



Q&A Roald Hoffmann

Chemical connector

Theoretical chemist, poet and playwright Roald Hoffmann won a Nobel prize in 1981 for his work on how molecules change as they react. As the International Year of Chemistry comes to a close and he releases two books, Hoffmann talks about language, ethics and the sublime.

Why edit a volume of essays about the sublime?

Beyond the Finite is a collection by various authors writing on the role of the sublime in art and science, co-edited with Iain Boyd White. Most scientists think that the sublime is just emotional excess or, God forbid, the religious creeping into what we do. This is silly. Scientists are confronted with astounding novelty. Why not embrace the wonder one feels when looking at the ribosome, or at the beauty of a molecule shaped like a Ferris wheel or at a distant dust cloud across a galaxy? Why not accept that point at which one feels one really knows something that is deep and universal? Why not be at peace with the sublime?

What topics do you cover in the other book?

Roald Hoffmann on the Philosophy, Art and Science of Chemistry, edited by Jeffrey Kovac and Michael Weisberg, collects my writings on a number of subjects. Among these are what goes on under the surface of an article in a chemistry journal, how the philosophy of science would be different if it was done by chemists, and strategies for improving teaching. I talk of the special relationship between handicrafts and chemistry. And I fight reductionism all the way.

When did you become a writer?

I leapt into poetry from science at 40, then filled in the ground in between. I started writing essays and philosophical articles at

Beyond the Finite: The Sublime in Art and Science

EDITED BY ROALD HOFFMANN AND IAIN BOYD WHITE
Oxford University Press: 2011. 208 pp. \$24.95, £15.99

Roald Hoffmann on the Philosophy, Art, and Science of Chemistry

EDITED BY JEFFREY KOVAC AND MICHAEL WEISBERG
Oxford University Press: 2012. 448 pp. \$35, £22.50

around 50, and plays after 60. My years of getting scientific articles rejected were good training for submitting poems. It took me seven years to get a poem accepted, and I still have difficulty getting them published.

What do you research?

Early in my career, I found a method to explain the ways in which electrons move in molecules. As a theorist, I have moved through chemistry and am now focusing on solid-state physics and conductors — and building bridges between these subfields. I have explained the shape, colour, spectra, electrical properties and reactivity of molecules using simple ideas about how electrons move in their orbitals, and I have tried to predict molecules that haven't yet been made. Chemists will tell you that I am good at devising verbal explanations and extracting understanding out of poor calculations.

You call your work “applied theoretical chemistry”. What does that mean?

I'm a theorist, but I take my inspiration from

experiment. I don't build castles in the sky. I don't believe in working on 'important' problems. I would rather solve the many little puzzles that I see in the literature — strange reactivities, or why one molecule is bent when another is straight. Underneath is my philosophy that if I look at hundreds of smaller problems in chemistry, and keep in mind the connections that must be there, I will see the chemical universe.

Should chemists take the blame for how the molecules they have created are being used?

We should not take the blame. But as we create the new, we should ask whether our creation — be it a molecule, a gun or a poem — can hurt people. Without that question, the act of creation is incomplete. My play *Should've* tries to deal with this question. What responsibility do we have when, despite our best intentions, something we made that appears harmless, or even good, is abused by others? Not much, but some. Here we enter the realm of Greek tragedy. This is not to set scientists on a pedestal, but to make them see that they are no more absolved of ethical choices than other people.

Your play *Oxygen* was staged across Europe this autumn. What does it portray?

Written with chemist and author Carl Djerassi, *Oxygen* comes out of the story of one week in 1774 when Antoine Lavoisier was on the verge of understanding modern chemistry. All he needed was the discovery of oxygen. Suddenly he is faced with Joseph Priestley and Carl Wilhelm Scheele, who have each discovered the element but don't understand what they have discovered. How does Lavoisier react to that? He ignores Scheele and tries to take credit away from Priestley. Then there is Madame Lavoisier, who deserves her own opera. So, who discovered oxygen? We have these romantic notions of the past, but there were disputes over credit then, just as there are now. One has to admire the Nobel committee for having the moral strength to make its decisions.

What keeps you interested in chemistry?

Chemistry is closer to the human scale than physics. Neither subatomic particles nor the shape of the Universe will affect you much. But if you are prescribed a drug, you want it to work. Molecules are like humans in some ways: they can hurt or heal us. They are constantly moving, both natural and unnatural, wondrous in their complexity. A journalist once asked me when we will discover the next element. I told him that it is not about new atoms, but rather the molecules that a chemist can build from them. As with toy blocks, it is what the child's imagination does with them that counts. ■

INTERVIEW BY JASCHA HOFFMAN