William R. Newman: *Promethean Ambitions: Alchemy and the Quest to Perfect Nature*, Chicago: University of Chicago Press, 2004, xv+333 pp. [ISBN 0-226-57712-0]

Referring to the Whig Party, the former political opponents of the Tories in Great Britain, British historian Herbert Butterfield once coined the term 'Whiggish' historiography for any account that looks at the past from the perspective of the present, as if the goal of the past were the achievement of the present. Thus, a 'Whiggish' history of science carefully ignores everything of the past that does not suit the idea of a steady growth of science towards the current state. Strangely enough, that approach has been prominent in philosophy too, from Hegel to recent philosophy science, so that we could equally speak of 'Hegelian historiography'.

Because alchemy was driven by the belief in the transmutation of our elements, it does not go well with the Whiggish historiography (and philosophy) of science. In this view, the laboratory work of the alchemists was neither experimental, because they did not measure anything unlike their contemporary astronomers, nor scientific, because they were not seeking for mathematical theories unlike math teachers such as Galilei, nor technological, because they were unsuccessful quacks and impostors. So, you better forget about this wrong track in the otherwise glorious history of science, even if the track lasted for almost two thousand years. At best, their unscientific, cryptic, and contradictory attitudes might qualify alchemists as bedfellows of the fine arts, as an inspirational source for mystic, anti-scientific movements. Modern science, on the other hand, as epitomized, for instance, by the latest nanotechnology, is now on the brink of making the illusionary dreams of the alchemists become real: wealth, longevity, and even the laboratory creation of life. While such a view flatters and satisfies the modern ego, it does everything to misunderstand science and its role in society and lets the propagators of science and technology run again and again into the same old societal troubles.

To be sure, all historians of alchemy have argued against such Whiggish suppression of major parts of the history of science, have pointed out that the history of alchemy is essential to understanding our (past and present) culture. However, *Promethean Ambitions* is by far the strongest account, because it links the history of alchemy to contemporary debates in philosophy and bioethics. Newman has not written another history of alchemy, but a history of the debate on alchemy that analyses the arguments pro and con and their philosophical, theological, and moral underpinnings. More precisely, *Promethean Ambitions* is a history of the debate on the relationship between technology and nature, *i.e.* on the ethical and practical limits of science and technology, in short the 'art-nature debate', from late antiquity to the 17th century. Newman's main thesis is that throughout that debate alchemy figured as the main cause. One of his implicit theses is that the numerous attempts by philosophers to study the ethical limits of technology from a historical perspective have missed the main point, because they all, of course, carefully disregarded alchemy.

Newman narrates the history of the art-nature debate with focus on four main issues: on how alchemy became the model case in that debate (chap. 2); on the competition between alchemy and the fine arts (chap. 3); on alchemy's Promethean ambition to create human beings (chap. 4); and on the development of the experimental method (chap. 5).

Among all the ancient and medieval arts and technologies, alchemy made the most ambitious claim that it could not only superficially imitate but also literal-

ly create and replicate natural things and transmute natural species. The most influential Islamic physician Avicenna harshly rejected the alchemical claim on religious grounds, arguing that such capacities were reserved for the Almighty God. Newman shows how Avicenna's thesis, and thereby the case of alchemy, moved to the fore of Christian medieval debates on the power of demons and witches. Since the power of demons (and witches) was conceived as largely limited to the power of human technologies plus some trickery, the capacities of alchemy became the benchmark to determine the power of demons. In fact, with his comprehensive knowledge of medieval manuscripts and his philological skills, Newman reconstructs a continuous demonological debate, ranging from Albertus Magnus to early modern witchcraft manuals, in which the limits of technology were discussed on the model of alchemy.

In order to point out their extraordinary capacities to replicate and to perfect nature, alchemists frequently distinguished their art from the merely imitating arts, among which the fine arts figured prominently; and sometimes they did so in quite a polemical way. In three case studies of Renaissance artists (including Leonardo da Vinci), Newman analyses their ambivalent responses to alchemy. On the one hand, they appreciated the practical alchemical achievements, like synthetic pigments and other useful materials. On the other, they saw themselves in competition with alchemists about the status of their art (imitating versus perfecting nature) and about the favor of Maecenas at European courts. Newman argues that artists developed a particular anti-alchemical resentment that was based on neither empirical nor religious grounds, but on rivalry. In one case the rivalry went even so far that the artist (Bernard Palissy) copied and transformed alchemical ideas so as to present his artworks as true replicas and perfections of nature instead of mere imitations. Given the frequently assumed romantic association between the fine arts and alchemy, Newman's historically informed analysis is particularly refreshing.

