

original papers. Although the descriptions in these biochemistry texts are qualitative, they impart a strong sense of intuition for the material they cover and will fill any reader with a sense of wonder.

At the specialized level, the three-part series *Biophysical Chemistry* by Charles R. Cantor and Paul R. Schimmel (Freeman, New York, 1980) is an excellent although slightly dated text on molecular biophysics. The biophysics of nerve cells is beautifully discussed by Bertil Hille in *Ionic Channels of Excitable Membranes* (second edition, Sinauer, Sunderland, Mass., 1991). I would select the text by Albers and coauthors for use in an undergraduate course on biophysics, and I would present more specialized and quantitative material through classroom lectures.

It may well be that the range of topics that falls under the rubric of biophysics is too diverse to be properly covered in a single text. Perhaps what is called for is an inspired set of lecture notes on selected topics in this area. Erwin Schrödinger's *What is Life? The Physical Aspects of the Living Cell* (Cambridge U. P., Cambridge, England, 1944) and Salvatore Luria's *36 Lectures in Biology* (MIT P., Cambridge, Mass., 1974) immediately jump to mind. Now, who will attempt this challenge?

DAVID KLEINFELD
AT&T Bell Laboratories

Nuclear and Particle Physics

W. S. C. Williams

Clarendon (Oxford), New York,
1991. 385 pp. \$75.00 hc
ISBN 0-19-851999-0

Most universities, including my own, incorporate a survey course in nuclear and particle physics in the curriculum for physics majors, typically at the senior level. In the past few years, when asked to teach this course, I have lamented the fact that there has existed no single adequate textbook. In 1974 Hans Frauenfelder and Ernest Henley produced a wonderful book, *Subatomic Physics* (Prentice Hall, New York). However, 1974 marked the beginning of our understanding of elementary particles through the "standard model." Correspondingly, that book was almost immediately out of date.

Now is a propitious time for a new book on the subject. The standard model of particle physics will certainly be around for a while, and it will be some time before experiments performed at new facilities such as the

Relativistic Heavy Ion Collider will be able to tell us something new about nuclei. When PHYSICS TODAY asked me to review a new book on nuclear and particle physics designed for undergraduate students, I agreed, with great expectations. The author, W. S. C. Williams from Oxford University, had written a satisfactory graduate-level text on particle physics in the early 1960s.

This is a physically attractive book. It covers just the material needed in a survey course. The standard elements of nuclear physics are all there, and the topics in particle physics include many of the more recent and speculative developments, albeit at the buzzword level. One chapter is devoted to nuclear and particle astrophysics, including the solar neutrino problem. There are beautiful illustrations and many of our physics heroes are pictured.

To give some idea of the level of presentation, here are a few isolated observations about the section on the weak interactions: The discussion stops short of the Cabibbo angle and the Cabibbo-Kobayashi-Maskawa matrix; while neutral currents are discussed, their absence in strangeness-changing decays is not mentioned; the Glashow-Iliopoulos-Maiani mechanism, which convinced most of us that charm must exist, is not covered. I find all of these to be major omissions even at the undergraduate level. Curiously, the author goes to great lengths to avoid associating the degree of forbiddenness in beta decay with the orbital angular momentum taken away by the leptons.

The text is occasionally interrupted by exercises for the student. The problems I checked were straightforward and appropriate for undergraduates although not especially challenging. Much more challenging are the literary style and syntax. In this regard it is best if I let the text speak for itself. I have reproduced below a few syntactic gems uncovered by rapid skimming.

▷ "We now have to apply the energy conditions for α -decay to occur to real nuclei to find where in the periodic table it is expected to occur."

▷ "The decay of equation (12.11) cannot be proved experimentally to be forbidden."

▷ "Reciprocal to recognizing what is going on is being able to guess, or better to estimate, or best to calculate..."

▷ "The assumption of an overall symmetry with a broken version that we know forces the use of group theory to explore the consequences of

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that assumption and the use of its language to name the symmetries of the whole or of the parts into which the whole divides."

If you and your students understand this language, then this is the text for you. As for me, I had difficulty parsing many of the sentences. The book is written in a literary fashion for which I have had to coin a term: bewilderstyle. This text has much potential, and I hope that a properly edited version appears soon.

VAL L. FITCH
Princeton University

The Trinity Paradox

Kevin J. Anderson and
Doug Beason

Bantam Spectra, New York,
1991. 325 pp. \$4.99 pb
ISBN 0-553-29246-3

My school has a multidisciplinary seminar on the history of the making of the atomic bomb. Students majoring in physics, chemistry, political science, history and basic sciences make up the roster. The readings for the seminar were chosen to illustrate both the technical and human sides of the subject. In addition to articles and reports from the time of the Manhattan Project, there are numerous excellent nonfiction accounts of this epochal undertaking.

But what can we use as an example of its influence on literature and fiction? We could use some rather dated (but still classic) postapocalyptic works, such as Nevil Shute's *On the Beach* (1957) or Pat Frank's *Alas, Babylon* (1959), or a more recent work, *Stallion Gate* by Martin Cruz (1986). Fortunately for us, just as our mandatory book order was due, Bantam came out with *The Trinity Paradox* by Kevin J. Anderson and Doug Beason. Anderson is a technical writer at Lawrence Livermore National Laboratory and Beason, who ran the plasma physics division at Phillips Laboratories, currently works in the White House Office of Science and Technology. The authors have woven a taut tale set against the backdrop of wartime Los Alamos.

