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tary concepts of solid-state physics. The authors examine ionic bonding and Van der Waals forces with some care; bonding in metals and covalent bonding are mentioned but not treated quantitatively or even described clearly enough to permit an uninformed reader to discriminate between the various kinds of chemical bonding. There is a strong emphasis on working with precise potential-energy functions—clearly the author team was dominated by theorists. (The materials were prepared by a large course team chaired by R. A. Ross and co-chaired by P. M. Clark.) While I concede that a student who is familiar with the approach of a theorist could learn much from this volume, I doubt that the uninitiated will follow the arguments, and I fear that anyone who does, despite numerous warnings, will be lured into a false sense of control over the theory of solids. In fact, I wonder whether there is value in devoting so much time and effort to quantitative treatments that are completely classical.

Units 9 and 10 deal with liquids. Despite the fact that the treatment suffers from the same limitation mentioned above, I learned quite a bit from this volume. This statement probably reflects more the general dearth of quantitative discussions of liquid-state models than it attests to any special excellence of this material. Nevertheless several fine features stand out in this volume. The diagrams and graphs are excellent and they add much to the clarity of the presentation. There are frequent comparisons between theoretical predictions and experimental data. In unit 10 on "Transport Properties in Liquids," the cell model is treated with unusual clarity; the distinction between fact and hypothesis is maintained consistently.

The authors devote the final six units (three volumes) to classical thermodynamics. Compared with most texts on this subject, these are somewhat unusual. They are, as I observed before, the products of theorists—fortunately very competent and articulate ones. Among the exercises, there are few opportunities for students to learn how to apply the basic laws to the analysis of heat-engine efficiencies or to the computation of entropy increases for irreversible processes. There is a sophisticated statement concerning consequences of the second law, and there is a coherent and edifying discussion of phase transitions. In the final unit, a Van der Waals liquid is examined in great detail and compared with other models and real liquids. The entire treatment is interesting and instructive—but not elementary. The major problem here is the absence of concept development. The formal steps by which one deduces consequences from proposed models are

plentiful in these volumes; what is missing is the kind of background discussion of ideas that is essential if this entire subject is to be meaningful to an adult student whose analytical skills have become rusty.

From my perspective as a pedagogue, I see these books as positive contributions to educational change, yet disappointing. Never before have we had at our disposal materials to support a competently taught upper-division course for continuing-education students working independently except for occasional sessions with a tutor. My disappointment is over the opportunity lost. I believe that even with the help of television and the other aids, individuals will have difficulty mastering the course. Even though a great deal of time and effort was invested in its preparation, my hope that the course would accommodate students with a wide variety of backgrounds will probably not be realized.

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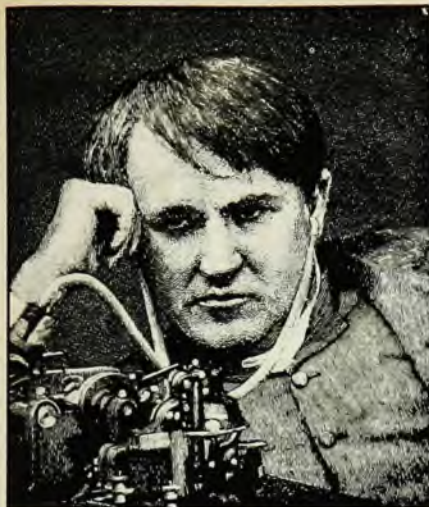
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A Random Walk in Science

R. L. Weber, compiler; E. Mendoza, ed.
206 pp. Crane, Russak, New York, 1973.
\$12.50

Like many brilliant ideas, this book was inspired by a grievance. For a long time, Robert L. Weber of Pennsylvania State University thought that he and his fellow physicists took themselves much too seriously. So, as an antidote for such pomposity, he began collecting jokes about them and eventually about other scientists as well.