His third main topic, the alchemical creation of life and homunculi, has frequently been subject to three misunderstandings, which Newman clarifies: First, the artificial creation of life was never much contested before the mid-19th century, because everybody could observe that primitive organisms spontaneously generated out of putrefying matter; and thus alchemists routinely pointed to spontaneous generation to argue only that the transmutation of natural species such as that of metals is possible. Second, the many alchemical illustrations that included human beings or animals, which flourished since the 15th century, were, of course, allegories of chemical processes. Third, the Jewish tradition of golems and the history of mechanical automata since early antiquity were both disconnected from the alchemical tradition. With these three misunderstandings clarified, Newman has browsed the alchemical literature for claims and recipes of making homunculi. While the number of results is rather meager, their role in the art-nature debate is indeed important. He finds two periods in which such bold claims were made and debated: early Islamic alchemy, from the pseudo-Platonic *Book of the Cow* to the Jabir corpus, and Paracelsian iatrochemistry. There are interesting parallels: in both cases, the making of homunculi was considered the apex of human technology; its crucial step consisted in the incubation of male semen, which referred to the Aristotelian theory of sexual reproduction; and it was meant to serve the ascetic and eugenic goals of male reproduction and refinement without sexual intercourse. Analyzing the Islamic and Christian responses, Newman argues that they largely prefigured current debates and arguments in bioethics, from 'playing god' and demonic involvement to the questionable status of parents and the

issues of human eugenics and organotherapy.

I may critically note that for the Paracelsian period, Newman's two main sources are a genuine text by Paracelsus (*De humunculis*) and a text of which the authorship is still debated (*De natura rerum*), which he acknowledges. While his arguments are convincing with regard to the latter text, I am not so sure about the former text. At least I recall that when I once followed the references to *De humunculis* provided by Goethe scholars in their routine commentaries on the humunculus figure in *Faust II*, I bursted into laughter because the text is essentially a moral treatise on sodomy rather than a laboratory recipe for the creation of humunculi. In *De natura rerum*, however, as Newman makes clear, the 'belly of the horse' (*venter equinus*) was a technical laboratory term for keeping the male semen in a closed vessel at a certain temperature.

The forth topic relevant to the art-nature debate is the question if artificial interventions into nature in the form of experiments prevent one from studying nature per se. Drawing on his earlier papers on this subject, Newman argues that the experimental method as a legitimate form to study nature grew out of alchemy before it was propagated and refined by Francis Bacon and Robert Boyle. More important, he shows that, apart from some demonological hotheads and inquisitors, there was a favorable ground rather than opposition to the experimental method in the mainstream Scholastic Aristotelian tradition, as it was in Aristotle's genuine writings.

The seed of *Promethean Ambitions* is clearly Newman's seminal paper on 'Technology and alchemical debate in the late middle ages' (*Isis*, 80 [1989], 423-445) which once inspired me to study the complimentary side in the history of the art-nature debate ('The Notion of Nature in Chemistry', *Studies in History and Philosophy of Science*, 34 [2003], 705-736). While I should perhaps argue that Newman does not distinguish enough between different concepts of nature in that debate, I can only admire how his medieval history scholarship has grown to place alchemy in the center of current philosophical and public debates. At the same time, the book is a masterpiece of the philological method, because the art-nature debate is the result of a comprehensive and thorough study of numerous texts that are linked to each other by many indirect references, which all needed to be philologically established. At times the meticulous analyses required may prevent general readers from following the main arguments. However, if they accept the necessity of such analyses as philological standard, equivalent to standards of chemical analysis, say, they will learn that the Whiggish historiography (and philosophy) of science has created a chimera. Newman's case for a deeper understanding of alchemy is no less than a general case for the understanding of science and technology in society.

Joachim Schummer:
Department of Philosophy, University of Darmstadt, Schloss, 64283 Darmstadt, Germany; js@hyle.org