workers, it will be valuable because of its compactness. It may serve as a stimulating introduction to the problems of selenology for readers with a general scientific education.

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Plasma Physics

Those who choose their books from a catalog should take care not to confuse this book, **Elementary Plasma Physics** [Blaisdell (Ginn), New York, 1965. 198 pp., $2.25], by Lev A. Arzimovich, with another of the same title, *Elementary Plasma Physics* by C. L. Longmire. The latter is really an introduction to the mathematical theory of plasma physics, first rate but quite hard.

So, Arzimovich's *Elementary Plasma Physics* is truly an elementary text, put together with signs of much forethought, by a definite authority in the field and, let me add, by quite a personality (glints of this personality can be seen here and there in these pages, even in translation).

Arzimovich defines the electron volt unit of temperature commonly used in plasma physics, but unfortunately uses it but little in the text. It is true that astronomers seem to manage very well in talking of millions of degrees, but I find 9 kev temperature much more informative (type of radiation, energy levels of excited state involved, and so forth) than 102 million degrees.

In the chapter where he introduces the Maxwell distribution, I would like the concept of 1/2 kT per degree of freedom brought out more than that of mean energy, but this is perhaps a matter of taste.

The important but difficult topic "Plasma in a magnetic field," chapter 7, is treated with great didactic skill.

Controlled fusion is apparently Arzimovich's main activity these days; he is the author of a book on that subject. He directs the Plasma Physics Division of the Kurchatov Institute in Moscow and is believed to wield some authority over the whole of the highly regarded U.S.S.R. controlled fusion project which absorbs a substantial fraction of the best physics talent in Russia. I like their work very much. So when he gets around to chapter 8, "Controlled fusion," one prepares for a feast. Alas!

What is it about controlled fusion research that causes perfectly respectable physicists to take leave of their senses? Perhaps Plato was right when he said that "only matters without utility are proper objects for contemplation by a philosopher." I always thought, myself, that this was a most mischievous remark. But there it is. We see that practitioners of controlled fusion research build great expensive machines, which, so far as approximation to thermonuclear reactors is concerned, would make better refrigerators. I too, in spite of the monumental difficulties, am quite confident that a thermonuclear power producing reaction is not far off: however, I doubt that it will take place in anything resembling those big machines.

After seven chapters on plasma physics handled with impeccable scholarliness, what would one expect to learn about controlled fusion? Since the aim of controlled fusion is to achieve a net output of energy, one must discuss the energy balance of thermonuclear reaction yield versus plasma losses, by bremsstrahlung, diffusion, magnetic radiation, and magnetic bottle maintenance. Is this done? Never mentioned. The above considerations lead to a vital criterion for power production in a thermonuclear reaction—that temperature being high enough, there exists a minimum value of density $\times$ time ($n\tau$). Never mentioned. The ability to trade off density for time which this criterion confers, leads to various important conclusions about thermonuclear reactors. Never discussed. The hopes for a positive power balance from a thermonuclear reaction hang on the fact that the fuels are hydrogen isotopes which radiate very little. Never mentioned.

So much for what he omits: Now, what does he say? He says: "This means that 1/10 second represents a satsfactory retention of particle in the plasma. This result was achieved by M. S. Ioffe in the Department of Plasma Studies of the Institute of Atomic Energy of the USSR and is the major achievement in the development of controlled thermonuclear reactions in recent years."

Do we hear the horns of propaganda-land faintly blowing? Well, perhaps a bit, but never mind: Everybody has admired Ioffe's achievement, and it has been widely copied. It is a triumph of principle but not a confinement duration record.

For if you want to boast of Ioffe's achievement in terms of confinement time τ (which I believe to be irrelevant), it is greatly exceeded in that respect by the Oak Ridge DCX experiment (70 seconds). If you want to rate it in more meaningful terms $n\tau$, it is exceeded greatly by the Los Alamos Scylla θ-pinch plasma. So he boasts for the wrong reasons.

He goes on to say ". . . a number of premature reports that this has been achieved, in reality nobody has succeeded in maintaining pure hydrogen plasma at high ion temperature in a magnetic trap for more than a few tenths of a microsecond." Simply not true. The Scylla plasma maintains 4×10^{16} ion/cm^3 (a very high density) at ion temperature of > 5 kev (a very high temperature) for three microseconds at a purity level which radiates bremsstrahlung at 2 $\times$ theory (a very high degree of purity). But there we go again. My own Sherwood syndrome is perhaps speaking.

In conclusion: To teach the fundamentals of plasma physics to readers with a high school education—the book is excellent and recommended. However, for information on the application of plasma physics to controlled fusion—the book is partisan and inaccurate.

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Geochronology

The art and science of nuclear age determination on rocks has been summarized and reviewed in a few chapters of books on broader subjects during the past decade or so, and the three or four books and booklets on geochronology have been published in the Soviet Union. We have here the first full-length book on the subject written in English.

Applied Geochronology (Academic Press, New York, 1965. 283 pp., $10), by E. I. Hamilton, with a chapter on comparative geochemistry by L. H. Ahrens, is a book crammed with information on theory, technique, and interpretation of all kinds of nuclear age meas-