Book Review

Bernadette Bensaude-Vincent & Richard-Emmanuel Eastes (eds.), *Philosophie de la Chimie*, Paris: DeBoeck Supérieur, 2020, 368 pp. [ISBN 978-280-730-5663]

by Sarah Hijmans

Philosophy of chemistry is still an underrepresented field within philosophy of science, especially when it comes to introductory textbooks. To name one recent example, the volume *Précis de Philosophie des Sciences*[1] included chapters on physics, mathematics, biology, and the social sciences – but nothing on the theme of chemistry. One way to correct this type of omission would be to broaden general philosophy of science by including examples from chemistry. However, this would be insufficient: not only does chemistry force us to rethink some generally accepted ideas about science, chemical practice also leads to its own set of questions and ideas.

Bernadette Bensaude-Vincent's and Richard-Emmanuel Eastes' new textbook *Philosophie de la Chimie* explores these unique ideas in order to show the many ways in which thinking about chemistry can contribute to philosophy. According to Eastes and Bensaude-Vincent, a number of dichotomies give rise to philosophical tensions in chemical practice: chemistry sits right on the borders between the natural and the artificial, between living and nonliving matter, between knowing and making, and between nature and society. As a technoscience, chemistry defies the view of 'pure' or 'rational' science in multiple ways; thinking about chemistry therefore requires the development of new philosophical concepts.

The structure of Eastes' and Bensaude-Vincent's textbook reflects this need for a truly *chemical* philosophy of chemistry. Besides the more traditional themes of epistemology and ontology, it contains sections dedicated to chemistry's quest for identity and to ethics of chemistry. Each section was compiled by a different team of authors, and divided into chapters which consist of a series of texts. Though some of the texts are original, most of them are extracts from existing works by chemists, historians, and philosophers. The resulting collection is an 'anthology' of philosophy of chemistry, in the editors' own words.

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The four sections of the book all highlight the ways in which chemistry can inspire philosophy, and the dichotomies described by the editors recur throughout the sections. In the introduction to the first section, Luc Peterschmidt and Brigitte van Tiggelen again argue that chemistry finds itself at a crossroads, located in between physics, biology, and medicine on the one hand, but also between technology, science, and society on the other. This blurs the disciplinary boundaries of chemistry and motivates chemists to continually redefine their territory.

In the second section, Pierre Teissier and Sacha Tomic show the need for an epistemology of chemistry, which is unique in multiple ways. The chemical way of knowing is characterized by the laboratory, where chemists not only study nature but also modify it. There, chemists manipulate an incredibly diverse range of substances, which they cannot reduce into a universally applicable theory. Another tension in the work of chemists arises from the limits of their knowledge: even if they do intend to formulate theories about the nature of matter, it is impossible to access the microscopic structure of the substances with which they deal. One consequence of this peculiar way of knowing is that chemistry is a good model for epistemic pluralism, as is illustrated by an extract from Hasok Chang's *Is Water H_2O?*.

The third section, compiled by Sacha Loeve and François Pépin, investigates the modes of existence of chemical entities. They show that chemists see matter as active and reactive, and that chemical substances are mainly characterized by the way they react with other substances. This is a uniquely chemical way of thinking, which differs from both Aristotelian and Cartesian views of matter. Furthermore, Loeve and Pépin elaborate on an ontological notion which is both unique and central to chemical practice: the mixt. The properties of the mixt surpass that of the sum of its components, and this means that a type of emergence is at the heart of chemical practice. All these specificities of chemical ontology are nicely summarized in an original contribution by Jean-Pierre Llored at the end of the section.

The final section of the volume is dedicated to ethics, which is a welcome choice: despite its relevance to chemists and society in general, chemical ethics is not always included in introductions to philosophy of chemistry. In this section, Richard-Emmanuel Eastes and Jonathan Simon argue for the need to think about chemists' responsibilities which results from yet another tension in chemical practice, relating to its impact on society and the environment: on the one hand, chemistry is capable of producing remedies and innovations which might benefit humanity, but on the other hand the substances they create might lead to harmful consequences.

