

Book Reviews

Hans-Werner Schütt: *Auf der Suche nach dem Stein der Weisen. Die Geschichte der Alchemie*, Verlag C. H. Beck, München, 2000, 602 pp., (ISBN 3-406-46638-9)

What was alchemy? This question has been a matter of discussion for at least the last two centuries, in which many scholars tried clarifying the limits of this activity. I have formulated this question in the past tense, because most scholars agree that alchemy as such had left the scene by the end of the 18th century, while its present continuation is usually not taken seriously. When asking this question, we find ourselves caught in a web of further problems: was alchemy a science as we understand it now, or was it a certain kind of teaching based on principles different from those considered as 'scientific'? Why did alchemy appear, and why did it survive for so many centuries? Answers to the former question vacillated between extremes. In the 19th century, Justus von Liebig judged that "alchemy was never at any time anything different from chemistry [...] Alchemy was a science, and included all those processes in which chemistry was technically applied". In 1742, however, Lenglet Dufresnoy opened his book on the history of hermetic philosophy: "I am about to give in this little work the history of the greatest folly, and of the greatest wisdom, of which men are capable." The difference between both statements is striking, as is the standpoint of their authors. While Liebig focused his attention on chemical aspects of alchemy, Dufresnoy concentrated on its links with hermeticism. Which one should we believe? Were alchemists scientists, credulous fools, wise fools, or frauds (as they often appeared in the eyes of the broad public)?

All of this, and more, should be kept in mind when reading any history of alchemy.

As the author states in the first chapter of the book under review, alchemy cannot be strictly defined because of its inherent lack of borders. The two preceding citations support this standpoint. On the other hand, we can trace through the entire book an Ariadne's thread of the eternal dreams of improving the human condition, whether in material status, physical health, or spiritual ennoblement as the highest peak. In this respect, perhaps the definition of alchemy proposed by Sheppard (*Wolfenbütteler Forschungen*, vol. 32, 1986, p. 13) would be acceptable, as it does not draw any clear-cut border, but instead stresses this idea of improvement.

The beginning of this review has outlined the scope of problems that any author would face in attempting to write a history of alchemy not only as a history of persons and events, but also as a history of ideas. In all such books, readers can find points with which they do not fully agree. The limits of alchemy can be frustratingly nebulous, and each reader can have his or her own conception of what alchemy means. The author nevertheless undertook this unrewarding task, resulting in a voluminous book that presents alchemy as a multifaceted phenomenon against the background of its history. Such an approach makes this book of interest to anyone who would like to get a picture of this strange science, which continued to attract attention as it remained in the shadows.

It is advisable to consider the short "Necessary epilogue" (p. 547) first, because it is there that the author explains his leading idea. He neither intends to write a complete history of alchemy, nor introduce all adepts of the Great Art. It

is likewise not his intention to bring new facts and discoveries to light. In this point a small correction of the author's statement is necessary, for he describes some experiments he made in order to test the reliability of some alchemical texts (he attempted to prepare the tetrasomia [p. 43]; and with Dr. C. Priesner, he reproduced an alchemical experiment [p. 496]). These experiments have indeed resulted in new contributions. However, the principal aim of this book, as we read in the epilogue, is to collect as much material as possible for drawing a broad yet coherent picture of alchemy. It should be stated that Prof. Schütt succeeded in this respect; but his book cannot merely be read, it requires study.

The book is divided into four main sections, each of which consists of individual chapters. The titles of the sections are suggestive: I. "In the shadow of pyramids"; II. "In foreign worlds"; III. "In monasteries and other places"; IV. "In the new world of Europe". Rich notes (33 pp.) bring additional information that would otherwise interrupt the main text. At first glance, the short list of references is surprising. The answer to this mystery is found in the epilogue: because the full list of references is fifty pages long, the author has instead posted it on the internet (<http://www.tu-berlin.de/fb1/alchemy>). This approach is unusual and will surely cause discussion, as innovations of this kind have positive and negative aspects. It seems that we must gradually become accustomed to this kind of symbiosis between classic and electronic media. The future will show whether or not this approach becomes generally accepted. To finish the description of the contents, indices of persons and subjects conclude the book.

