Found Chem (2015) 17:183–185
DOI 10.1007/s10698-015-9240-1

EDITORIAL

Guest editorial

Jean-Pierre Llored[1]

Published online: 24 September 2015

This Special Issue of *Foundations of Chemistry* features three papers presented to an conference held at the University Paris Diderot, France, 4–5 June, 2012, on the topic 'Nanotechnology: Irrational Fears or Realistic Expectations?.' The journal *Foundations of Chemistry* aims to promote a philosophical reflection about new ways of doing chemistry from nanochemistry to biotechnology, or from materials science to green chemistry. It is important, first of all, to examine what is happening in actual laboratories, as well as the procedures followed there. In this respect, studying chemistry philosophically requires the integration of chemists' own questioning into the global pattern of the investigation of the world.

New instrumentation and chemical devices enable chemists to explore temporal and spatial scales that have been completely unreachable so far. Chemists have gained an enlarged capacity to synthesize, scrutinize, and modify particle size and size distribution, agglomeration state, shape, crystal structure, chemical composition, surface area, surface chemistry, surface charge, porosity, and interfaces. A 'science of individuals or particulars' arises and chemists are now able to generate and study multifarious details. They even contrive to combine organic and inorganic ingredients into the same hybrid body; thus, holding together types of chemistry which have always been incompatible hitherto.

The structure of a nanocompound can be different, depending on what surrounds it, the device, and the time employed for its precipitation. Though the compounds that are obtained from two different approaches can share the same chemical formula, they can be different bodies. Their composition is the same, but the environment, the procedure, and the time involved in the production of the compound have influenced the relatedness of their parts. Thus, the whole compound, its parts, and their environment are intertwined within a process. The mode of operation cannot be eliminated from the final product, because this mode determines the whole and its correlative parts. The structure of the crystals may differ if the chemical device changes, and those crystals can even differ

✉ Jean-Pierre Llored
jean-pierre.llored@linacre.ox.ac.uk

[1] Linacre College, St Cross Road, Oxford OX1 3JA, UK

within the same particular chemical device, depending on their size, which itself depends on the environment. *Therefore, for the first time of their history, chemists have to hold the composition, the structure, the parts, the whole compound, the environment, and the device together within the same coherent explanation.* This situation is not without effect on the very definition of a nanosubstance, and, thus, on the way it is diffused by chemical industry. It is not without consequences on the ecotoxicity of those bodies too. In this context of activity the structure/biological activity paradigm does not always work because of the size effect dependence on nanostructure. Things turn out to be far more complicated than before…

Chemical bodies, and especially nanocompounds, are context-sensitive, and the ways they act upon the world always depend on contexts. Chemical bodies are mutually defined within a network including operations, instruments, transformations, and other purified bodies: They are not simply predictable by considering the body in isolation! Now, they have been dispersed everywhere, at all scales, from macro to nano, in air, soil, water, and, even, inside live or 'inert' bodies. Their effects on the health of humans and non-humans are not known *exhaustively*, and cannot be so. Indeed, the methods which determine their relative (eco)toxicity are being set up and stabilized. Hence it is of primary importance for *Foundations of Chemistry* to connect socio-historical perspectives on nanochemistry with ethical and philosophical investigations of this new domain of activity because of the societal and environmental impacts of nanobodies, among many other reasons. We need to integrate this new way of doing chemistry into the philosophical reflection in order to address the specific situation related to the *consequences* of chemical activities upon ourselves, ecosystems, and the Earth. In a way, this first set of papers about nanochemistry is an attempt to address this requirement.

In their paper 'Nanotechnology: from the Ancient Time to Nowadays,' two chemists, namely Delphine Schaming and Hynd Remita, point out that metallic nanoparticles have already been used since ancient times, in particular as colorants in the glass and ceramic industries. Moreover, they show that a lot of natural nanomaterials are also present in the mineral, vegetal and animal worlds. They thus take distance in order to widen our view on nanoparticles, their existence and uses. In so doing, they provide us with a wide presentation of the applications of nanomaterials and nanoparticles in many domains, among them electronics, catalysis, optics, biology, and medicine.

In his paper 'Operations for a Problem of Existence: Dealing with the Ontological Uncertainty of Nano Substances', the French sociologist Brice Laurent considers practical attempts to deal with nano-substances in industrial and regulatory contexts as a way of illustrating the challenges of the definition of nano-substances as "new substances," and the making of political order and categories identifying technical objects. This approach allows him to account for the plurality of existence for nano-substances. In particular, he characterizes the "ontological uncertainty" about nano-substances, using two examples, one related to carbon nanotubes and the other to silver nanoparticles, that illustrate the ways in which industrial, civil society and regulatory actors deal with the uncertainty related to the identity of nano-substances.

In their paper 'Deliberating Responsibility: A Collective Contribution by the C'Nano IdF Nanoscience & Society Office,' a team of researchers in philosophy, history, sociology, toxicology and ecotoxicology, supervised by Stéphanie Lacour, a researcher in international judicial cooperation, explores the different controversies associated with nanotechnologies. Their objectives include: (1) a better understanding of health and environmental risks, and (2) a deeper inquiry into the philosophy and sociology of

nanosciences and their applications. They investigate what 'having a responsible attitude' means in such a domain of activity and of action upon the world.

This diversity of papers highlights the plurality of approaches promoted by *Foundations of Chemistry* in order to widen and strengthen studies about the history, the philosophy, and the education of chemistry, whatever the field of chemistry, past and present, at stake. Chemistry is not solely a system of propositions, a social product, or a set of conventions or of practices, among other possible definitions. It is neither exhaustively social nor simply logical. It is both and more. More than ever, we need to be open-minded in order to face the new challenges that chemistry and new technologies impose.