art of 1973. In view of the important developments in time and frequency since then, the book is out of date. Kartaschoff does not mention the successful experiments in special and general relativity performed with atomic clocks in aircraft and spacecraft, the stabilities in the 10^{-16} region achieved with modern hydrogen clocks and superconducting-cavity oscillators, and sub-Doppler techniques such as two-photon absorption and trapped-ion spectroscopy. Nor does he discuss novel quartz-crystal cuts and electrodeless-resonator designs. His chapter on measurement techniques falls short of covering the low-noise circuit and measurement innovations of the last several years. The listed references are often incomplete; for example, chapter 5 has just two references, both basically unavailable from libraries.

Nevertheless, the book definitely has its value, because not only is it almost unique in its coverage of an important subject area, but also it contains a wealth of information that otherwise is difficult to find easily; in particular, this is true for the chapters on radio-signal comparison methods (ranging from radio signals to satellite techniques) and on time scales, where Kartaschoff gives an excellent historical and international perspective. The reader who is interested in time and frequency can find in this book a useful first access and a continuing reference. I encourage the interested reader to supplement his reading with the sophisticated coverage by Gernot M. R. Winkler ("Timekeeping and its Application," *Adv. in Electronics and Electron Phys.*, **44**, 33 (1977)) and James Jespersen's popularly written book *From Sundials to Atomic Clocks* (Nat. Bureau of Stds. Monograph 155 (1977), USGPO, Stock No. 003-003-01650-1).

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Science Policy: Problems and Trends

Y. Sheinin
331 pp. Progress, Moscow (US distributor: Imported, Chicago), 1978. $4.80

The field of science studies, incorporating a variety of approaches to the study of scientific activity, has consolidated its hitherto amorphous structure during the last ten or fifteen years. Signs of this consolidation can be seen in the appearance of specialized journals (for example, *Scientometrics, Research Policy and Social Studies of Science*), the organization of associations (such as the Society for Social Studies of Science) and programs of specialized graduate training (such as those at George Washington

University, Cornell and Université de Montréal), and the emergence of an identifiable group of researchers striving to develop a common conceptual framework. This development has involved scholars in both Communist and non-Communist nations, and, up to a certain point, the field of science studies has been an exception to the other social sciences, where ideological partitions have proven to be serious obstacles on the way of meaningful scholarly interplay between the USSR and the West.

Science Policy: Problems and Trends was written by Yulian Mikhailovich Sheinin, a prominent Soviet authority on science policy, and more specifically, on American science. Currently on the staff of the prestigious Institute for World Economics and International Relations in Moscow, he has been visible in science studies in the Soviet Union. He has written and edited several publications in the field and headed, for a number of years, the Department of the History and Theory of Scientific Activity at another institute of the USSR Academy of Sciences.

The book offers a lively account of science and its organization in the post-World War II industrialized nations. While Sheinin relies almost exclusively on research done by others, the book, nonetheless, contains fresh insights into the sociopolitical structure of science. Sheinin wrote the book as a reflective narrative interspersed with occasional propagandistic remarks. The latter are rather few and moderate, perhaps because the book, although written in Russian and later translated into English, has so far not appeared in the original within the USSR. The translation is very good and contains rather few errors (for example, "scientology" is used instead of "science studies" (page 18), and "TV-management" instead of "remote control" (page 112)).

Alongside analyses of Soviet-science studies produced in the West (for example, Linda Lubrano, *Soviet Sociology of Science* (AASS, Columbus, Ohio, 1976); and Yakov M. Rabkin, "*Naukovedenie:* The Study of Scientific Research in the Soviet Union," *Minerva* **16,** 61 (1976)), Sheinin's book is an informed summary of the field as seen from the Soviet Union. The author displays broad erudition and resorts to a wide variety of sources, largely Soviet but also some Western, albeit outdated, ones as well. The bibliographic value of the book is somewhat marred because of a peculiarity found in most books put out by Moscow's Progress Publishers for foreign consumption. All references to Russian-language sources found in their books are translations rather than transliterations of the original titles, tremendously complicating eventual search of these publications. The book is likely to attract readers keen on having a first-hand, even if officially approved, impression of Soviet attitudes toward science, but for whom neither science studies nor Sovietology are main areas of their scholarly pursuits.

