through the laboratory: the search for material principles in the three kingdoms through the specialization of the sciences in the 1700s*, supported by the São Paulo Research Foundation (FAPESP). “In spite of conducting procedures close to those of modern science, notable minds from an institution like the Royal Society still saw the “eye of God” in “enlightenment” laboratories, noted Márcia Ferraz. In fact, it was by delving into the archives of the British society that these two researchers are creating more and more doubt about the belief that alchemy, which is based on mysteries, was unable to make the passage into a rational and mechanistic universe, in which no mystery was admissible.

“For a long time, alchemic ideas, under another name, intrigued many of the great names that we now associate with modern science. This is the beauty of this story: there is no single reasoning, but several “reasonings” that were able to co-exist until the 19th century,” according to Alfonso-Goldfarb. In fact, this will be the focus of the spin-off of the thematic project into a new project, also supported by FAPESP and now underway. This project will extend as far as the 1800s, a period in which the professors’ research confirmed that the areas of knowledge were actually broken down into a modern system of organization. “At the same time, and perhaps not by chance, the notion of a material principle or principles was overcome in many ways, including through distant variations like the new understandings of active principles,” said Ferraz.

Until that time, the interest of the scholars had been divided between two lines of investigation. One of the perspectives organized the material into “cardinal principles:” these were exclusive to the kingdom they belonged to and were not transferable to other kingdoms of nature, even in the laboratory. A second group defended the existence of a single principle that circulated among the three kingdoms (animal, vegetable, and mineral), although it

acted in a distinct manner in each of them. This belief dated back to Aristotelian times, and was based on the observation of processes in materials from different kingdoms, which appeared to transfer their characteristics to each other when they interacted. Notable scholars of the first modernity were among the adherents to this view, whose reverberations continued to prevail throughout the 18th century.

“Many of the works that created modern science were at a threshold. On the one hand, they captured this totalizing logic of the knowledge gained by voices from the past, while at the same time beginning contact with a new cosmology and new ideas,” Alfonso-Goldfarb said. At the beginning, the researchers themselves were somewhat bothered by the discovery that men like Boyle and Newton believed in the possibility of the “sorcerer’s stone.” But, as loyal followers of reason, the researchers were convinced by their documentary findings at the Royal Society archives to revise their beliefs and to begin to look at the old models of new science from the prism of that time, rather than with the anachronistic and “prejudiced” vision of our times.

After all, how could they dispute an official document of an institution that was more than 350 years old, especially the writings of Henry Oldenburg, a member of a European network of sages and secretary of the recently created English society? “For scholars

Works that created modern science were on the threshold of voices from the past and new ideas



REPRODUCTION FROM THE BOOK O MUSEU HERMÉTICO: ALQUIMIA & MISTICISMO BY ALEXANDER ROOB



of the Royal Society there was nothing more to be discovered in their files, especially after the complete cataloguing of the collection made by Marie and Rupert Hall beginning in the 1960s,” said Alfonso-Goldfarb. However, the Brazilians discovered a lot of material in the “closed bottoms” of the file, and it was not insignificant. The most “spectacular” finding was the “recipe” for alkahest, alchemy’s alleged “universal solvent” that could dissolve anything, reducing it to its primary components. This was found in the papers of men who were “enlightened” by reason, like Oldenburg and Jonathan Goddard, a professor at the institution. This discovery only confirmed that Newton’s “secret papers,” which had been released little by little since the 1930s, and their relation with alchemy, were but the tip of

an iceberg that was larger than what would have been desirable.

“There was a second agenda for the new scientists, and documents show in a concise and almost modern way that in many experiments there were concepts and processes linked to old treatises and reference formulas. It is enough to look at the attempts to refine gold with antimony described by Goddard to the Royal Society,” Ferraz noted. However, before judging, it is necessary to know the link at that time between material sciences and medical sciences, the preferred site for this hybridism between the old and the new in the battlefield of the laboratories. “The so-called ‘kidney stones,’ or renal lithiasis, was one of the main causes of death before the 19th century.

Within this context, alchemy appeared to be a lifesaver, since its supposed ability to ‘open’ the most resistant materials in order to extract their purer essence could dissolve stones in the body,” Alfonso-Goldfarb noted.

