

ATOMISTS, ANTIATOMISTS, AND
THE CHANGE OF A CHEMICAL
CONCEPT

BRITTA GÖRS, *Chemischer Atomismus. Anwendung, Veränderung, Alternativen im deutschsprachigen Raum in der zweiten Hälfte des 19. Jahrhunderts*, ERS-Verlag, Berlin, 1999, 240 pp. (ISBN 3-928577-33-6)

"Indeed, little recent work has been done on post-Daltonian chemical atomism [...]", said American historian of chemistry Alan Rocke in the preface of his *Chemical Atomism in the Nineteenth Century* (Columbus, 1984). Britta Görs took Rocke seriously, and that was a fortunate decision. From a historical point of view, Görs' first book – in fact her doctoral thesis at the University of Regensburg (1998) – fills a gap left open by Rocke's milestone book. First, she tells the 'German' story of atomism and, in particular, the 19th century development and thus supplements the results of Rocke. Secondly, she discusses the issue of atomism *versus* antiatomism in more detail than had been done so far.

The book consists of six chapters: 'Introduction', 'Chemical Atomism', 'Application of Chemical Atomism' (*Anwendung des chemischen Atomismus*), 'Changes of Chemical Atomism' (*Veränderungen des chemischen Atomismus*), 'Alternatives of Atomism' (*Alternativen zum Atomismus*), 'Summary'. There is also a one-page English summary.

In the introduction, Görs states that Kuhn's philosophy of science is not an framework in which 19th century chemistry can be adequately described because the latter was not a 'normal science' but changed gradually over the years, at least concerning the understanding of atomism. Instead, she prefers Ludwik Fleck's concept of theory dynamics and his "Denkkollektive" (*Entstehung und Entwicklung einer wissenschaftlichen Tatsache*, Frankfurt a. M. 1980, 1st edn. 1935). She explicitly uses Rocke's dis-

tinction between 'chemical atomism' and 'physical atomism' (cf. the preface of his *Chemical Atomism*). That distinction corresponds to the distinction between epistemological and ontological statements about the finest material parts of the world. According to Rocke, physical atomism takes the notion 'atom' to refer to a real physical entity. On the contrary, 19th century chemists used to apply atomic concepts without claiming the reality of atoms explicitly, sometimes even without reflecting that subject. They were only epistemological atomists. In the chapter 'Application of Chemical Atomism', the author sketches the history of atomic weights and the reappraisal of inorganic chemistry and atomic weights as prerequisite for the development of the periodic system research program. Prout's hypothesis is one of the main topics of the chapter on 'Changes of Chemical Atomism', the other one is the issue of spatial 'properties' of atoms and their representation by chemical formulas.

Perhaps the most intriguing chapter from the viewpoint of philosophy of chemistry is the one on 'Alternatives of Atomism'. Görs pays close attention to Wilhelm Ostwald and Frantisek Wald, while others such as the English Benjamin Brodie are consequently neglected. Her thorough analysis of primary sources throws, to some extent, light on a difficult and important period of early physical chemistry: Ostwald, who fought against what he called 'scientific materialism' and atomism for about 15 years was an atomist himself in his everyday scientific practice. He applied atomism in the sense of 'chemical atomism'; thus without reasoning about ontological questions explicitly. According to Ostwald, energy was a superior concept in science, whereas atoms and matter were secondary. Consequently, even Ostwald was a "pragmatic atomist", to use the term of Britta Görs.

The author does not clarify the term 'pragmatic' (she only states that the philosophical theory of Peirce is not referred to). It seems that 'pragmatic at-

omist' is only another term for 'chemical atomist', and thus chemists have to be pragmatic. On the other hand, it is very difficult to find an adequate expression for describing the attitude of 19th century chemists – 'theoretical light-heartedness' was surely their main attitude. Since 'pragmatic' is a very ambiguous and underdetermined term, it should better not be used in that discussion, however.

Unfortunately, those interested in philosophy of chemistry including theory dynamics do have to develop their own views. In the text, Görs does not exceed the plain statement that 19th century chemistry is not describable by Kuhnian concepts. Her rejection of these concepts – rather the concept 'normal science' than 'crisis' and 'paradigm change', I suggest – is not really convincing. We must take into account that there are good reasons – given for example by Paul Hoyningen-Huene – that Kuhn's concepts are founded just on (admittedly 18th century) chemistry. In addition, the comparison with Fleck's *Denkkollektive* is not as elaborated as some readers would have expected (three pages at the end of the text). On the other hand, it is surely worth another study to show if and how the stories told by Rocke and Görs fit different dynamical concepts. Anyway, the present book is worthy and useful also without caring about concepts of theory dynamics.

Britta Görs has written a very careful and thoughtful study that is a valuable contribution to the interface between philosophy and history of chemistry from the perspective of the latter. We are looking forward to reading more of this author, who is apparently interested in both.

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AUTOBIOGRAPHY OF A NOBEL PRIZE

KARY MULLIS, *Dancing Naked in the Mind Field*, Pantheon Books, New York, 1998, x + 222 pp. (ISBN: 0-679-44255-3)

Dancing Naked in the Mind Field is a series of twenty-two short essays (all between three and nineteen pages) on a number of different topics. Mullis won the Nobel Prize for Chemistry in 1993 for his 'invention' of PCR, the polymerase chain reaction (for more on this see *HYLE*, 4 (1998), no. 2, pp. 167-169). This book, then, joins the growing catalog of popular books by Nobel Prize scientists. Not all of the topics raised in the book are related to Mullis' scientific work. This review will focus on the essays about science education and scientific practice (in general and Mullis' own). These are the topics discussed in the book that will not be addressed here: supernatural and unexplained phenomena, astrology, cholesterol and diet, free will and determinism, infected spider bites, and numbers and chronology. The other essays can be grouped into several categories. There are three essays that are PCR-related. Six essays deal with the policy ramifications of scientific practice. Mullis also discussed his own formal and informal scientific education in four of the essays. Finally, there is an essay about the chemical effects of drugs, which might also count as an essay on informal scientific education. In an attempt to make the non-linear linear, I will start with his education.

The first of the education essays, "A Lab is Just Another Place to Play", is a recounting of his first chemistry set in the 1950s, his first lab job after high school at Columbia Organic (a chemical supplier), his undergraduate lab (Georgia Tech), his graduate lab (Berkeley), and finally his lab at the biotech company Cetus, where he ultimately 'invented' PCR. "I Think, Therefore I Wire" is about his fascination, from youth (disassembling a broken Maytag) to adulthood