Alchemy is treated chronologically in this book, tracing its gradual development in Hellenistic Egypt, from which it eventually reached Latin Europe through Arabic mediation. Some tangents of Western alchemy are men-

tioned, such as Chinese alchemy. The author repeatedly draws parallels to the modern world in order to make some of the problems under discussion more understandable to contemporary readers. This approach does not seem to work in all cases, although it can help those readers who read this book as their first acquaintance with alchemy. Because of the length of the book, it seems appropriate to formulate this review as individual points concerning items that deserve attention or comment.

The origins and some typical aspects of alchemy are discussed in the first section, in which attention is focused on Hellenistic alchemy. One such typical aspect is the role of colors, and here the author's attempt to prepare the tetrasomia (p. 43) should be discussed. In his opinion, his results corresponded well with the ancient descriptions. However, an important question is whether or not there is any convincing proof that suitable salts of gold were known in the Hellenistic world. Unfortunately, there is no adequate specification of which salts react with potassium hydroxide and the reducing agent to produce a dark violet Au(I) hydroxide (p. 56). Indeed, there are other ways in which the desired color changes could be achieved. For example, white, yellow, and red could be related to reactions involving the oxidation of lead (H. Hild, Dissertation, TU Munich, 1991, p. 112). As the lead ore galena (PbS) is black, the process of cupellation could also explain the color sequence in question, as the final red color could correspond with red lead oxide (Pb₃O₄).

As the author points out (p. 34), the Leyden X and Stockholm papyri contain nothing mystical or religious. Yet, the use of the urine of a pregnant woman in recipe No. 9 of the Stockholm papyrus (p. 36) reveals an attitude that was related to natural magic in medieval Europe (R. Kierckhefer, *Magic in the Middle Ages*, Cambridge Univ. Press, 1989, p. 9). Such beliefs are reflected in the manual

of Theophilus (Theophilus, *On Divers Arts*, Dover, New York, 1979, book III, chap. 21), according to which iron tools can be hardened by being quenched in the urine of goats fed on ferns for four days. The urine of young, redheaded boys is also allegedly suitable. However, neither pregnancy nor diet significantly changes anything in the product from the point of view of such uses. This is an example of the type of magic that was an inseparable part of human thinking in the past, and which found its way into the manuals of craftsmen in the Hellenistic world and in medieval Europe.

An interesting point is the influence of shamanism on alchemy (p. 93) as mentioned in the discussion of Zosimos' visions. While it is not unlikely that such an influence could have existed, it would be difficult to prove that shamanism reached the Hellenistic world in some form, or that the martyrdom described in Zosimos' visions was a symbolic reflection of the Gnostic initiation rites whose roots reached back to shamanism. The influence of shamanism appears more clearly in Chinese sources, such as the treatise of Ko Hung (*Alchemy, Medicine, Religion in the China of A.D. 320*, MIT Press, 1966) in which there are stories about fairies that should appear after ingesting an elixir, and about travelling in the air. Such cases suggest the effect of intoxication by plant drugs, as it is sometimes the case with Siberian shamans (H. Findeisen, H. Gehrts: *Die Schamanen*, Diederichs, Munich, 1996). Links between shamanism and the Hellenistic world would be more complex, and this question deserves deeper attention.

Concerning note 6 on p. 164 that questions the discovery of gunpowder in China, it should be noted that Needham has analyzed this problem very precisely, and has also tried to explain how Roger Bacon might have arrived at a recipe for this substance (J. Needham: *Science and Civilization in China*, Vol. 5, Part 7, 1986, p. 568 ff.).

Concerning the list of Arabic alchemical books compiled by an-Nadim, it should be noted that according to J.W. Fück (*Ambix*, 4 [1951], 81) it was compiled A.D. 987, not 988 (p. 179). Furthermore, the Jabirian corpus as given in this list encompassed over 4000 titles, not 500 as stated by Schütt (p. 178). Only some of these works are fully cited in Fück's paper. The section on Jabir is long enough, but nevertheless one of his names, as-Sufi, could also be mentioned because it throws light on Jabirian philosophy in general and numerical mysticism in particular. The third-order magic square Jabir used need not have been borrowed from the Pythagoreans (p. 186) as it is easily constructed and its aesthetic properties are immediately apparent. Furthermore, the extent to which Greek mathematicians were interested in numerical magic squares remains uncertain. On the other hand, Jabir's numerical analysis of words would deserve further comment (p. 186 ff.), such as his intentional introduction of numerical 'correction' coefficients for arriving at whole numbers corresponding to those in a given magic square. The description of Jabir's experiments with water (p. 195) is not fully clear. If an aqueous solution is distilled, the solute would appear as a crystalline residuum, yet if pure water is distilled repeatedly (as done by Jabir), a similar result can be expected if silicates from the glass apparatus become absorbed by the water. These are two different processes with similar results, which would certainly be unexpected in the case of pure water.