It was necessary to find something that had the power of acid, but without acid’s lethal side effects on the human body. “Alkahest and the sorcerer’s stone combined to make up the ideal remedy: the first softened the negative effects of the acid and the stone was

It is necessary to know the link between the sciences of matter and medical sciences of the time

the ideal complement, since it would be potent enough to dissolve even a resistant metal like gold, and yet at the same time, be harmless to the organism,” Ferraz explained. However, it cannot be denied that the search for these alchemy products was also linked to the desire to produce gold, so desired by both common folk and kings, as well as to much esoteric “philosophizing,” which was in vogue in puritan England. “We found many documents in the Royal Society archives that reveal a millenary view held by many wise men of that time,” Alfonso-Goldfarb said.

Less vulgar than the medieval millenarianism, the British professor advocated the “importation” of Jews from the Low Countries into England, bringing them together with the Pu-

ritans, a mixture that would create a “natural cauldron” from which the messiah would be born, who would be able to launch a new age of scientific, educational and medical progress in which everyone could benefit from the advances made in the laboratories. “They wanted to make everything that was incomprehensible, and thus threatening, into something understandable, through puritanism, generating the best and most rational of worlds, said Alfonso-Goldfarb. Far from delirium, it was a debate that involved an intensive exchange of letters among members of the Royal Society and figures like Espinoza and Leibniz. Einstein, who didn’t play dice with the universe, had his reasons.

Alongside the hybrid research with alchemy, everything was a secret to be kept under lock and key. “Very often, there were cases of bribery, espionage and theft of alchemy “recipes” ordered by Oldenburg in the name of scientific progress,” the researcher said. However, these recipes raised questions that helped to create the new science. After all, the secret papers either listed exotic ingredients or did not describe them precisely. So, how would it be possible to obtain the right material that was pure enough, capable of making the reference formula work? Perhaps the failure to find the sorcerer’s stone, for example, was due to these imprecisions. “It was a search for transmutation, but within procedures that would become the cornerstone of modern science. The laboratory is

transformed into the place of ‘proof.’ Previously, it had been used to create products, and now, between the 17th and 18th centuries, it began to serve as a center for the standardization of experiments,” Alfonso-Goldfarb said.

Beginning with alchemy questions, a discussion arose regarding the need for a universal science. At the center of this was a preoccupation with the ability to reproduce a given experiment in which scientific parameters would be established, a middle road between mystical aspects and science. “The gradual development of the printing press, which enabled better circulation of information, and the exchanges between those who had traditionally kept information taken from ancient literature and its vestiges secret, weighed heavily in the birth of the new science of

chemistry,” Alfonso-Goldfarb observed. “Instead of obsessive searches for legendary materials, the laboratory ended up guaranteeing excellent markers for the progress made in analysis and synthesis. Above all, the idea was to use them to guarantee a material and visible expression for the study of the elementary principles or bases which would otherwise seem unattainable,” added Ferraz. It took more than two centuries for the old alchemy laboratory to become a chemistry laboratory, with its modern standards. These were times in which science tried not to limp and a part of the religious world wanted to see. ■

It took two centuries for the old alchemist’s laboratory to become a chemistry laboratory

PROJECT

Revealing natural processes in the laboratory: the search for material principles in the three kingdoms until the specialization of the sciences in the seventeen hundreds – no. 2005/56638-7 (2006-2011)

GRANT MECHANISM
Research Assistance – Thematic Project

COORDINATORS
Ana Maria Alfonso – Goldfarb
Márcia Ferraz
Cesima (PUC-SP)

INVESTMENT
R\$659.361,18

SCIENTIFIC ARTICLES

1. ALFONSO-GOLDFARB, A. M. *et al.* Gur, Ghur, Guhr or Bur? The quest for a metalliferous prime matter in early modern times. *British Journal for the History of Science*. v. 44, pp. 1-15, 2011.
2. ALFONSO-GOLDFARB, A. M. *et al.* Chemical Remedies in the 18th Century: Mercury and Alkahest. *Circumscribere*. v. 7, pp. 19-30, 2010.
3. ALFONSO-GOLDFARB, A. M. *et al.* Lost Royal Society documents on ' Ikahest' (universal solvent) rediscovered. *Notes and Records of the Royal Society of London*. pp. 1-23, 2010.

FROM OUR ARCHIVES

The secret agenda of chemistry
Issue no. 154 – December 2008

Documents that are worth gold
Issue no. 182 – April 2011

The gold of wisdom
Issue no. 177 – November 2010

