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Linus Pauling: Scientist and Peacemaker. A Centenary Volume

edited by Clifford Mead and Thomas Hager

Oregon State University Press: Corvallis, OR, 2001. 288 pp.
ISBN 0-87071-489-9. Hardcover, \$35

Linus Pauling: Selected Scientific Papers (World Scientific Series in 20th Century Chemistry, Volume 10)

editor-in-chief Barclay Kamb

World Scientific Publishing Company: River Edge, NJ, 2001.
2 volumes ca. 1600 pp. ISBN 9810227841. Hardcover.
\$196

The Research Notebooks of Linus Pauling

46 volumes. Digitized and released online by Oregon State
University Special Collections. [http://osulibrary.orst.edu/
specialcollections/rnb/index.html](http://osulibrary.orst.edu/specialcollections/rnb/index.html).

Profiles in Science

National Library of Medicine: The Linus Pauling Papers. [http://
profiles.nlm.nih.gov/](http://profiles.nlm.nih.gov/).

reviewed by Derek A. Davenport

Since several major additions to the Linus Pauling canon have recently appeared it would seem timely to update the previous summary. ("The Many Lives of Linus Pauling: A Review of Reviews", *J. Chem. Educ.* **1996**, *73*, A210–A212.)

February 28, 2001, marked the one hundredth anniversary of the birth of Linus Pauling (1901–1994). The occasion was celebrated in symposia held around the world and was marked by the issuance of a Centenary Volume and the announcement of a forthcoming two-volume compendium, his Selected Scientific Papers.

The Centenary Volume is explicitly modeled on similar compilations produced by the American Institute of Physics

and Harvard University Press in honor of Albert Einstein and Niels Bohr. Though not quite of their lofty eminence, Linus Pauling is probably the only 20th century chemist who could withstand such broad-brush treatment. In particular he was uniquely far-ranging in his interests and achievements. However, by the standards of those two exemplary volumes this one, though a fine read and imaginatively illustrated, falls short.

The reasons are, I think, two-fold. Firstly, much (too much?) of the book consists of Linus Pauling in his own words. While they are authoritative they are also partial—in both senses. Besides, some of this has been mined in Barbara Marinacci's two paperbacks: "Linus Pauling: In His Own Words" and "Linus Pauling on Peace". The two new interviews, by Neil A. Campbell (1980) and by Wayne Reynolds (1990), are far from probing and elicit little fresh information. Much of the rest consists of material already available in Thomas Hager's excellent biography.

The second problem derives partly from the first. In their book catalogue Oregon State University Press emphasize Pauling's "contradictions":

Some observers found Pauling arrogant; many others loved him for his humour, humanity and warmth. Observers likened him to the Pope, to a fascist, a wizard, and a king. He was a write-in candidate for governor of California. He was listed among the twenty greatest scientists of all time. He was listed as a subversive. He was called a threat. He was a complex individual.

Somewhat hyperbolically stated perhaps but it would be nice if more of this complexity were addressed in the book.

On the positive side, the book furnishes a good introduction to a remarkable man. In particular the illustrations, drawn from the vast Pauling archive in Corvallis, are profuse and endlessly intriguing. One treasures a surprising rebuff from James B. Conant (p 212) and portraits of the five-year-old Pauling dressed in a cowboy outfit and another of the nineteen-year old in drag. For those of us privileged to have heard Pauling's mesmerizing public lectures, the many pictures of the magician holding forth bring back wonderful memories of those spell-binding occasions. Many of the illustrations are letters, annotations, and pages from his research notebooks all written in his big, round, legible hand. But more on the notebooks later.

The two hefty volumes of "Linus Pauling: Selected Scientific Papers" have just shown up in the Purdue Library. The editor-in-chief is Barclay Kamb together with his wife Linda Pauling Kamb, Peter Pauling, Alexander Kamb, and Linus Pauling, Jr. Very much a family effort! Pauling wrote close to eight hundred and fifty scientific papers and these two generous volumes reprint (in excellent facsimile) 144 of these. Their quality and clarity are as astonishingly high as their range is wide. Volume I is divided into two parts and 10 chapters and comprises 81 papers. This is the volume most accessible to chemists. Part I, *The Chemical Bond*, and Part II, *Crystal and Molecular Structure*. For the most part these document the way Pauling became the father of modern structural chemistry and the author of the "Nature of the Chemi-

cal Bond”, the classic text of 20th century chemistry. The last chapters contain his excursions into ‘Entropy and Molecular Rotation’—including the one-off paper on the residual entropy of ice—and into nuclear structures, superconductivity, and quasicrystals.