The task was made all the easier by a new phenomenon: the explosive growth in recent years of what Weber calls "the flourishing underground press"—such irreverent, spoofing publications as *The Journal of Irreproducible Results* and *J. V. McConnell's Worm Runner's Digest* ("My own personal joke on the Scientific Establishment"). From these and kindred sources, Weber has assembled enough jokes and short anecdotes to enliven after-dinner speeches at scientific gatherings for years to come. Some examples: Werner von Braun's sardonic definition of basic research as "what I am doing when I don't know what I am doing" and Pamela Anderton's wry comment that the best general measure for science may be not English or metric but the Rule of Thumb.



"The eminent Tom Edison brushed off alternating current as unreliable and dangerous."

Fortunately, *A Random Walk in Science* is much more than a lively compendium of contemporary scientific wit—or, some might say, witlessness. Digging back into the history of their subject, Weber and his editor-collaborator, Eric Mendoza of the Hebrew University in Jerusalem, have unearthed material not only about science's foibles, but about its more serious moments—for instance, F. Sherwood Taylor's classic account of the trial of Galileo: It was not simply a battle of "a champion of scientific truth against a reactionary church" but a far more complex struggle of personalities and ideas that is surprisingly relevant to our times.

In their selections, Weber and Mendoza also show that scientific writing has not always been a wasteland of calculated obscurity. Indeed, at times, it has even had a literary tone. As an example, they recall the advice of the 19th century mathematician, the Rev. Charles L. Dodgson, otherwise known by his *nom de plume* Lewis Carroll. "When I come upon anything—in Logic or in any hard subject—that entirely puzzles me," wrote *Alice's* creator, "I find it a capital plan to talk it over aloud, even when I am alone. One can explain things so clearly to one's self . . . one never gets irritated at one's own stupidity."

Stupidity, in fact, is another recurring theme of this book. In 1837, Weber and Mendoza note, the Surveyor of the Royal Navy loftily dismissed a proposal to propel a steamboat with a "screw-propeller" at its stern because it would be "absolutely impossible to make the vessel steer." Half a century later, the eminent Tom Edison brushed off alternating current as unreliable and dangerous. Nor are scientists alone singled out by Weber and Mendoza. Without any editorial comment of their own,

they quote a 1921 *New York Times* editorial chiding Robert Goddard for not knowing "the relationship of action to reaction—and of the need to have something better than a vacuum against which to react . . . knowledge ladled out daily in high schools."

More than anything else, however, this collection succeeds in answering a key question posed by William Cooper in his provocative introduction: "What is it that enables a set of clever men to live out there, having a high old intellectual time, on their own?" The answer is, as *A Random Walk* shows again and again, that scientists often display their creative genius even at play. Who else but a Gamow would have tagged the name of Hans Bethe onto a paper, even though he had nothing to do with it, simply so the authors could be listed as Alpher, Bethe and Gamow? No less creativity was displayed by the anonymous physicist who "proved," by Scriptural clues and the Stefan-Boltzmann law, that Heaven (525°C) is hotter than Hell (445°).

A Random Walk, in short, is an entertaining stroll behind the scenes of science, a backstage look at the shenanigans and foolishness, the frustrations and genius that so often remain hidden under the coldly logical language of scientific reports. Both scientists and nonscientists should enjoy taking this amusing and provocative excursion.

FREDERIC GOLDEN
Science Editor
Time magazine
New York, New York

* * *

Note: A Random Walk in Science is available to members of AIP Societies from Marketing Services, AIP, 335 E. 45th St, New York, N.Y. 10017 for \$9.95 prepaid with checks payable to Crane, Russak.

Stable and Random Motions in Dynamical Systems

J. Moser
198 pp. Princeton U. P., Princeton, N.J.
1973. \$7.50

One of the older and more celebrated topics in astronomy and mathematics is the question of stability—stability of the solar system, stability of the Trojan asteroids and, more generally, stability in dynamical systems. On the other hand, in contradistinction to the predictability inherent in the notion of stability, there is the possible existence of random and erratic behavior of the masses. In the 1920's J. Chazy was forced, for technical reasons, to introduce such a motion in his study of the final evolu-

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