Nearly every history of Chinese alchemy mentions the statute of the emperor Jing from 144 B.C., according to which all those who produce artificial gold should be executed. However, this statute is not itself a convincing argument for the existence of alchemy, as the falsification of gold was within the reach of any skilled metallurgist. What is often omitted in this story is the fact that Jing's predecessor, the emperor

Wen, allowed the common people to produce coins (H.H. Dubs, *Isis*, 38 [1947], 62). Jing's statute seems merely to have been a reflection of the damage this practice could cause to his country's finances.

In the third section of this book, Theophilus is mentioned in a discussion of 'Spanish gold' and 'basilisk powder' (p. 257). As the author suggests, this gold could have been nothing more than brass. But the question of why Theophilus would conceal the production of brass, when it is quite clearly described elsewhere in his book (Book II, Chap. 66), is not addressed.

There was an epoch of alchemy in Europe in which the 'mercury only' theory found acceptance. As the author writes (p. 279), the conflict between this theory and the sulfur-mercury theory, which lasted throughout the 14th and 15th centuries, ended by returning to the original sulfur-mercury theory. It should be added, however, that the 'mercury only' theory did not completely disappear and can be traced in later works (A. Libavius, *Alchymia*, 1597, lib. II., tract. I., chap. L, p. 235).

Roger Bacon's contributions to European alchemy would deserve deeper analysis, as this scientist seems to have supposed that chemical components react only in definite proportions. This idea is documented with reference to HgS and Hg₂S. Bacon's statement in the *Speculum alchemiae* that mercury and sulfur should be compounded in certain proportions was well in advance of the contemporary state of science (*Vseobščaya istoriya khimiyi: Voznikoveniye i razvitiye khimiyi s drevneyschich vremen do XVII veka* [General History of Chemistry: Origin and Development of Chemistry from Ancient Times Till the 18th Century], Nauka, Moscow 1983, p. 242).

Much space is devoted to the fabulous story of Nicolas Flamel, while comparatively less space is given to Lully, although the latter was very important in two regards: as Ramon Lully, the phi-

losopher, and as the name under which a corpus of spurious, yet influential, alchemical works were published. The identity of pseudo-Lully would deserve attention, as would the influence of the true Lully and Lullism on the emperor Rudolf II. It should be added that rose nobles were first struck after 1344, not 1465 (p. 570, n. 15). Concerning Flamel, the author suggests (p. 351) that three times seven pages of a mysterious book in Flamel's possession could symbolize the main colors of the alchemical opus, namely blackening, whitening, and reddening. However, the question of why yellow would be omitted is not addressed.

Discussion of the world ether (p. 292 ff.) touches upon the modern scientists A. A. Michelson and E. W. Morley. Mendeleev also speculated on ether, which he considered to be the lightest chemical element (D. I. Mendeleev: *An Attempt towards a chemical Conception of the Ether*, London 1904).

In the long chapter devoted to pseudo-Geber (pp. 323-37) there is no mentioning of the significant recipe for nitric acid, which appears in the pseudo-Geberian corpus.

European alchemy has passed through several peak periods, one of which was the Rudolfian era in Bohemia. This extraordinary blossoming of alchemy is clouded by many legends, among which that of the Golden Lane in Prague appears in the reviewed book (p. 369). Contrary to popular legend, no alchemists ever lived or worked there, the name of the street being derived from the color of the uniform of the guards that were housed there (as the houses adjoin the casements of part of the old castle fortifications). The full text of Rudolf's decree, on the basis of which these soldiers received their houses, is cited in O. Zachar, 'Rudolf II. a alchymisté', *Casopis musea království Českého*, 87 (1913), 246.

The use of gold in creating a ruby color was known well before the Arabs (p. 358). In fact, this practice seems to

have been known even in ancient Mesopotamia. This is discussed by R. Campbell Thompson (*Ambix*, 1 (1937/38) 8), who translated the name of a substance prepared with gold as 'ruby coral'. According to this author, the amount of gold required in these recipes should have been enough to identify this substance with 'Purple of Cassius'.

