Kenney is inconsistent in the use he makes of comparison with other enterprises in expounding the uniqueness of linkages between academic research and the rise of the biotechnology industry. In places comparisons are made to highlight how emerging events in biotechnology differ from past experience—for example, the role of faculty in the early history of biotechnology firms is contrasted with their less important role in computer hardware, and biologists who have resigned their faculty appointments to go into business are contrasted with electrical engineers who have not. In other places, however, portentous implications are attributed to events in biotechnology that appear to be little different, for good or ill, from longer-standing or quite commonplace occurrences in academic life, business history, or university-industry relationships. For example, Kenney concludes that because molecular biology has an emphasis on hardware and machines it "was well prepared for commercialization," observing in a footnote that the cost of equipment for a molecular biology laboratory may total $1 million. Yet the amount he cites is less than is required in other departments, chemistry for example, which, however commercialized they may be, have not exhibited the same linkages. As represented by Kenney the ability of (some?) molecular biologists to secure financial gain through consulting arrangements does not appear strikingly different from that of professors of finance with expertise in new forms of stock-index futures tradings. That premiums may be gained by promoters and insiders when forming new "high-flying" firms is an outcome noted in accounts of many other industries.

These would be matters merely for methodological cautionary notes were it not that the book is pervaded by editorializing, unproven assertions of causal linkages, and other unsupported statements. Empirically testable propositions are presented as self-evident; cause-and-effect relationships are blurred; use of data is erroneous (figure 1.1 shows declines in real levels of NIH funding of DNA research after 1968, not the "atmosphere of growth" associated with current dollar levels); rumor is given equal status with findings; only one side of identified debates is presented; and citations do not always, as implied, provide support for statements in the text (for example, Conrad's paper, which is a call for encouraging graduate students to be allowed to publish their thesis work by themselves, is not empirical support for the statement, "It has been standard practice for professors to exploit graduate students"). Throughout the text Kenney's depiction of the "chaos and opportunity" that prevail as firms explore the possibilities of strengthened in-house capabilities, equity interests in start-up firms, and long-term research contracts with universities is contradicted by judgments such as, "The emphasis on proprietary molecules, etc. by American corporations indicates that they are interested in receiving monopoly returns and not in competing in the sphere of production" (p. 77).

Alternative treatments (speaking perhaps more softly but certainly more soundly) of the issues Kenney examines are available in Sandra Panem's *The Interferon Crusade* and in the article on university-industry relations in biotechnology published in *Science* (**231**, 242 [1986]) by David Blumenthal and his colleagues.

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Solar Wind Phenomena

Collisionless Shocks in the Heliosphere: A Tutorial Review. ROBERT G. STONE and BRUCE T. TSURUTANI, Eds. American Geophysical Union, Washington, DC, 1985. viii, 115 pp., illus. $18. Geophysical Monograph 34.

Collisionless Shocks in the Heliosphere: Reviews of Current Research. BRUCE T. TSURUTANI and ROBERT G. STONE, Eds. American Geophysical Union, Washington, DC, 1985. vi, 303 pp., illus. $36. Geophysical Monograph 35.

Most of the universe is filled with ionized gas so tenuous that for many purposes two-body collisions can be ignored. Despite this the electromagnetic couplings between the charged particles and the many collective plasma modes allow the plasma to behave in many ways like a normal collision-dominated fluid. One of the most dramatic manifestations of this is the formation of collisionless shocks in close, but not exact, analogy to normal gas shocks.

Collisionless shocks in the solar wind were the subject of the Chapman conference held in Napa, California, in February 1984. The papers in the two books reviewed here are based on talks presented at that conference. However, the books have been produced to a far higher standard than the usual conference proceedings; the text and equations have been properly set in an attractive typeface, the papers have all been refereed, and the books are well bound.

The first volume contains four tutorial reviews: a general retrospective account of collisionless shocks in the heliosphere by Kennel, Edmiston, and Hada; a description of the macroscopic gas-dynamic aspects of shock formation in the heliosphere by Hundhausen; a survey by Papadopoulos of the microscopic plasma processes responsible for dissipation in collisionless shocks; and an introduction by Forman and Webb to particle acceleration at shocks. These are intended to provide a graduate student or a scientist from another field with the necessary background to understand the 19 topical reviews in the second volume and should fulfill this function well. I particularly enjoyed the paper by Kennel *et al.*, which, despite its retrospective character, contains some new material and could in itself provide a complete introduction to the field.

The second volume gives a reasonably complete survey of the field as it was in about 1983 from a predominantly American perspective but with substantial contributions from the Federal Republic of Germany. The emphasis is very much on experimental observations and their confrontation with theory. Thus rather oddly, but quite consistently, there is no discussion of what must be the biggest (but as yet not directly detected) shock in the heliosphere, the solar wind termination shock. Planetary bow shocks and traveling interplanetary shocks are treated in great detail, however. Were the conference to be held now the only major change would probably be a much more extensive coverage of cometary shocks inspired by the success of the International Cometary Explorer mission to comet Giacobini-Zinner and the Planet-A, Vega 1, Vega 2, and Giotto missions to comet Halley. However, this is a rather specialized area and probably deserves a monograph to itself.

When one considers that the existence of collisionless shocks was first proposed by T. Gold in 1955, the progress made in the intervening 30 years is remarkable and a tribute to the value of space research in allowing us to investigate in situ plasma processes that it would be almost impossible to recreate in terrestrial laboratories. As well as providing an excellent test of our understanding of plasma physics, these processes are of direct relevance to solar physics and astrophysics. For example, although the idea is still rather controversial, it seems probable that at strong quasi-parallel shocks in the heliosphere we see in miniature the same basic Fermi acceleration process that in supernova remnants accelerates the galactic cosmic rays. For anyone wishing to enter this fascinating field or already working in it these two volumes can be strongly recommended.

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