Volume II, *Biomolecular Sciences*, begins with Part III, *Biological Macromolecules*, containing 39 papers. Here we find the early work on oxygen/hemoglobin bonding, and the seminal, if not totally correct, views of the structure and functions of antigens/antibodies. There follows the unassailable triumph of the α -helix and related structures to be expected in proteins, proposals that made him one of the founding fathers of molecular biology. Then comes the “infamous” proposal of a triple-stranded helix structure for the DNA molecule. With the subsequent triumph of Watson and Crick’s familiar double-stranded model for DNA, the Corey and Pauling version was consigned to the dust-heap of history. Their only consolation came in pointing out that the cytosine and guanine base-pair interaction involved three hydrogen bonds rather than the two that Watson and Crick had proposed. This section concludes with Pauling and Zuckerkandl’s paleographic clock, based on changes in the sequence of amino acid residues over evolutionary time.

Part IV, *Health and Medicine*, starts with the sickle-cell anemia story—the first disease diagnosed at the molecular level. (“While there are molecular diseases, there are no diseased molecules”.) After a brief speculative excursion into the theory of anesthesia, we move into the areas of physiological chemistry, effects of radiation, and health hazards. From here it is but a small step into the domains of orthomolecular

medicine and the vitamin C imbroglio. The jury on the last-named would appear to be still out.

The two volumes contain many fascinating photographs orchestrated by Linda Pauling Kamb. The book concludes with Jack Dunitz’s fine obituary reprinted from the Biographical Memoirs of Fellows of the Royal Society of London. This obituary, in abbreviated form, also appears in the Centenary Volume. Appendix III is a novel, and potentially very useful, concordance of all 828 of Pauling’s scientific papers in terms of how they relate to the 17 chapters into which the 144 selected papers have been placed. While all of these are, of course, available “in the literature” they are widely dispersed and it is certainly a great, if somewhat pricey, boon to have them gathered together, judiciously chosen, authoritatively edited, and amply illustrated.

Perhaps the most exciting event of the centennial year has been the release on the Web of digitized facsimiles of all 46 of Pauling’s research notebooks. These are in the Ava Helen and Linus Pauling Papers in the Special Collections of the Oregon State University Libraries in Corvallis. They were posted on 28 February 2002, Linus Pauling Day in the state of Oregon, and they are a veritable gold mine. Each large-format bound notebook, written in Pauling’s splendidly legible hand, is indexed by the author. Starting with entries from 1922 when he was still a graduate student learning X-ray crystallography under R. G. Dickinson, they end with an entry for January 1994, a few months before his death. Although the 46 volumes are arranged in chronological order of their earliest entry, many of them contain material from later, sometimes much later, years. Thus Volume 19 has entries

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from 1941–1942, 1944, 1949, 1955–1956, 1959–1960, 1965, 1967, 1976–1978, 1980–1981.

While the overwhelming emphasis is on the working out of scientific problems, we find many fascinating autobiographical entries. Thus on page 3 of Volume 23 we find an inserted map of the Big Sur coastline showing the location of the soon-to-be-purchased Deer Flat Ranch. Later, on page 205 of Volume 35 we find a vivid description of two of the ranch buildings going up in flames. Calculations on nuclear stability adjoin a discussion of cancer in hairless mice and accounts of Pauling's frequent self-mediations. Draft of an angry letter to President George H. W. Bush opposing Desert Storm shows up sandwiched between notes on the nuclear stabilities of palladium and molybdenum isotopes. All-in-all it is rather like having a key to Alladin's cave and the experts at OSU have made it disarmingly simple (even for a semi-Luddite) to unlock all manner of scientific treasures. Go and try for yourself—but be warned it is addictive.

The National Library of Medicine has also just posted a Web site on Linus Pauling in its Profiles of Science series. While by no means as rich as the various Oregon State University sites, it is well worth visiting. There are texts of various speeches (including his Nobel address), many downloadable photographs, correspondence (including a poignant letter to James Watson and Francis Crick concerning their "rival" structures for DNA), and much else besides. There is a certain irony in Linus Pauling being honored by the National Library of Medicine. Ever since his 1949 presidential address to the American Chemical Society, and perhaps earlier, Pauling had been at loggerheads, sometimes acrimoniously so, with the medical establishment. It is easy to imagine him somewhere in the timeless infinitude of the empyrean sporting his characteristic ear-to-ear grin.

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