

## BOOK REVIEWS, NOTES AND COMMENTS

Edited by  
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**FILOSOFIA CHIMICA**  
Ermanno Bencivenga,  
Alessandro Giuliani  
Roma: Editori Riuniti  
University Press; 2014.  
138 p.  
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€ 12,75.

Can philosophy learn from chemistry? The question might seem paradoxical, but the answer is yes. If philosophy wants to be omniscient, it has to consider all the disciplines that study a part of reality. And chemistry, studying the composition of matter and its behaviour, is surely no exception. The question is rather what philosophy can learn from chemistry. Here it is more difficult to come up with an answer. A precise, useful and even surprising insight in this direction is given by two authors who are apparently very different in terms of background and research, but united by a converging epistemological and methodological interest. Ermanno Bencivenga is a philosopher at the University of California, specializing in logic, philosophy of language and moral philosophy. Alessandro Giuliani is a biologist – senior researcher at the Italian National Institute of Health and a professor at “Sapienza University” of Rome – whose field of study is mathematics and statistical modeling of biological systems.

The engaging book they co-wrote is also an attempt to overcome scientific reductionism understood as the sole method of knowledge and ontology of natural science. This does not mean that the authors are somewhat critical of science: indeed, they make a convincing apology of chemistry as an effective scientific model both from the gnoseological and from the practical point of view. What philosophy (and philosophy of science in particular) can learn from chemistry is thus a way to look at reality that is not *necessarily* reductionist. The elements of the Mendeleev Table are many and there is no way to bring them back to a few more basic entities. In chemistry, forms and relations are important, much more than in physics, as Bencivenga and Giuliani show in great detail. Besides, they use technical but very understandable examples, in line with their objective to write an accessible book aimed at the general audience, while not being simplistic.

Thus, in line with their rejection of reductionism as the sole method, they bring back to the fore secondary qualities and Tellegen’s theorem (1952), even though it

originates in electronics. According to this theorem, “the behavior of each system formalized as a network of relations between elements is defined by the constitutive laws of the individual elements (...) and *the type of network* (in an electrical network, the particular wiring of the elements to form a circuit). These two levels are complementary, and topology – *ie* the way in which the elements are connected, what we have called “form” – *is an independent reality within the system, which coexists with the constitutive laws*” (p. 60). In other words, as the authors say, the world works in a unified manner, not only because the fundamental laws of nature are the same, but also because very different systems such as networks of social relationships, proteins, computer networks etc. follow common organizational and topological principles. And chemistry is the science that most underlines the autonomous and decisive role of relations.

This means that “truth is not necessarily the result of a finer analysis, and it is not obvious that there is such a thing as a fundamental level, be it small or large. Instead, we must determine every time the level that best allows us to see and understand what we want” (p. 124). Such level is located where the relations between the components of a system show their importance and therefore their predictive value. Chemistry is a potential model because it avoids situations too simple that provide a simplified view of nature. Chemistry, the authors say, is above all a practical discipline, facing complex situations, but the complexity involved is linked to “modest” cases, located at the mesoscopic level. Also, in chemistry the relations or interrelations involving the human subject play a central role.

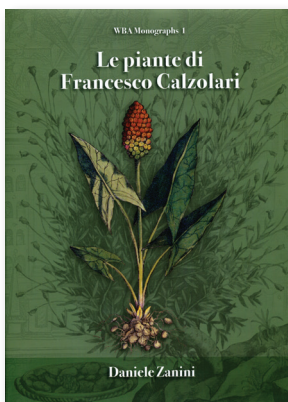
All this – and more – is what chemistry teaches as a general philosophical attitude. The one proposed by Bencivenga and Giuliani is therefore a useful remedy to some reductionist tendencies that have high visibility in both philosophical and scientific areas. And the chemical philosophy proposed by the authors also converges with some pluralist proposals that are gaining popularity today. For instance, one may consider the framework of *explanatory pluralism*, which recently has become a relevant topic in philosophy of science (as stressed in Italy for example by Massimo Marruffa). Its gist is that “theories at different levels of description, like psychology and neuroscience, can co-evolve, and mutually influence each other, without the higher-level theory being replaced by, or reduced to, the lower-level one” (de Jong). The focus is on the growth of explanatory resources; this allows the pluralist to carve a third way in between the reductionist insistence on ontological parsimony on the one hand, and the antireductionist claim for the strong autonomy of special sciences on the other.

