counts of the growth of science. For example, he repeats the unlikely retrospective judgment of Pauli's friends that Pauli's often biting criticism did not wound its targets, except, perhaps overly sensitive persons like Max Born (*7*). This opinion scarcely squares with the following "Bavarian sermon" from Heisenberg: "It is really disgusting that you can't stop bitching. Your eternal abuse of Copenhagen and Göttingen is a screaming scandal. You will have to leave us alone" (*8*).

The edition originated in a work of love, the collection of Pauli's letters made by his widow from letters supplied by their physicist recipients. Pauli's "wissenschaftlicher Briefwechsel" has therefore meant in practice his correspondence with physicists. This is a narrow conception of Wissenschaft, and quite inadequate to capture the range of Pauli's intellectual interests in his middle years, when he was a close student of Jungian psychology. It is to be hoped that later volumes of this series will include Pauli's correspondence with distinguished colleagues in other disciplines, for example Jung and Erwin Panofsky. The editors have an unusual opportunity to bring forward the full record of a powerful and far-ranging mind. No such public record yet exists for any modern physicist. A start has been made on a project of great importance.

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References and Notes

1. See D. Cassidy, "Heisenberg's first wave model of the atom: The formation of a professional style," *Hist. Stud. Phys. Sci.* **10**, 187 (1979).
2. A. Sommerfeld, *Atombau und Spektrallinien* (Braunschweig, ed. 3, 1922), P. v. Pauli and Heisenberg liked to call Sommerfeld's physics school the "Institut für Zahlenmystik."
3. None of the three standard modern meanings fits; "corruption" is authorized by T. Heinsius, *Volkthümliches Wörterbuch* (Hanover, 1818–22), but "diddle" (taking *Schimmel* as dialect for *Schummel*) may better convey the sense. Here the editors are no help.
4. See D. Serwer, "*Unmechanischer Zwang:* Pauli, Heisenberg, and the rejection of the mechanical atom, 1923–1925," *Hist. Stud. Phys. Sci.* **8**, 189 (1977), and E. MacKinnon, "Heisenberg, models and the rise of matrix mechanics," *ibid.*, p. 137.
5. P. Forman, "Weimar culture, causality, and quantum theory, 1918–1927: Adaptation by German physicists and mathematicians to a hostile intellectual environment," *Hist. Stud. Phys. Sci.* **3**, 1 (1971).
6. P. Forman, "The doublet riddle and atomic physics *circa* 1924," *Isis* **59**, 156 (1968). A "Bibliography on the history of 20th century physics" will be published in September 1980 by the Office for History of Science and Technology, University of California, Berkeley.
7. See the review of Born's autobiography in *Science* **204**, 740 (1979).
8. Bavarian eludes translation: "Betreffend Ihrer beiden letzten Briefe muss ich Ihnen noch ein Predigt halten, und Sie entschuldigen, wenn ich auf Bayrisch fortfahre: Es ist wirklich ein Saustall, dass Sie das Pöbeln nicht aufhören können. Ihre ewige Schimpfereien auf Copenhagen und Göttingen sind einfach ein schreiender Skandal. Sie werden uns doch lassen müssen" (p. 250).

Of Accelerators and Theories

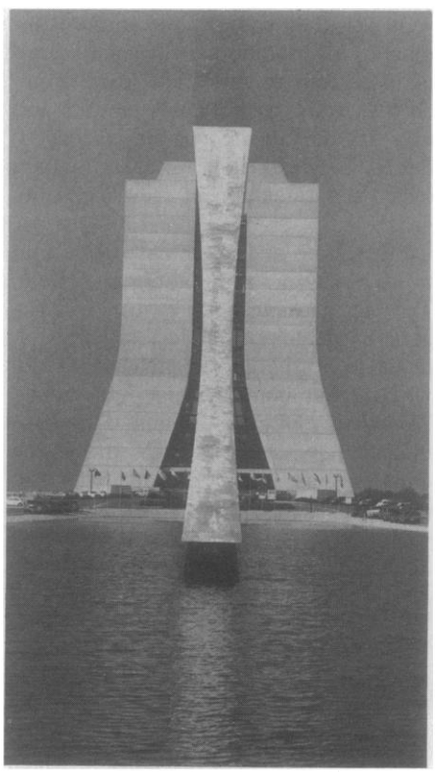
Aesthetics and Science. Proceedings of the International Symposium in Honor of Robert R. Wilson. Batavia, Ill., Apr. 1979. Fermi National Accelerator Laboratory, Batavia, Ill., 1980. viii, 120 pp., illus. $20.

This volume is dedicated to Robert Rathbun Wilson, whose career its title embodies. Wilson is at one and the same time a premier builder of particle accelerators and a sculptor whose works have attained some modest recognition. The book contains the proceedings of an international symposium held on the occasion of his retirement as director of the Fermi National Accelerator Laboratory (Fermilab).

Because of the nature of such an occasion, only two of the five papers included actually address the subject promised in the title. One of these, however—that of the astrophysicist Subrahmanyan Chandrasekhar—is of sufficient merit to justify the whole enterprise.

Two of the papers recapitulate Wilson's career. Hans Bethe offers reminiscences of days at Los Alamos and Cornell, and Leon Lederman, Wilson's successor at Fermilab, summarizes Wilson's achievements there. The latter paper is leavened by the wit that has made Lederman one of the best stand-up comics in the world of science.

A third paper, by Wolfgang Paul, is a history of particle accelerators. Its principal merit lies in giving due credit at last to a number of pioneers who were first with the ideas on which modern accelerators are based but who for one reason or another never got a chance to put these ideas into practice.



Fermilab. [From *Aesthetics and Science*]

Addressing the main subject, Victor Weisskopf contrasts the holistic approach of art to the particularism of science. He marvels that the latter has, despite its modest immediate goals, led to deep insights of surpassing beauty: "The detour through the diversity of experience paid off." He regards these two worldviews as complementary, in the sense applied to that word by Niels Bohr—embodying irreconcilable opposites both of which are essential to get at the complete reality of nature.

But these are conventional sentiments, and Weisskopf adds little to them, other than a measure of style and grace.

Chandrasekhar shows far more daring, tackling a truly deep question: How is it that theories born of a quest for beauty turn out also to be true? He addresses the question both in the context of great world schemes, such as Einstein's general relativity, and small jewels, such as Weyl's "premature" two-component neutrino, which seemed wrong at its birth because it violated parity symmetry but proved 30 years later to be right.

Chandrasekhar goes beyond the facile solution implied by Keats's phrase "beauty is truth, truth beauty." He observes that beauty is not essential to make a theory useful (with "renormalization" in quantum electrodynamics as a perfect example). But it does make us take seriously a theory's pretension to represent a deep insight worthy of a place at the heart of our world view.

He also takes a stab at formulating a specific esthetic of science, taking as one starting point Francis Bacon's dictum that "there is no excellent beauty that hath not some strangeness in the proportion." It is peculiar asymmetries blended harmoniously with satisfying symmetries that catch the eye and excite the imagination. The contributions of Kerr and of Reissner and Nordstrom to general relativity are cited as examples, signposts pointing to deeper truths yet to be unraveled.

Though far from a definitive treatment of the subject, Chandrasekhar's observations are well worth the effort to read and ponder.

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