Sheinin presents a detailed account of the Soviet interpretation of the concept of science planning and science administration. This interpretation is rather scientistic, at times frightfully so (page 15):

> . . . the most perfect plans are worth very little indeed unless they are fulfilled. Verification of fulfillment of planned targets is effected by means of *control.* This is above all a way of maintaining the functioning of the system by means of feedback signalling any departures from the established parameters which helps to return them to the norm.

Yet a closer look shows that Sheinin virtually exempts basic research from that kind of rigid planning and even from attempts to quantify inputs into basic research in terms of cost, time and so forth. "Fundamental scientific discoveries tend to revolutionize science, and ultimately practice as well, with minimal inputs," Sheinin claims (pages 19–20), and he resorts to the concept of self-regulation

(which he explicitly borrows from biology) as the appropriate way of managing basic science. In the beginning of the book (page 23) he also says "that materialistic dialectics has the best chance of becoming the universal method in the science of science, after it has been invested with the necessary strictness." Yet the reader desirous of finding proof or at least examples of application of the "universal method" will find neither in the book under review.

Sheinin's account of the origins of Soviet policy, in which he gives a knowledgeable summary of Russian-language sources, is among the incontestable merits of the book. The historical associations and parallels that he draws are rich and show that he feels at ease with the past of science, stretching as far back as the Middle Ages and antiquity. Although Sheinin discusses science both in the USSR and elsewhere, crossnational comparisons are fewer and less impressive. For example, his discussion of the motivation of scientific work in the Soviet Union and the United States (pages 62–63), based on the data derived from two independent studies, indicates that commitment to "national welfare" as a motivational factor is stronger, predictably, among Soviet scientists. Sheinin, however, neither shows whether the two sources of data are methodologically compatible with each other, nor attempts to explain the transnational differences. Discussing public disenchantment with R&D in the United States (pages 273–74), he pays inordinate attention to the speed with which that feeling promptly reached the level of national policy makers and led to a relative stabilization of the science budget. It is indeed rare that officially approved Soviet authors pay tribute to the democratic process in the "bastion of imperialism."

Sheinin sounds rather convincing when he observes that "the synthesis of science and organization is realized above all through a sharpening—and resolution—of the contradictions between nonconformism and conformism, the former being organically inherent in science as a form of human activity" (page 322). This observation, albeit somewhat less than novel, could have provided a clue for an analytic presentation of Soviet science and its organization. This opportunity has been missed, unfortunately, by the time the reader has reached the conclusion, where a statement makes it clear that the few cases invoked as examples of conflict and "acute political and party struggles" (page 326) within the realm of science policy have been borrowed from Western secondary sources. I do not believe that Sheinin's own background as a specialist in American science biased his choice of subject matter. At least two other reasons may have been more important.

The first one has to do with the em-

phasis on writing about America put in science-policy studies and a variety of other policy sciences in the USSR. America's science in particular has attracted consistent attention of Soviet policy makers and, consequently, that of Soviet scholars. The post-Sputnik interest evoked in the US toward Soviet science has been matched by the rapidly growing attention to America's science in the Soviet Union. Watching the other superpower has provided many a full-time job in both countries.

The second reason is the political control exercised over social sciences, including science studies, in the Soviet Union. Allegory has been often used to obviate the political difficulties of doing serious policy analysis of any segment of Soviet society. Although science was at one time temporarily exempt from the effects of these difficulties, it obviously no longer is. Thus writing about politics of America's science is not only a safer pursuit, but also one that provides a means of alluding to the closer and more easily identifiable problems in Soviet science. While this is true for the Soviet reader, well versed in reading between the lines, such a deciphering job may be too great a challenge for his non-Soviet counterpart. Yet, those familiar with the genre of fable would find Soviet writings about America's science both informative and instructive. See, for example, a perspicacious article by T. Gustafson, "American Science Policy Through Soviet Eyes: A Reflection of Soviet Concerns and Priorities", pages 83–100 in *Soviet Science and Technology: Domestic and Foreign Perspectives* (George Washington University, Washington D.C., 1977).

To summarize, the book is worth reading but the expectations should not run high.

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