

portant development in the matter of academic tenure: the right of any university teacher to be judged for competence and fitness to teach exclusively by his peers.

The German influence, also, was clearly evident in the founding of Johns Hopkins University, which was called "the Göttingen at Baltimore." It was there that the German conception of a university as a research institution devoted to the extension of knowledge, even more than to the transmission of knowledge, was first introduced into American higher education. And it was no accident that, with such antecedents, it was from the Hopkins, much later on, in the days not long before the United States entered World War I, that the invitation went out to nine other leading universities to help in the founding of the American Association of University Professors. The latter-day history of academic freedom in this country is chiefly the history of that organization's successful efforts to codify the principles of academic freedom and tenure and, after bitter initial opposition from trustees and administrators, eventually to achieve agreement with them in the maintenance of good standards; and the history also of the same organization's less successful efforts to mediate disputes between faculty members and administrative officers and, in cases of flagrant violation of the established principles, to investigate the cases and to censure the guilty administrations.

In the years before World War I, the struggle for academic freedom shifted from its focus around the evolutionist to one centered on the economist and sociologist, in measure as the vehemence of public opinion about the evolutionary philosophy was mitigated and the role of big business in the endowment and trustee management of American colleges and universities increased. World War I shifted the area of struggle to focus on the pacifist and the professor of German extraction—a grim story lightened only by the magnificent gesture of Harvard University in refusing a \$10 million bequest carrying a stipulation that the openly pro-German professor Hugo Münsterberg be dismissed from his post. It is interesting that during World War II there were virtually no infringements of academic freedom of the sort that blemish the history of our universities during World War I. Yet the struggle for the maintenance of academic freedom and the tenure provisions upon which it depends was by no means won. With the quest of the American people for security in the disillusionment, hysterical fear, and suspicion of the Cold War, threats of ever greater magnitude arose to imperil academic freedom.

This most recent chapter of the history of the subject is in part related in MacIver's book, which successively considers

"The climate of opinion," "Academic government and academic freedom," "The lines of attack on academic freedom," "The student and the teacher," and "The university and the social order." But as these chapter headings show, MacIver is chiefly concerned with causes and relationships, with trends and general principles. The actual history of these recent episodes is only now being recounted by the American Association of University Professors, which has asked a Special Committee (under my chairmanship) to survey all the cases arising from the national quest for security and to report on them. Beginning with the famous University of Washington "Communist" cases and the dismissals of the nonsigners of the disclaimer oath instituted by the Regents of the University of California, the roll is a lengthy one.

What is of more importance than the judgments rendered in the individual cases of those scientists and nonscientists involved is the formulation of new principles around which the guardians of academic freedom can rally. Perhaps in time, though bitterly opposed by many at first, these principles will come to be accepted by administrative officers and faculty members alike, to stand alongside the 1940 principles as the voice of wisdom in the right regulation of universities and the maintenance of freedom of thought and instruction among scholars and research workers. Having weathered the storm of suspicions, accusations, and investigations, the freedom of the mind that tolerates sharp differences of opinion and encourages criticism—the freedom of the mind that has its stronghold in our universities—will continue in the spirit of John Milton, Thomas Jefferson, and John Stuart Mill, to serve our people infinitely better than the repressed and constrained thought of those who are subject to the bonds of authority.

BENTLEY GLASS

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Soviet Professional Manpower, Its Education, Training, and Supply. Nicholas DeWitt. National Science Foundation, Washington, 1955 (Order from: Supt. of Documents, Washington 25). xxvii + 400 pp. \$1.25.

This book reports the results of a comprehensive study of the entire Soviet educational system, with particular emphasis on the training of scientists and engineers. It is based on a large volume of statistical data and descriptive reports from a wide range of sources, and with considerable variation in degree of reliability. The author discusses at some length the difficulties encountered in interpreting and combining available data, which he presents in 45 tables and 11 charts.

Despite these difficulties, this volume is probably the most complete and searching study thus far made of the Soviet educational system, and it seems likely to remain the standard work in the field for some time to come.

Public education is a central purpose of the Soviet Union, but it is based on the needs and desires of the State rather than of the individual. It is interesting to note that, in contrast to the current serious shortage of teachers in the United States, the student-teacher ratio in Soviet schools was reduced from 28 to 1 in 1940 to 23 to 1 in 1950. Furthermore, about 42 percent of Soviet professionals were trained for, and are employed in, the field of education.

Despite the emphasis on education, educational opportunities in the Soviet Union are generally much more limited than in the United States. Soviet higher educational institutions have graduated only half as many persons during the past 25 years as have the higher educational institutions in the United States. However, by sacrificing the humanities and the liberal arts, the Soviets manage with a smaller educational base to turn out a higher number of trained specialists than does the United States.

Throughout the system, a heavy emphasis is placed on technology and basic science. In the elementary grades 1 to 4, inclusive, about 28 percent of the subjects studied are in the fields of mathematics and science. In the intermediate grades, more than one-third of the time is spent on such subjects, and in the secondary school more than 40 percent. The result is that *all* high school graduates have substantial training in and familiarity with physics, chemistry, mathematics, and the earth sciences.

The emphasis on science and technology is reflected not merely in the curriculum, but in various selective devices that tend to channel the ablest youth into the technological branches. Twenty-seven percent of the 2 million professionals in the U.S.S.R. are in engineering and related fields, 16 percent in health fields, 9 percent in agricultural fields, and only 6 percent in all socioeconomic service fields. A similar situation obtains with respect to semiprofessionals.

The Soviet Union is graduating almost twice as many technical specialists in certain fields as is the United States. Between 1928 and 1954, the Soviet Union graduated about 682,000 professionals in engineering as against 480,000 in the United States during roughly the same period. Agricultural graduates in the Soviet Union totaled about 244,000 as against 133,000 in the United States. Soviet graduates in medicine outnumbered those in the United States more than two to one, 320,000 against 148,000.