In a theme common enough in literature, the heroine, Elizabeth Devane, travels back through time from the early 1990s and is given a chance to alter the past and shape the present. But this is no mere tale of a California activist in J. Robert Oppenheimer's court. Devane (who studied at Berkeley, of course) has a combined knowledge of physics and history potent enough to effect and direct changes. It does not take much before

we are swept along through twists and turns that history did not take. Intentional and unintentional transmutations abound—a careless slip of the tongue starts a chain reaction that leads to the execution of a high-ranking German physicist, while deliberate sabotage of theoretical calculations shifts the emphasis of the American bomb design.

The setting and the people of Los Alamos come alive. The cast is impressive—our students knew most of the characters from their physics texts. (I was particularly pleased to see the inimitable "den mother," Dorothy McKibbin, figure prominently in the story.) In one very amusing incident, the protagonist admonishes one of the younger scientists with the line, "Surely you're joking, Mr. Feynman." We meet, among others, Leslie Groves, John von Neumann, Edward Teller, Werner Heisenberg, Kurt Diebner and Abraham Esau.

Ultimately the story is about Devane. She is a stimulating, memorable literary creation. Her sensibilities and political views were forged in the 1980s and 1990s, but suddenly she is compelled to confront her convictions in a time of horror and atrocity. She chooses her final course honestly and believably. The climax is thrilling and, as one might suspect, explosive.

This book was an exceptional find for our seminar. It acted as a sounding board for a number of important questions surrounding the atomic projects. For example, the students were interested in the Goudsmit-Heisenberg controversy over the goal of German scientists during the war. *The Trinity Paradox* rekindled the discussion because much of the action takes place tracing the German effort.

In the next three years the 50th anniversaries of the establishment of Los Alamos and the Trinity test will be commemorated. We can expect a number of new articles and books about this important period. Consider reading *The Trinity Paradox* (to coin a term) retrospectively. It's not your standard fare, but stimulating and insightful nonetheless.

DONALD R. ERBSCHLOE
United States Air Force Academy

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Calif., 1991. 708 pp. \$53.00 hc ISBN 0-8243-0929-4. *Compilation*

The Astronomy and Astrophysics Encyclopedia. S. P. Maran, ed. Van Nostrand Reinhold, New York, 1991. 1000 pp. \$89.95 hc ISBN 0-442-26364-3. *Reference*

Astrophysical Formulae: A Compendium for the Physicist and Astrophysicist. Second edition. K. R. Lang. Springer-Verlag, New York, 1980 [1974]. 783 pp. \$49.00 pb ISBN 0-387-55040-2. *Reference*

Atoms, Stars and Nebulae. Third edition. L. H. Aller. Cambridge U.P., New York, 1991 [1971]. 366 pp. Price not stated hc ISBN 0-521-32512-9

Databases and On-Line Data in Astronomy. M. A. Albrect, D. Egret, eds. Kluwer, Boston, 1991. 273 pp. \$120.00 hc ISBN 0-7923-1247-3

Gamma-Ray Line Astrophysics. AIP Conference Proceedings 232. Proc. Symp., Paris-Saclay, December 1990. AIP, New York, 1991. 518 pp. \$95.00 (\$76.00 AIP, members) hc ISBN 0-88318-875-9

Massive Stars in Starbursts. *Space Telescope Science Institute Symposium Series 5.* Proc. Mtg., Baltimore, May 1990. Leitherer, N. R. Walborn, T. M. Heckman, C. A. Norman, eds. Cambridge U.P., New York, 1991. 333 pp. \$49.50 hc ISBN 0-521-40465-7

The New Cosmos. Fourth edition. A. Unsöld, B. Baschek (Translated from German by W. D. Brewer). Springer-Verlag, New York, 1991 [1967]. 438 pp. \$59.00 hc ISBN 0-387-52593-9

Plasma Loops in the Solar Corona. *Cambridge Astrophysics Series.* R. J. Bray, L. E. Cram, C. J. Durrant, R. E. Loughhead. Cambridge U.P., New York, 1991. 498 pp. \$99.50 hc ISBN 0-521-35107-3. *Monograph*

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The Sun and Cool Stars: Activity, Magnetism, Dynamos. *Lecture Notes in Physics 380.* Proc. Colloq., Helsinki, January 1991. I. Tuominen, D. Moss, G. Rüdiger, eds. Springer-Verlag, New York, 1991. 530 pp. \$64.00 hc ISBN 0-387-53955-7

Chaos and Nonlinear Systems

Bibliography on Chaos. *Directions in Chaos.* Shu-yu Zang, ed. World Scientific, Teaneck, N.J. 1991. 514 pp. \$68.00 hc ISBN 981-02-0580-5

Chaos and Quantum Physics. Proc. Sch., Les Houches, France, July 1989. M.-J. Giannoni, A. Voros, J. Zinn-Justin, eds. North-Holland, New York, 1991. 920 pp. \$213.00 hc ISBN 0-444-89277-X

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