More so than the others, the last section has a practical goal, for ultimately the aim is to inspire chemists to take action. The texts illustrate not only the different questions that arise and the ways in which chemists

respond to them via initiatives such as green chemistry and codes of conduct – it also provides suggestions for how chemistry might go forward. Thus, the book ends with a remarkable original text by Bernadette Bensaude-Vincent in which she proposes, instead of precaution or prevention, to place *care* at the center of ethics of chemistry.

All four sections thus highlight the ways in which chemistry can help ask new philosophical questions. Yet this is not the only methodological choice that influences the overall structure of the book: Bensaude-Vincent and Eastes have also chosen to historicize the philosophical issues in order to clarify their development in different historical contexts. Whereas philosophy of chemistry as a discipline is only very young, their approach shows that some of its questions have been asked since antiquity. Instead of dedicating a section to history, the editors have chosen to dedicate an important part of all four sections to historical texts.[2]

The result is a truly panoramic view of thoughts on chemistry, which includes works from contemporary historians as well as texts from the past. For instance, in the first section, which almost exclusively contains historical texts, the reader is reminded that the questions of the possible reduction of chemistry and its relationship to physics is not merely asked in current literature. These issues are already present in some of the beautiful extracts that the authors selected from Venel's article on chemistry from Diderot's and d'Alembert's *Encyclopédie*, and they can likewise be found in the texts from Gaston Bachelard. Similarly, the editors of the third section have chosen to explore the topic of relational ontology using parts of a 2008 paper from Jens Soentgen, but they also trace back this type of thought to 18th-century affinity tables. Altogether, this provides an interesting perspective on the field of philosophy of chemistry.

The important role attributed to history of philosophy sets this book apart from many other contemporary (Anglophone) publications in the philosophy of chemistry. To an international audience this might seem surprising, but the editors align themselves with the French tradition of philosophy of science. This tradition, following the works of philosophers such as Pierre Duhem, Gaston Bachelard, and Emile Meyerson, for example, attributes a key role to history of philosophy.

This choice quite literally separates this textbook from current Anglophone literature, since some contemporary philosophers of chemistry are left out in favor of historical texts. For example, Jaap van Brakel, Paul Needham, Eric Scerri and Robin Hendry are not cited in the book at all even though their work addresses themes that are relevant to this volume. This might be seen as a disadvantage, but the editors do not claim to have produced an exhaustive summary of the current field of philosophy of chemistry. Rather, one could see this volume as complementary to existing

introductions to the philosophy of chemistry, consisting of original and enriching illustrations of recurring themes.

Philosophie de la Chimie will be useful for anyone who teaches philosophy of chemistry, as well as chemistry teachers wanting to introduce their students to philosophy. Many of the extracts are short enough to study as examples in class, and contextualized accordingly. It will also provide a good introduction for chemists, engineers, or anyone of a similar profession to philosophy of chemistry. The overall structure and intended use make for a book that doesn't have to be read from beginning to end, since it lacks a rigid argumentative structure. Rather, the collection of texts can be read *à la carte*, according to the reader's needs and interests. Being an introductory textbook, it is not meant for specialists in philosophy of chemistry. Nevertheless, it could be of interest for them as well: especially those working within an ahistorical tradition of philosophy of science might find that it will broaden their horizon.

Notes

[1] Anouk Barberousse, Denis Bonnay, Mikael Cozic (eds.): 2011, *Précis de Philosophie des Sciences*, Paris: DeBoeck Supérieur.

[2] This also sets Eastes' and Bensaude-Vincent's book apart from other books, for example: R. Hendry, P. Needham & A. Woody (eds.) *Handbook of the Philosophy of Science, Volume 6: Philosophy of Chemistry*, Amsterdam: Elsevier, 2012.

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