The Soviets place a much heavier emphasis than does the United States on

the type of training represented in America by technical institutes. There are in the U.S.S.R. something like 1500 of these institutions, which offer training in engineering, science, medicine, pedagogy, law, and agriculture. The courses are generally 4 years in length, with admission being highly competitive and based on the completion of at least 7 years of instruction. Entrance requirements are being raised, and in the near future the Soviets may require a full secondary education. Graduates in recent years have numbered about 60,000 per year in the field of engineering alone, as compared with about 11,000 in the United States.

College-level engineering education in the U.S.S.R. requires many more hours of class attendance than in the United States, and a much greater degree of specialization. Approximately a quarter of the time is spent on the general sciences, and another quarter on general nonspecialized engineering. Only about 6 to 8 percent is allotted for political and socioeconomic courses, which could probably be better called indoctrination courses. Narrow specialized engineering instruction takes the rest of the time except for physical training and military instruction.

The inescapable conclusions to be derived from the book, with all due allowance for possible errors, are that in technological areas the Soviet Union is graduating more trained personnel than is the United States, and that from a purely technical viewpoint Soviet training is probably at least as good as, and quite possibly better than, that received by American engineering and science students.

One ray of comfort may be drawn from the possibility that the extremely high degree of specialization in scientific and engineering fields may carry with it such a lack of flexibility or adaptability that the individual who cannot work in the field of his immediate specialization may be considerably less useful, or perhaps frustrated entirely. However, in view of the high degree of selection in the Soviet educational system, it seems probable that many of those in the field of science and engineering have sufficiently able minds so that this result will not occur. Still, it does represent one possibility that may limit the effectiveness of Soviet technology.

Another possibility is that the great emphasis in the U.S.S.R. on education may lead to changes in the Soviet philosophy. It is conceivable that the emphasis on education may sufficiently emancipate enough minds in the U.S.S.R. so that the seemingly widespread acceptance of the present official Soviet philosophy will no longer be possible.

On the whole, this volume presents a

study that is challenging in its significance to American educators, both technical and general, to American industrialists, and to American citizens generally.

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The Soviet Academy of Sciences. Hoover Institute Studies, Series E: Institutions, No. 3. Alexander Vucinich. Stanford University Press, Stanford, Calif., 1956. 157 pp. \$2.

One by-product of the cold war has been our realization that what goes on in the U.S.S.R. affects us directly. Thus it is only prudent for us to keep ourselves informed on things Russian and for our scientists to keep a constant check on their colleagues in the Soviet Union. Fortunately, most scientists can learn the status of their specialties in the Communist countries without taking too much trouble, and the scientists as a whole can evaluate the accomplishments of Soviet science quite accurately. We know, for example, that Soviet mathematics, atomic physics, and engineering are truly excellent but that Soviet biology, medicine, and agriculture are backward and permeated by quacks. But over and beyond such information, there exists a mass of background knowledge that can be made available to us only by those who are experts on the Soviet Union. Alexander Vucinich, the author of *The Soviet Academy of Science*, is such an expert.

The work begins with a historical account of the Academy of Science from its founding in 1725 by Peter the Great to the latest tasks imposed on it by the current reigning syndics. The Soviet Academy has now become unique and is quite unlike any academy of science outside the Communist world. Today it plans, organizes, and supervises all scientific research in the Soviet Union. It controls numerous lesser scientific institutions, employs a large staff of scientists and administrators, and dispenses an enormous budget. It has recently acquired a number of new functions, one of which is the training of future scholars and scientists. The individual academicians have great social prestige, receive large salaries, and have many perquisites that are highly desirable.

The academy, however, is subordinated to the Council of Ministers, and the academicians both individually and collectively take their orders from the political authorities. They must be ready at all times to shift their ideology whenever the party line changes. When necessary, they must attack the science and

the scientists of the West, rewrite the history of science, and search out the heretics in the ranks of the scientists below them. This latter function is important, for the academicians are responsible for the ideological purity of all Soviet scientists.

The Soviet Academy of Sciences contains a great deal of factual information that is not found elsewhere. It describes the internal organization of the Soviet Academy, its attitude toward pure and applied science, and its role in planning the activities of scientists in the various 5-year plans. The appendixes list the scientific organization of the academy, the different academies of the several Soviet republics, the periodicals published by the academy, and the names of the academicians. The whole is a small but useful compendium. It also gives an exceptionally clear picture of the conditions under which scientists have to labor in the new, socialist Utopia.

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The Mighty Force of Research. Editors of *Fortune*. (15 articles reprinted from *Fortune*) McGraw-Hill, New York, 1956. 308 pp. Illus. \$4.

Fifteen articles that appeared in *Fortune* between January 1953 and August 1955 are here brought together in a hard cover. The resulting book gives a well-integrated and easily readable account of the state of applied and basic research and research support by foundations, universities, government, and industry. Several chapters are mainly concerned with technology. The chapter titles give some idea of the scope of the treatment: "The strange state of American research" (support of applied and basic research, research by the General Electric and Bell Telephone Companies, and the role of private foundations and the government); "The young scientists" (a survey by interview of the opinions and characteristics of 20 outstanding scientists under the age of 40, ten from industry and ten from universities, supplemented with the results of a questionnaire of 87 additional young scientists; the generalizations about scientists, derived from so small a sample, are of questionable validity); "Science for sale" (contract research and development with special reference to Arthur D. Little, Inc.); "The inventor in eclipse" (decline of the free-lancer and the rise of the industrial research team; decline in number of patents); "New light on the brain" (an account of recent research on the brain with special reference to H. W. Magoun, H. H. Jasper,