

No holds barred

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Science and Cultural Crisis: An Intellectual Biography of Percy Williams Bridgman (1882–1961). By Maila L. Walter. *Stanford University Press: 1990. Pp.362. \$42.50.*

PERCY Williams Bridgman (1882–1961) was an unusually productive and unusually perceptive physicist who made a strong impression on the scientific community. "Brilliant, intense and dedicated" were the adjectives with which his colleagues led off their biographical memoir. How to compress substances under very high physical pressure, and how matter behaved under such high pressure, was his experimental field.

Maila L. Walter's *Science and Cultural Crisis* provides a detailed discussion of Bridgman's life and career. It is based on extensive work on Bridgman's papers and will reward the interest wide range of readers.

From the age of 18, Bridgman found a home at Harvard, as student, scholar and faculty member. As a graduate student he found a way to achieve hydrostatic pressures higher than previously possible. Leaking was eliminated by "a method of packing . . . which automatically becomes tighter the higher the pressure." He used his technical skill to measure several mechanical, electrical and thermal properties of a wide variety of materials over the new ranges of pressure made available, surmounting the challenging problems of calibration with ingenuity and perseverance. His work was careful and precise and was described in prose that, like his life, was straightforward and vigorous.

Approximately 200 scientific papers appeared between 1909 and 1958, later gathered in seven volumes by Harvard University Press. (*Collected Experimental Papers*, 1964). Many of the papers contain

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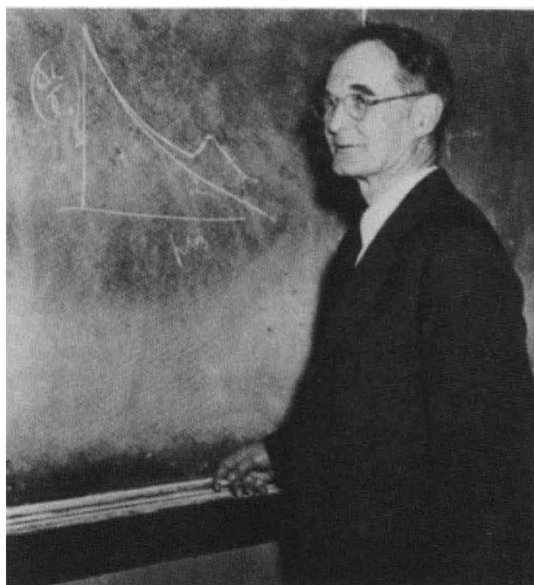
This year, *Nature's* annual new journals review supplement will appear in the issue of 3 October. Publishers and learned societies are invited to submit journals for review, taking note of the following criteria:

- Journals that first appeared after June 1989 and issued at least four separate numbers by the end of April 1991 will be considered.
- The deadline for submission is end of May.
- Journals covering any aspect of science are eligible, but those dealing with clinical medicine, engineering and pure mathematics are excluded, as are publications of abstracts.
- The journals must be published at least three times a year.
- The main language used must be English.

When submitting journals for review, please send at least four different issues (the first, the most recent and any two others).

extensive data on several different materials. The physics of materials under high pressure, as of the 1950s, was a field created by and dominated by Bridgman.

He worked alone, or with the help of a laboratory technician and a master machinist. The graduate students he supervised — never more than two at a time — pursued their own separate projects. He guarded his time for experimental work by negotiating his freedom from faculty committees, and taught, for most of his years, only graduate courses. In his modest rooms in the basements of Jefferson and Lyman Laboratories Bridgman laboured hard, with his mind and with his body, in pursuit of new data and new understanding.



Bridgman — "Brilliant, intense and dedicated".

The summers Bridgman spent in Randolph, New Hampshire, in a grand sloping valley in the White Mountains. He hiked, raised vegetables, read and played music with his family, and wrote up the accounts of his experiments. He also pondered and wrote about some of the deeper questions raised by physics and how physics is done. An examination of Tolman's attempt to exploit scale-invariance arguments led Bridgman into dimensional analysis, on which he published a book in 1922. (*Dimensional Analysis*, Yale University Press). A more general investigation of the 'meaning' of the conceptual terms used in physics, mostly stimulated by the special theory of relativity but with the interpretative puzzles of quantum mechanics also in mind, resulted in *The Logic of Modern Physics* (Macmillan, 1927), in which he proposed that "we mean by any concept nothing more than a set of operations; the concept is synonymous with the corresponding set of operations." (Bridgman's emphasis).

Bridgman's operational analysis struck a responsive chord among many scientists, and among quite a few philosophers as well. He was very much an individualist, however, and could not be subsumed even by the

Vienna Circle of philosophers, with whose approach his own had much in common. He continued to explore these deeper questions, in articles, and in books like *The Nature of Physical Theory* (Princeton University Press, 1936), *The Nature of Thermodynamics* (Harvard University Press, 1941), and *The Way Things Are* (Harvard University Press, 1959).

Some psychologists found operationalism particularly congenial, and through the efforts of S. S. Stevens applications and elaborations of Bridgman's line of thought played a considerable role for some time in that field.

If from Walter's book it seems to a non-philosophical reader that Bridgman's *sui generis* approach to deep questions is sometimes too much nibbled at for not conforming to comfortable philosophical classifications, there is recompense in the realization that his contributions are considered worth so much and so detailed an analysis.

Walter successfully covers the things Bridgman did that make him a culture hero to physicists. For example, she reminds us of his dictum that "The scientific method . . . is . . . doing one's damndest with one's mind, no holds barred" (*Reflections of a Physicist*, Philosophical Library, 1950); and of the manifesto once posted on his door: "I have decided from now on not to show my apparatus or discuss my experiments with the citizens of any totalitarian state." He did his best to maintain in himself and promote in others the highest standards of intellectual integrity.

Despite his rigour, he could be kind, for example to the young. In the strength and purity of his intellectualism he was not unlike Wittgenstein, with whom he shared a disquietude about the diagonal proof of non-denumerability. His operationism was in one sense a pointing at what scientists do, as more powerful than categorization by words.

In his later writings Bridgman stressed the privateness of science, and of human life itself. "Beyond the public level, waiting for a deeper analysis, is the private level. It is on the private level that I realize my essential isolation; here is my awful freedom that I can hardly face" (*Reflections*, p.75). Walter is good on this important existential strain in Bridgman.

Into his middle seventies Bridgman rode a bicycle to work. When faced by rapidly spreading inoperable cancer his response was as stoic, rational and straightforward as the rest of his life: he put the index to his collected scientific papers in the mail, wrote a brief note, and shot himself. Bridgman's life and his writings had a deep effect on physicists. Walter's book is a good reminder of this. □

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