Carl Craver’s model of mechanistic explanation is a good example of explanatory pluralism. According to Craver, his explanation can provide us with an account of

inter-field integrations that is preferable to the reductionist one. Against the reductionist claim that when lower-level explanations are completed, the higher-level explanations stop being causally explanatory, the explanatory pluralist denies the existence of a fundamental explanatory level, and argues that higher-level entities continue to play a causal and explanatory role even when lower-level explanations are complete. In this perspective, then, the most serious shortcoming of the reductionist conception of the relation between lower and higher levels is its unidirectional nature: since it assigns a priority to lower levels, when the higher-level and lower-level theories fail to map onto one another neatly, the blame lies exclusively on the upper-level one. By contrast, the pluralistic perspective is bidirectional: the higher-level theory should be subjected to revision in light of the findings of the lower-level theory, and vice versa. This approach has two implications. On the one hand, the functional knowledge obtained through, for example, psychological research allows us to identify the neural mechanisms; on the other hand, the knowledge of neural structure is a heuristic guide to the development of more sophisticated psychological models (Bechtel and Mundale). And chemistry can teach us all that as well.

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**LE PIANTE DI FRANCESCO CALZOLARI**

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[*The plants of Francesco Calzolari*]

*The plants of Francesco Calzolari* is a valuable book that the author Daniele Zanini, professor of Natural Sciences, dedicates to Francesco Calzolari (1522-1609), the famous chemist and botanist who lived in Verona in the sixteenth century and collaborated with the greatest Italian naturalists of his age: Pietro Andrea Mattioli, Luca Ghini and Ulisse Aldrovandi.

Zanini, after an introduction devoted to the scientific renaissance in the sixteenth century, describes the life and work of Francesco Calzolari focusing in particular on his famous pamphlet *Il viaggio di Monte Baldo, della*

*magnifica città di Verona/The travel of Monte Baldo, of the wonderful city of Verona* (Venezia: Vincenzo Valgrisi, 1566) which is included in this book in a complete facsimile reproduction.

*Il viaggio* is a pamphlet of 16 pages in which Calzolari listed, with a cartographic method, over 450 plants identified during a travel from Verona to the top of Monte Baldo. Structured as a modern floristic survey, *Il viaggio* became very famous in the sixteenth century because of the wide variety of botanical species living in this area, which had never been reported before. Zanini starts from Calzolari's pamphlet to examine one by one the 450 plants according to the following fixed pattern: *Plant of Calzolari; Description of Mattioli and other contemporaries; Synonyms and data of Aldrovandi's herbarium; Comments of Goiran* (botanist: 1835-1909); *Attribution of the scientific name; Pharmacological use in the sixteenth century; Comments of medical botany*. The result is an erudite work in which the author collects the history, the phytophany, the ancient use and the modern properties of each plant described by Calzolari.

The Zanini's book also includes the correspondence between Calzolari and Ulisse Aldrovandi, Luca Ghini, Pietro Andrea Mattioli, Joachim Camerario. The Calzolari's epistolary is very interesting both from an historical and scientific point of view, because it is useful to know the activity of the veronese scholar and the scientific environment in which he lived. It points out that he was in contact not only with the great naturalists of the Italian Renaissance, but also with doctors from across the Alps like the German Joachim Camerario and the Swiss Conrad Gesner (unfortunately the correspondence with the latter was lost).

The last chapter of Zanini's book is dedicated to Calzolari's *Theatrum Naturae*, the first example of a private museum arranged according to the classification of the finds. The fame and the merit of Calzolari as collector and cataloguer of natural objects were great in his age and, from this point of view, he had an absolute pre-eminence in Italy in the second half of the sixteenth century.

*The plants of Francesco Calzolari* is a prestigious work that has a great scientific and historical value. It is the fruit of a very long labour of prof. Zanini who, with this book, pays homage to the veronese scholar and recognizes definitively the value of Calzolari as naturalist as well as chemist. It is particularly noteworthy the rigorous and meticulous method with which Zanini analyzes the over 450 plants enumerated by Calzolari in his pamphlet, preserved in his *Theatrum Naturae*, cited in his epistles and used in his famous *Theriaca*.

This book is also an important instrument for evaluating the environmental modifications elapsed in the last five centuries in the veronese area, through a comparative analysis between the plants living in the sixteenth century and those living today in the same region.

Finally this book, printed on FSC-certified paper, stands out for its fine and elegant edition with hardcover in slipcase.

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