

Allowing that a U.S. high school graduate has acquired in primary school a science background equivalent to the Soviet—

- 3 years of natural science (grades 2-4)
- 3 years of geography (grades 5-7)
- 2 years of biology (grades 5-6)
- 1 year of physics (grade 6)

we find that a *Soviet secondary school graduate* who is university-bound, or entering a military academy, or one who is a middle-level professional or a skilled worker has, in comparison with his American counterpart, *on the average*, at least (in years, not hours):

- 1-2 years more training in algebra
- 8 years more training in geometry
- 1-2 years more training in calculus
- 4 years more training in physics
- 3 years more training in chemistry
- 3-½ years more training in biology
- 1 year more training in astronomy
- 3 years more training in mechanical drawing
- 6-10 years more training in workshop

Many of the Soviets have an additional several years of elective courses and extracurricular activities in mathematics, science, or technical fields in school or at an institution of higher learning and in the Pioneer Houses.

*The disparity between the level of training in science and mathematics of an average Soviet skilled worker or military recruit and that of a non-college-bound American high school graduate, an average worker in one of our major industries, or an average member of our All-Volunteer Army (in 1977 only 59 percent of the Army's entrants possessed a high school diploma) is so great that comparisons are meaningless.* Consider, on the one hand, the Soviet's educational background in mathematics and science (presented on page 9), and, on the other, the American's:

- 8-9 years of arithmetic
- 1 year of algebra
- 1 year of geometry, at most

*and no high school level physics, chemistry, biology, or astronomy.*

*The Soviet Union's tremendous investment in human resources, unprecedented achievements in the education of the general population, and immense manpower pool in science and technology will have an immeasurable impact on that country's scientific, industrial and military strength. It is my considered opinion that the recent Soviet educational mobilization, although not as spectacular as the launching of the first Sputnik, poses a formidable challenge to the national security of the United States, one that is far more threatening than any in the past and one that will be much more difficult to meet.*

## Novosibirsk tames Siberia with science

Only two decades ago, there was virtually nothing there. Today, what was a vast expanse of desolate tundra, seemingly uninhabitable, is an international symbol of human scientific achievement. A city of 1.5 million has been built in the middle of Siberia: Novosibirsk.

Its creation in the space of two decades is not only the consequence of the Soviet Union's commitment to scientific and technological progress, but to an educational policy that matches. In fact, Novosibirsk might be described as one vast university and scientific laboratory, developing a labor force that can apply the most advanced technologies for the development of the whole of Siberia's resources, and much else besides.

In the mid-1950s, when the Soviet Union had largely completed the reconstruction of its economy from the destruction of World War II, a major expansion of scientific efforts was undertaken, most famously resulting in the 1957 Sputnik space shot. But also included was research into controlled thermonuclear reactions (fusion energy), advanced industrial processing, and economic planning methods.

In 1957, a group of scientists under the leadership of Academician Mikhail Lavrent'ev submitted a proposal to the government for the establishment of a branch of the Moscow Academy of Sciences in Western Siberia. In May, the proposal was approved by the government and in June it was taken up by the Academy Presidium. The objective of the plan was to create an on-site center that could solve the problems blocking the development of the vast resources of Siberia and the Far East.

Complementing the earlier established institutes of Chemicals and Metallurgy, Transport and Power, and their subdivisions in East Siberia, Yakutsk, and the Far East, the Novosibirsk branch of the Academy established an Institute of Mathematics, another for Mechanics, and others for Physics, Hydrodynamics, Automation, Geology and Genetics, Economics and Statistics, and a com-

puter center. Around the institutes, 18 in all, an industrial city was built.

Academician Lavrent'ev, Novosibirsk's founder and first settler, heads the Institute of Hydrodynamics. He has done work on the theory of cumulative (directed) explosions since the 1940s, and contributed substantially to Soviet weapons development during World War II. He once made the observation that "modern science cannot develop without a large industrial base." That is the thinking that produced Novosibirsk.

When the project was first launched, scientists found that, as their theoretical breakthroughs were tuned toward application to industrial processes, the factory workforce drawn from around Novosibirsk could not immediately assimilate the new technologies. The scientists themselves were therefore continually drawn into engineering and technical experimentation and away from basic theoretical work.

To solve the problem, Lavrent'ev drew up a program for creating experimental pilot-plants to test the latest technologies, and industrial research centers to handle their design and production. This division of labor allowed scientists to concentrate on basic research, the foundation of the development project.

To Soviet scientists and science students, Novosibirsk's development has constituted an unparalleled opportunity for creative work. At the Institute of Mathematics, Academician L.V. Kantorovich put his ideas on the use of mathematics in economic planning to practical test. Novosibirsk was planned with the question of improving the quality of labor-power foremost in mind.

The key consideration in massive industrial construction is whether a labor force—drawn initially from a culturally backward, peasant region would be developed to the point of assimilating a whole range of new technologies successively brought on line. Therefore, Novosibirsk and the attached Akademgorodok community (where the Academy institutes themselves are located) have been planned and built as cultural centers for the surrounding population. The city now has a population of more than 1.5 million, with over 550 libraries, four museums, an opera house, concert hall, a university, and several technical high schools, all immediately accessible to towns and villages within a 200 mile radius via the Trans-Siberian Railroad.

The Academy itself is made up of 18 Institutes involving over 50,000 people, including 21 Academicians, 47 Corresponding Members, 3,000 scientists with masters or doctoral degrees, and thousands of engineers, technicians and students. The community has been made into a national science training center that attracts some of the most promising students from all over the country.

*Every third person in Novosibirsk is a student*, and other centers modeled on Akademgorodok are now being built elsewhere in Siberia.

## Can we restore West Point's tradition?

*University of Chicago Professor Izaak Wirszup's point that the average American high school graduate is essentially illiterate in science and math (most particularly when compared to the typical Soviet student) was recently well substantiated by Dr. Morris Levitt, a former physics researcher and teacher who is now the director of the Fusion Energy Foundation. In a guest commentary in the May 14 issue of the twice-weekly newspaper New Solidarity, Dr. Levitt recounted the situation at the United States Military Academy at West Point, New York where he had just given a seminar on "Fusion Power and its Military Applications" at the invitation of members of the physics department. We excerpt that article here.*

... The situation at West Point that I learned of first hand from officers in the science faculty is perhaps the most shocking aspect of the ongoing collapse of U.S. scientific training and capabilities. Compared with the many campus playpens I have visited this year, West Point and its cadets at least still *look* like they should. But our nation's most respected institution of higher learning and national service is also in danger of becoming not much more than a Hollywood set....

Back in 1976, you may recall that there was a major cheating scandal at West Point. Somehow, an advance copy of an exam was obtained, copied, and distributed to a number of cadets. Whether or not cheating went on, it was alleged that the honor code, which calls for reporting anyone else known to be violating the rules, had been seriously breached. The whole incident had a most peculiar odor about it, because grade-grubbing is normally alien to cadet and military life since professional advancement is very rarely linked to purely academic accomplishments.