

Review of IN THE MODERN AGE, edited by Peter J. T. Morris

The Bloomsbury Cultural History of Chemistry is part of an established series of volumes spanning over a hundred topics to date, from Furniture to Genocide, and all around. Six hundred bucks will get you six volumes on each topic. The gaping hole of science in this remarkably broad survey of human culture is being filled by a set of volumes on chemistry, chronologically arrayed; I am asked here to tell you of the volume on the modern period, here defined as the past century, from World War I on.

I have been active as a chemist for just about half of that period. And I have an abiding concern about “chemistry in culture, and culture in chemistry”. So one would expect I would be an ideal reviewer. But perhaps not, for I have participated so intimately in some of the scientific developments surveyed, that it is difficult to step back and take the balanced perspective on what one was in the midst of. It’s not quite a good analogy, but those of us who were busy surviving in Poland in 1943, had no idea of what was going on in North African fighting in the same year. But let me try to outline the contents of this valuable volume.

Beginning this volume, Mary Joe Nye is an ideal reporter for the *Theory and Concepts* section (the Bloomsbury Cultural History format dictates a leitmotif for each chapter. Which the authors follow or subvert...). She follows well the interesting way in which the chemical bond resisted the quantum mechanical ways to question its existence. And how Lewis, Ingold, and Robinson intuited the quantum mechanical expression of bonding that Pauling and Mulliken and others made clear. As Nye says “...complementarity of mechanisms and representations are natural to chemistry and not at all concessions of failure.”

In a chapter on *Practice and Experiment*, José R. Bertomeu-Sánchez and Antonio García-Belmar write of a range of practices, from the instruments of the chemist to what they are taught. They have a very nice account of the role of molecular models, with the insight that “...molecular models have defined and redefined, rather than represented, molecules.”

Peter Morris, one of the editors of the entire series, writes with expertise of the chemical laboratory in this century, both as it changed and didn’t. His account is especially good on sketching how different the nuclear magnetic resonance, nmr, machines were to chemists, both in their manufacture (no optical components in them), and in their use. He notes the 8,000 copies sold, at a relatively high price, of Jack Roberts’ “Nuclear Magnetic Resonance.” Morris also has an excellent

account of the development of chromatographies in the period covered. These methods, unlike nmr or infrared and UV spectroscopies, did not have the benefit of romantic connections to state-of-the art physics. Nor were there explanations for separation phenomena based on molecular orbitals or rate constants for simple reactions. Not that organic chemists (and biochemists, and industrial chemists) failed to value and use these techniques.

In an insightful article, Carsten Reinhardt begins by seeing chemistry at the beginning of the period as providing in abundance the makings of modern society “between Ersatz and miracle”. But even as the physicist’s (war which should have been called the chemist’s war) was over, as chemical industry was being rebuilt or flourishing, and support for chemistry abundant, our field enters a crisis of confidence. The loss of the centrality of chemistry is traced, in a careful reading by the author, in two major contemporary reports on the state of the science. The future is (perhaps) “outside of chemistry.”

The shift from a romantic view of chemistry as the heroic enabler of a better life, to real concern about what the abundance of cheap synthetic materials does to the air, waters, and soils of the planet and to our bodies, is succinctly traced by Peter Reed. He also provides an analysis of the growth of the participation of women in the chemical profession.

Peter Morris and Anthony Travis are the right people to analyze, in a chapter on *Trade and Industry*, the growth and profound changes that the century brought to chemical industry. They discuss carefully the ingenuity marshalled coping in two wars, the important role of the growth of the automobile industry for chemicals, and the transformative nature of plastics. They detail how, despite expectations that the chemical industries would continue a march ahead (even if IG Farben was broken up), that other factors led to large-scale rearrangements and crisis post World-War II. The raw material changes, petrochemistry and requisite oil resources mattered more. And a resurgent Japanese industry (and now that of China), along with a multitude of takeovers and spinoffs created an entirely new landscape across commodity chemicals, pharmaceuticals and materials. It’s an uncertain, precarious and exciting world.

I would have wished a little more, if not here than in another chapter, on the role of chemists-inventors, on start-up companies, and the growing (or diminished) role of chemistry in the trillion dollar companies of the IT age.

Johnson, Furikawa and Jiang give us a welcome broad view of *Learning and Institutions*. The scope is appropriately global and well documented. It is especially good in detailing the growth of the Japanese research enterprise in the 20th century, and the exponential growth of Chinese science.

In the final chapter of the book, on *Art and Representation*, Joachim Schummer gives us a perceptive and extensive analysis of the main tropes in which chemistry was perceived by the general public in the 20th century. He shows in detail how the old “mad scientist” caricature evolved into superheroes and supervillains, with chemistry figuring importantly in the existence and actions of both. Maybe more so for the bad guys. Interestingly, children were more likely to be fed another stereotype – the absent-minded professor. Schummer describes the fascinating growth of the chemical content of apocalyptic narratives. And he shows how standard plotlines in the chemical industry’s imagined (but based on authentic events) causation and resistance to remediation evolved. He makes the important -- and disheartening – observation that once the theme of an environmental apocalypse entered our imagination “...chemistry, much more so than any other science or technology, became firmly associated with the total destruction of the world as we know it.”

I may think of myself as a reflective observer as well as long practitioner of chemistry, but reading the “In the Modern Age” volume of this series made me aware of how limited in fact my perspective was. The information on the growth, diversification and fragmentation of chemical industry in the 20th century was very informative. To go back to the analogy I gave at the beginning of this review, of the ignorance due to being in the midst of a war, I chose, out of intellectual laziness or compartmentalization, not to know of these gigantic transformations. Even as my students were looking for jobs in just these companies. Not good. But not too late to learn about this, or to learn of the German or French novels that made us imagine a chemical apocalypse. This volume of “A Cultural History of Chemistry” was educational, and fun to read.

Roald Hoffmann