Many alchemists are discussed in the book under review, but a few others could have been added, for example Alexander von Suchten. The discussion of the discovery of oxygen (p. 467) is complicated, and the roles of M. Sendivogius, J. Mayow, and perhaps even C. Drebbel should have been mentioned. The experimental side of alchemy could have appeared in the long discussion of Newton's alchemical activities (pp. 479-89), as it could have been interesting to readers to follow his experimental attempts at preparing various 'mercuries' of metals. Likewise, the alchemical experiments of R. Boyle could have been mentioned, for he wrote that it is impossible to become wealthy by alchemy.

Fraudulent alchemists constituted a special group (especially attractive to the popular audience) which seems to have existed throughout alchemy's entire existence. The way in which these 'alchemists' are characterized in the book under review (pp. 489 ff.) is not fully clear. Perhaps a citation of M. Maier's *Examen Fucorum Pseudo-Chymicorum* would have provided an adequate illustration of the methods utilized by frauds, especially as this book was written by a contemporary of such people (a translation and commentary of this work was the topic of the dissertation of W. Beck, TU Munich 1991).

Central Europe seems to have been full of alchemists during the 16th and 17th centuries. The social status of these men is a matter of discussion. The promise of gaining considerable riches through alchemical means still seemed credible, and this idea was attractive to aristocrats who hoped to improve their finances which were sometimes devas-

tated by their expensive lifestyles. Furthermore, it was to some extent fashionable to employ court alchemists, similar to court musicians, painters, etc. Yet, the position of alchemists was different: they could either maintain themselves while impoverishing their aristocratic employers (as happened to a Czech family from Vresovic who lost their property in this way); or they could remain on the verge, on the verge between life as a fugitive and death on the scaffold.

The final sections of the book under review are devoted to the Jungian explanation of alchemy. The Jungian interpretation of alchemy is commonly discussed among many scholars (excellent analysis of this and related problems appeared recently in *Secrets of Nature: Astrology and Alchemy in Early Modern Europe*, eds. W.R. Newman, A. Grafton, MIT Press, Cambridge, MA, 2001, pp. 385-431); the author of the book under review presents this subject with reference to the questions that appeared at the beginning of this review; namely, what is alchemy, how did it originate, and why did it survive for so long? The author brings rich material in consideration of these questions, and the reader gradually understands that there are no simple answers.

The points mentioned in this review do not change the fact that the book is an interesting reading. It is a welcome attempt to describe and characterize alchemy while making it more comprehensible to readers unfamiliar with this science. The book can also be of interest to scholars working in the field, as they can find it as a useful attempt at bringing together the present state of our knowledge of alchemy. Background knowledge in general history and the history of philosophy is necessary for understanding the book fully. The rich material collected in the book is sometimes presented in a flowery language with long sentences, quite characteristic of the German style of writing. After becoming accustomed to the author's

style, we can follow him on an interesting and alluring journey through the centuries in which many people lived for dreams that could never be fulfilled.

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Of Minds and Molecules. New Philosophical Perspectives on Chemistry, ed. by Nalini Bhushan & Stuart Rosenfeld, New York, Oxford University Press, 2000, xvi + 299 pp. (ISBN 0-19-512834-6)

It is a well-known fact that big publishing houses are very slow in recognizing new scholarly trends and even much slower in producing their books. In rapidly growing fields, such as philosophy of chemistry, this causes particular problems. Authors and editors are forced to make a decision between small and fast publishers, with the risk of reaching only a smaller audience, and big and slow publishers, with the risk that the book is already outdated at the time of publication. The editors of this anthology decided for the latter in the mid-1990s, for patiently awaiting the response of a wider readership. However, when their editorial work was virtually finished, one of the editors, the chemists Stuart Rosenfeld, died in January 1999, so that it was up to his wife, the philosopher Nalini Bhushan, to finish the common enterprise alone. She had to wait another two years, before the book was eventually delivered in early 2001, with publication date as of 2000. At that time, more than ten anthologies and several monographs on the philosophy of chemistry were already published in various countries. That did not prevent Oxford University Press, however, from calling their book in the blurb “the first anthology of its kind devoted exclusively to the work in the philosophy of chemistry”. So much about the policies of big publishing houses.

Since the early 1990s, philosophy of chemistry has emerged, at the beginning quite independently from each other, in numerous countries. Due to the publication delay, the book under review represents the state of philosophy of chemistry of about 1997 in the USA, with two guest contributions from abroad. Its fourteen papers, authored by both