Special Issue

Aesthetics and Visualization in Chemistry, 1

Editorial

There is a particular irony that chemistry – the most visual, tactile, and pungent of sciences – is rarely associated with modern notions of aesthetics and science. Indeed, as any examination of aesthetics and modern science reveals, physics, rather than chemistry or biology, is considered the paradigm because of its extraordinary ability to comprehend and communicate through the symbolic language of mathematics. Echoing Heisenberg's 1970 essay, "The Meaning of Beauty in the Exact Sciences", this perspective on physics takes the inherent abstraction of quantum mechanics and relativity as the result of the physicists' search for beauty in nature.

How could this originally Pythagorean-Platonic linkage between mathematical abstraction and beauty, between epistemology and aesthetics, become important in the twentieth century? After all, science in the late eighteenth- and nineteenth-centuries was considered schematic and empirical, almost the opposite of both the Pythagorean ideal and the arts. In the early twentieth century, Ernst Cassirer (1923-29) provided a complex reinterpretation of science as philosophically akin to art by claiming that "art, science, myth and religion should all be considered at the same level, as forms of symbolic activities" (Chevalley 1996, p. 228). Half a century later, in his influential essay 'Abstraction in Modern Art and Science', Heisenberg (1971) used this idea of art and science as parallel symbolic systems to align the study of aesthetics with abstraction in science. Claiming that "striving for unification and bringing together leads to abstraction in art no less than science" (p. 152), Heisenberg cemented our modern conception of an aesthetics of science which values the conceptual purity of quantum mechanics over the perceived visuality of chemistry and biology. Based on this assumption, modern writings on science, aesthetics, and art have focused primarily on mathematical physics.

What are the costs of such a narrow aesthetic focus on science? On the one hand, these publications are almost completely disconnected from the main aesthetic discourses on art. Frequently written by senior physicists for a general public, they aim at leveling off barriers to the understanding of mathematical abstraction rather than seeking understanding of aesthetic phenomena or epistemological issues. On the other, they exclude 99% of our actual sciences that do not subscribe to the Pythagorean epistemology. As to chemistry, its exclusion supports the prevailing view of a less abstract and applied

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(*i.e.*, non-aesthetic) science and the underlying cultural chemophobia that aligns chemistry with the toxicity of modern industrial society. Moreover, by reducing aesthetics to the issue of the beauty of mathematical abstraction, important issues disappear from the agenda of aesthetic studies; such as the aesthetic experience of scientists in their daily laboratory work with material objects and instruments, and how that has impact on guiding their research; the increasing role of visuality in scientific communication and teaching; or the cultural aesthetics of the image of the sciences.

In fall 2001, we published a Call for Papers (HYLE 7, pp. 181-2) with a list of 22 topics as a preliminary agenda for future research in Aesthetics and Visualization in Chemistry. This and the subsequent issue of HYLE present the fruits thereof. In addition, since we think that artists can, with their artistic means, make equally important contributions to the general topic, we issued a 'Call for Artworks', the fruits of which will be published as a virtual art exhibit 'Chemistry in Art' along with the next issue of HYLE. Altogether these scholarly and artistic contributions may constitute new starting point for aesthetic studies of science in general and chemistry in particular.

Our special issue opens with an introductory essay by ROALD HOFFMANN who pioneered molecular aesthetics since the late 1980s. His "Thoughts on Aesthetics and Visualization in Chemistry" highlights the role of visualization in both chemical understanding and communication, and provides a psychological reading of the chemists' sense of beauty as the pleasure from achieving goals after difficult work: what is hard sought becomes immediately beautified. Defending this notion of beauty against aesthetic criticism, he also points out two dangers: the one-sided preference of simplicity and the neglect of ethics.

PIERRE LASZLO's seeks the "Foundations of Chemical Aesthetics" by exploring chemistry's relation to a series of classical positions in aesthetics. Arranged in five famous oppositions, beauty may be sought in the natural versus the artificial, the visible versus the invisible, the predictable versus the unpredictable, the invariant versus the changing, and the complex versus the simple. With respect to each of these positions, he articulates philosophical pros and cons for legitimating an aesthetics of chemistry, and concludes with a call for the reconciliation of art and science through the abstraction of computer generated biomolecular representations.

In his "Sensual Chemistry", biochemist ROBERT ROOT-BERNSTEIN uses a personalized narrative as a framework within which to delineate aesthetics as a motivation in chemical research. Situating the beginning of the essay in his own burgeoning awareness of the sensuality of chemistry when he was a student, he chronicles the ways in which a myriad of scientists, from van't Hoff to Watson and Crick, have noted the link between art in science in their own work. Against this background, he then explicates how 'aesthetic cognition'

and intuition impinge on the idea of a 'scientific method' and how aesthetics can be used to alter the way of chemical education.

In "The Molecular Aesthetics of Disease", organic chemist TAMI SPECTOR explores the enzyme HIV protease as an instance of how molecular scientists employ aesthetics in their study of culturally and visually demonized diseases. Following up previous studies on the nature of AIDS imagery, she demonstrates how HIV protease has become an aesthetically sublime scientific object. In order to do so she develops a functionalist aesthetics of molecular representation. With this focus, and numerous examples from organic chemistry, she seeks to unravel the nuances of the term 'elegance' in the discourse of molecular science.

JOACHIM SCHUMMER provides a systematic investigation of "Aesthetics of Chemical Products", by distinguishing between three types of products (materials, molecules, and molecular models) and by analyzing their aesthetic potential in view of a wide range of theories (from idealistic, to materialistic and semiotic aesthetics). Although most of the results are negative, with regard to earlier claims by chemists to the beauty of their products, he points out several neglected fields of aesthetic studies. Beyond beauty, particularly Eco's theory helps understand how aesthetic experience can be a driving force in chemical research.

Unlike other aspects of chemistry, the visual and symbolic manifestations of alchemy have been subject to ample analysis by art historians. In the final contribution, art theorist JAMES ELKINS seeks a legitimate place for alchemy in understanding contemporary art. Seeking a middle stand between uncritical embrace and ignorant neglect, he defines "Four Ways of Measuring the Distance Between Alchemy and Contemporary Art". He argues that, while the historical impact of alchemy on art has been overestimated, it may serve as a model for understanding the artists' fascination with materials and their aversion to full rationality.

References

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