

Roald Hoffmann

*on poetry &
the language
of science*

There was a time when poetry and science – these two luxuriating, contraentropic glories of the human spirit – walked hand in hand:

See the blind beggar dance, the cripple
sing,
the sot a hero, lunatic a king;
The starving chemist in his golden views
Supremely blest, the poet in his muse.

Thus Alexander Pope (1688 – 1744)
aligned – with his sharp wit – the muse
of the poet with the “golden views” of
the chemist.

Roald Hoffmann, Frank H. T. Rhodes Professor of Humane Letters at Cornell University, shared the Nobel Prize in Chemistry in 1981 for his theoretical work on the course of chemical reactions. A Fellow of the American Academy since 1971, Hoffmann is a playwright, poet, and essayist as well as a chemist. His research group looks at the electronic structure of molecules of any complexity, whether organic or inorganic, discrete molecular structures, or extended arrays in one, two, or three dimensions; it is interested in why molecules have the structures they do, how they might react, and whether they are stable or good conductors.

And not only in their delusions. . . . In Pope's day, it was not unusual for a 'natural philosopher' to be both a poet and a chemist: trying to understand the world around and within us required all the resources of art and science. But in the beginning of the nineteenth century things changed. Small wonder – it was getting awfully dark, the smog and stink of the industrial revolution coming down over the Midlands and the Ruhr, and there were all these distracting wild noises, romanticism beating its chest.

Art and science developed in divergent ways. Most scientists took on a creative analysis of quality and quantity in nature, yet one bound to prose in its method, while most poets turned nature into a mirror for the self.

Shall we complain? One result has been two centuries of glorious poetry, from Goethe to Inger Christensen. Another has been the greatest explosion of reliable knowledge that humanity has ever seen. So what, if anything, was lost in this obviously productive divorce of art from science?

One answer will come if you open an issue of a modern chemical periodical, for example *Angewandte Chemie*. Inside one finds riches upon riches: reports of new discoveries and accounts of marvelous molecules, unmakeable and unthinkable yesterday, made today, reproducibly, with ease.

But look now at the way what is written is, in fact, written. There is a ritual form: "The structure, bonding, and spectroscopy of molecules of type X have been subjects of intense interest.^{a-z}"

There is a general use of the third person and a passive voice. Accounts of historical development are few and overtly expressed personal motivations nonexistent. Here and there in the neutered language one glimpses deflected personal claims of achievement or priority – "a

novel metabolite," "the first synthesis," "a general strategy," "parameter-free calculations." But on balance there is a mind-deadening monotony to the language – and this in a field filled with fresh discoveries!

I am as guilty of this as anyone else.

In Pope's day, the scientific article was a personal, first-person account, attesting to the reality of phenomena. That changed in nineteenth-century Germany. In an effort to counter the pernicious (so it was perceived) influence of romanticism and its *Naturphilosophen*, German scientists, formalizing what their scientific French colleagues had begun the century before, purged the scientific article of its last vestigial links with poetry. The new ideal was dry, impersonal, dispassionate: the facts being reported had to be believable independent of the identity or emotions of the person reporting them. Neither the structure nor the causality of the facts was to be prejudged. It followed that findings should be presented in the third person, and in a passive and cautious voice.

I love the complexities of molecular science. But I also know that its richness was created by human beings. So I'm unhappy to see a significant part of the humanity of creative scientists being suppressed in the way they express themselves in print. The periodical article system of transmitting new knowledge has worked remarkably well for two centuries or more. But there are real dangers implicit in its current canonical form.

By removing emotion, motivation, the occasionally irrational, we may have in fact done much more than chase away the *Naturphilosophen*. What we have created is a mechanical, ritualized product that 6×10^5 times per year (that's the rough number of chemical articles pub-

lished annually) propagates the notion that scientists are dry and insensitive, that they respond only to wriggles in a spectrum.

I would argue for a general humanization of the publication process. The community should relax its strictures against expressing emotions and personal motives. So what if it takes a little more space? As it is, we can keep up with the literature and tell without much trouble the mass of hack work from what is truly innovative. And we recognize hype ever so easily. I think we have much to gain from acknowledging more directly in our scientific papers the personal and emotional elements in our struggle to discover, and create, the molecular world.

Admittedly, a young chemist trying to carve out an academic career, and anxious to have his or her research published in the established journals, is unlikely to follow my advice. Conservative editors and anonymous reviewers of scientific papers, struggling to find something moderately intelligent to say, are likely to look askance at colloquialisms, plain talk, and touches of literary style – any language, in short, that deviates from the ossified conventions of the scientific journal article.

Indeed, I myself have had difficulty in practicing what I preach. As a theoretician, I want to join a conversation among fellow chemists, in an effort to shape current thinking. Much of my audience (which I take as graduate students and young academics) would be put off if I wrote in an entirely offbeat way, inventing batteries of neologisms. So on matters of style, I go easy. Still, here and there I do sometimes try to sneak in a word or a phrase that may momentarily shock the reader into the realization that he or she is empowered to see things in a different light.

The contemporary poets I most admire – such as the late A. R. Ammons – are similarly subtle in the ways in which they use language to transfigure our perception of the natural world. Here, for example, is his poem “Planes”:

The whirlwind lifts
sand to
hide holy
spun
emptiness or erect a
tall announcement
where formed
emptiness is to be found

The image of the whirlwind is natural, but the questions it raises are deeply metaphysical: How is nothingness to be defined? How are we to reconcile one of the essential tensions, the quietude sculpted by impelled motion? The image also evokes the whirlwind in the Book of Job, from which the Lord asks Job: “Who put wisdom in the hidden parts?”

Ammons’s poem also reveals another characteristic of great poetry. I will clumsily call it “turning back to climb higher.” Look at the word “holy” in the third line. It is unclear whether what is “holy” is sacred, or simply has a hole, or rather establishes an enriching acrophonic relation to wholeness. “Holy” becomes the center; to me the poem caroms back and forth around that word, like a laser beam amplified by mirrors.

It is sometimes said that scientists have purged the world of poetry, because they have reduced the miracle of the living world to a set of cold, hard facts gained by the logic of dissection. Surely this cannot be right. What I know as a scientist about the physics of whirlwinds does not diminish my pleasure in the natural phenomenon. Or the poet’s language.

Few writers, of course, can turn that

Tsunami

A soliton is
a singularity
of wave
motion, an edge
traveling just
that way. We saw
one, once
filmed moving heed-
lessly cross
a platinum surface.
Solitons pass
through
each
other
unperturbed.

You are a wave.
Not standing, nor
traveling, satisfying
no equation.
You are a wave
which will not be (Fourier)
analyzed.
You are a wave; in
your eyes I sink
willingly.

Not solitons,
we can't pass through
unaltered.

– R. H.

kind of scientific knowledge into poetry. That Ammons was one means only that he was a very great poet – not that modern science and poetry are irreconcilable.

As for myself, I have no problems doing research as a scientist and trying to write poetry. Even if these activities are most often not in the same space-time. Both science and poetry emerge from an attempt to understand the universe around us – and from a wish to share that understanding with others in words.

I think there is, in fact, a richness in the scientific background, which in the hands of someone better than myself might be a real advantage in writing poetry.

After all, the language of science is a language under constant stress. The practice of science demands precise meanings – which must be defined in beautifully imprecise words. Mathematical equations and chemical structures are absolutely necessary. To be explained in words. New concepts, begging for new words, force themselves on us.

Because it is a natural language, yet always under tension, the language of science is inherently poetic. Which may be why this chemist feels compelled to turn his understanding of science into poetry.