

Beyond the Finite

When cultural historians, art critics and philosophers expatiate on the meaning of the word sublime they invariably dwell on the discourses of the eighteenth century philosophers Edmund Burke and Immanuel Kant who, in their separate ways, described how the sense of the sublime aroused responses such as the pleasurable, the fearful, the heroic, self-preservation, transcendence, the numinous, wonder and terror, as well as other so-called super-sensible faculties. A chemist, on the other hand, in common with most natural scientists, not only recognizes the literal, mundane practical meaning of sublime as a phase-transition, but will also know it to signify indescribable joy, exalted feelings, ecstasy, beauty and a host of other emotional responses ranging from awe to the incomprehensible to the mysterious, to the poetic, the pantheistic and perhaps the religious.

This volume represents what is claimed to be a first attempt to extend the discussion of the sublime—a topic of ancient lineage, for the Greek philosopher Longinus said many cogent things about it in the first century AD—into the realm of the natural scientist. A chemist, a behavioral neurologist, an art historian and an architectural historian, as well as others, have contributed to the monograph, which has been edited by Whyte (architectural historian) and Hoffmann (Nobel prize-winning chemist and writer). The project originated at a conference entitled “Image and Meaning” held at the Getty Centre, Los Angeles in 2005, prompted, in part, by Felice Frankel, the distinguished artist who, with George Whitesides, previously produced an excellent monograph that sought to fuse art and science. The editors felt, and the efforts of the nine contributions to this book, confirm, that the quintessential topic of discussion—the sublime—is broad enough in its numerous definitions to stimulate new thinking both in the arts and in the sciences.

Partly because of its novelty, but mainly because of its provocative and stimulating contents, this book provides scholarly insights into facets of nature and human experience that all scientists will find rewarding. Some of the chapters are beautifully written, others are rather difficult to digest; but the whole meal is intellectually nourishing. I confess that, until I brushed up my naïve knowledge of Edmund Burke’s work, I was unaware that he had proclaimed in his celebrated exegesis *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and the Beautiful* (1757) the following:

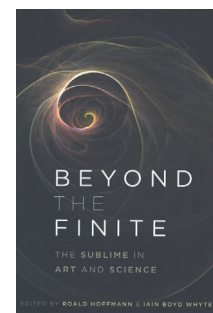
“Whatever is fitted in any sort to excite the ideas of pain, and danger, that is to say, whatever is in any sort terrible, or is conversant about terrible objects, or operates in a manner analogous to terror, is a source of the **sublime**; that is, it is productive of the strongest emotion which the mind is capable of feeling When danger and pain press too nearly, they are incapable of any delight, and are simply terrible, but at certain distances and with certain modifications, they may be, and they are delightful, as we every day experience.”

Most of the contributions to this volume amplify these thoughts of Burke. They also refer frequently to Kant’s view that aesthetic experience is central to mediating the relationships between humans and the world, a theme that permeates the chapter entitled “Quantum Romanticism” by Ian Greig. One of the chapters that I found particularly appealing is concerned with application of neuroscience to the sublime, by John Onians, a historian of art, who has previously explored neuroarthistory in his book that ranges from Aristotle to Pliny to Baxendall to Zeki. It is in his chapter that we learn how Charles Darwin, pursuing the statement by Burke that the mixture of admiration and terror elucidated by the sublime is crucially connected to “self-preservation”, was led to write *The Expression of the Emotions in Men and Animals* (1872). Onians chapter also illustrates his arguments by reference to functional MRI and discusses the pioneering work of Semir Zeki who has clarified neural responses that are triggered by visual experience. My only criticism of this chapter is that it should have included some figures to drive home the arguments.

There is a fascinating chapter by Kessler that deals almost exclusively with the role of the images retrieved by the Hubble Space telescope to conjure up various facets of the sublime, and also an interesting discourse by Stafford on “The Nonconscious Sublime—and the Science of Submergence”, where, inter alia, there is talk of an “eroticized gravitational process”, a concept the precise meaning of which I am still trying to fathom.

Elkins chapter, “Against the Sublime” starts with the provocative statement that his “interest in the sublime which turned into a long dissatisfaction”. It is a delightfully iconoclastic piece that claims: “the sublime does not apply outside particular ranges of artworks”, that “the sublime is used principally as a way to smuggle covert religious meaning into texts that are putatively secular”; that “virtually none of the scientists use the concept (of the sublime) in describing their own work”. I shall return to this point after describing next the essence of Roald Hoffmann’s concluding chapter entitled “On the Sublime in Science”.

It would be difficult to find a better representative of and spokesman for chemistry than the



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polymathic Roald Hoffmann: a writer of poetry, essays, non-fiction and plays, quite apart from his exceptional versatility as a chemist. At the outset of his contribution he poses the questions: where is wonder voiced? And how? He reminds the reader that the defining essence of chemistry is change, and that “chemistry” was and is the art, craft and business of substances and their transformation. He rightly recalls, “*the sublime aspect of the microscopic perspective is that it was attained without waiting for any microscopes to show us what is there*”. Personally, I believe this to be one of the supreme achievements of the chemist, and it prompts me to recall what I have always regarded as a sublime, deeply moving facet of the evolution of the molecular sciences, namely Avogadro’s hypothesis. Even today, when an intelligent layperson, unfamiliar with anything other than a rudimentary knowledge of the molecular, is told, “*Equal volumes of all gases, under the same conditions of pressure and temperature, contain the same number of molecules*”, the response is one of astonishment and disbelief. Yet Avogadro was right, and Avogadro’s number is a numeric cornerstone of science. To me this is an example of the sublime in chemistry.

Hoffmann also reminds us that chemistry is as much about creation, the synthesis of molecules, as it is about discovery and “*the chemists’ ingenuity in exploring the natural and unnatural universes accessible to us is sublime*”. He amplifies this thought by emphasizing what every practical chemist knows innately that the work of creation—of a previously unknown material—constitutes another road to the transcendent. I also applaud his assertion “*that the sublime in science may also be diffused and build*

upon itself”. Here he quotes Einstein’s monumental four 1905 papers, written by a 26 year old and the 27 year old R. B. Woodward’s classic synthesis of quinine, as justification for his assertion. He could have added Newton’s work on calculus, gravity and light all done when the son of an illiterate English father was but 24 years of age, a fact that moves one to the brink of ecstasy.

As all chemists familiar with Hoffmann’s work know, he writes engagingly and with style, declaring eternal truths in memorable ways. This prompts me to return to Longinus whose treatise on sublimity focuses on excellence in language, the expression of a great spirit and the power to provoke awe and ecstasy, to move the reader however, many times he or she reads a passage. This is how I feel whenever I read C. N. Hinshelwood’s opening paragraph of his *The Kinetics of Chemical Change* (Oxford University Press, 1940):

“*That everything changes is an unescapable fact which from time immemorial has moved poets, exercised metaphysicians, and excited the curiosity of natural philosophers. Slow chemical transformations, pursuing their hidden ways, are responsible for corrosion and decay, for development, growth and life. And their inner mechanisms are mysteries into which it is fascinating to inquire.*”

I first read this nearly sixty years ago. It moved me profoundly then as it does now. This meets Longinus’s criterion for the sublime.

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