

"The Same and Not the Same"
by Roald Hoffmann
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The very first phrase of the Preface to The Same and Not the Same, is "In this book I argue that chemistry is interesting...." Surely that goes without saying? Well, maybe not. Consider all the science books aimed at general audiences that have approached best-seller status in the last few years, such as Hawking on cosmology, Weinberg on particle physics, Gould on biology, Gleick on chaos, etc. No chemistry books there. Then look at a recent book I happened across -- a collection of interviews aimed at demonstrating that scientists are the focus of contemporary intellectual life [1]. It introduces us to 20 or so physicists, biologists, cognitive scientists, complexologists -- but not a single chemist. Why is that? I assume we chemists would all agree that chemistry offers as much intellectual content and general interest as any field of science, so it must be that chemists have generally been unwilling and/or unable to make that case to outsiders. Roald Hoffmann, in this book, demonstrates that he is both willing and able.

Such a groundbreaking task must have appeared rather daunting at the outset. How to select from the vast choice of possible material? How to organize it coherently? How to balance scientific rigor against readability? I like to think that Hoffmann, as a good empirical scientist (even if he is known for his theoretical work), approached those questions empirically: just start writing and see where it goes. The book indeed follows no obvious logical pattern, but it is by no means chaotic. Rather, the sense is of a storyteller, letting one tale lead to the next according to what interests him and what he thinks his listeners will enjoy; and generally this approach works very well.

The central organizing theme -- to the extent there is one -- is that of duality, the tension between paired polar opposites. We see this immediately in the title: "The same and not the same" refers primarily to the question of chemical identity. Are two structural isomers (or enantiomers, or isotopomers, or samples of different purity) the same thing? To what extent do their differences matter more than their similarities? This opens up the main thrust of Hoffmann's message for non-chemists -- what is it that chemists really do, what kinds of problems do they concern themselves with and how do they go about solving them? But it also serves to seed many of the other topics that Hoffmann develops. A chapter on the thalidomide story grows out of the structural resemblances to established drugs that led to its initial trials. That chapter in turn leads to further ones on scientific responsibility, on how chemists should react to environmental concerns, and further topics on the relations between science and society.

Another duality is that of synthesis/analysis, or creation/discovery. Hoffmann suggests that chemistry perhaps diverges from other sciences, and more closely approaches the arts, in the relative importance of these two categories. Both are well illustrated, though: there are accounts of a complex synthesis (cubane) and a mechanistic investigation that are sufficiently detailed to get the flavor across and still accessible to the lay reader. Some of the other topics include the chemical article, chemical industry, reductionism in science, Fritz Haber, and too many more to mention -- but all linked to, and flowing from, the main theme.

It should also be clear that, though primarily written for the non-chemist, this book has much to offer the chemist as well. Hoffmann clearly is fascinated by the myriad ways that chemistry branches outward to connect with all other fields of human endeavour -- literature, the arts, philosophy, politics, history, etc. -- and any reader willing to follow him along some of those paths will be richly rewarded.

I found a few minor problems, probably attributable to the decision to emphasize readability and the consequent free-form organization. For example, the first 10 chapters, on chemical structure, end with a comment on the key role of representations of structure; but then there's a digression, and we don't come back to it until chapter 15. Later, in a chapter entitled "Equilibrium, and Perturbing It" there is a list of four strategies for dealing with the equilibrium problem in nitrogen fixation, the last being use of a catalyst. This could leave a non-chemist with the impression that catalysts do perturb equilibrium, which is not clarified until 2 chapters later -- and even then, explicitly only in an endnote [2].

However, none of this is serious; the only major disappointment I felt was that Hoffmann could have written much more about many of his topics. So read this book now, as a first installment, and look forward along with me to the next.

NOTES

1. Brockman, L. The Third Culture; Touchstone: New York, 1995.
2. Actually this is one of my pet peeves: when endnotes may be either bibliographic citations or commentary (some of which is at least as interesting or important as the main text), and I want to skip the former and read the latter, how do I know, when I'm referred to a given endnote, whether to take the trouble to turn to the end of the book? Isn't there a better way to do this?