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SCIENTIFIC SWEEPSTAKES.

On his long climb from cave to laboratory man has reached a peak. Mid 20th century is the starting point of the greatest of scientific revolutions—a period in which natural laws and unnatural machines are being coupled to create a new world.

Progress dramatizes this change. Thirty years ago television was only a test pattern in the eyes of a few. The propellerless airplane was science fiction, atomic energy was theory.

We have not moved forward alone. Scientists elsewhere, particularly in Russia, have kept pace. There, for example, visitors recently inspected—from a distance—a new synchrotron for high energy research, a machine which one English scientist said would give Russia a world lead in that field.

So science becomes a point of orientation for world struggle, key to survival and key to peace. To put the atom to practical use, to tap the energy of the sun, to distill sea water—these are goals which in the next century may strengthen the hand of East or West and may save have-not nations from extinction.

THE chief weapon is the scientific brain. Russia realizes this and has taken tremendous strides in production of scientists and engineers. By contrast we have slipped backward. Dean John R. Dunning of the Columbia university school of engineering says, "already we have lost the battle of engineering manpower—at least in numbers."

Allen W. Dulles of our Central Intelligence agency cites these numbers. In this decade Russia will graduate 1,200,000 in the sciences while the U. S. will graduate 900,000.

To Dr. Alan T. Waterman of the National Science Foundation this means one thing: "A crisis in science education." Others have joined him in examining the success of the Soviet program and the reasons ours has faltered. Their first conclusion is to dispense with the false comfort of considering Russian scientists inferior to ours. That is mere wishful mythology.

Russia has organized a huge education machine to turn out technicians. This year the U. S. graduated 23,000 engineers with B. S. degrees; Russia gave comparable certificates to 63,000. (Their population is one-fourth larger than ours.) It is small consolation that we produced educated individuals while the Soviet developed only educated state serfants.

The Russian setup consists of a 10-grade compulsory general education school comparable to our grade and high schools, followed by five years in higher education establishments, such as the huge University of Moscow.

If the child is scientifically inclined, there is no question of his future. State stipends and general deferment from the draft are inducements to better grades throughout scientific training. Such rewards are not common in other fields. The graduate is a capable scientist but lacking in a background in the humanities. Emphasis is placed, however, on foreign languages, particularly English.

Students report Russian science is weak only in biology where it has been hampered until recently by Marxism. There is great emphasis on scientific teaching with almost 50 per cent of technical students channeled into classrooms. Only 35 per cent of our scientists are engaged in teaching and research at educational institutions.

WHERE does this leave the U. S.? At the moment our position is not encouraging. We are not producing enough scientists and engineers.

One reason has been the law of supply and demand. In 1949 we graduated 50,000 engineers and many had trouble finding jobs. Fewer technical positions were available, so the number of students in those fields decreased. There now is an upturn in response to the new demand, but not enough to meet long-term needs.

On another level we have failed to make teaching sufficiently attractive to lure the scientifically-minded from the rewards of industry. The number of graduates who completed requirements to teach high school science decreased from 9,100 in 1950 to 3,800 last year. Thus others must step out of their fields and instruct in mathematics or science. A Princeton survey shows that four-fifths of the math teachers are not competent in the subject.

Math enters the picture in another way. Woe-folly it appears to be a vanishing American. Invariably it is voted the most unpopular of school subjects—"Too hard" or "too dull." Students avoid it, partly due to an impression of some parents that math is strictly for the egg-heads. Only half the nation's high schools offer physics or chemistry, 23 per cent neither. Less than a quarter of our high school students study even elementary algebra.

THESE are the facts that worry our educators and government alike. For the short-range problem—finding scientists and engineers for immediate needs—the law of supply and demand is on our side. Active recruiting by industry is helping. Some companies have even placed "Help Wanted: Scientists" ads in British newspapers.

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Local programs should have a big effect. For example, Southeast high school this year exposed more students to the scientific world through outside speakers. The Wyandotte High School Science Field club has been a pioneer. And nation-wide Science fairs are important.

On a national level, government can but point the direction. It would be conceivable for it to take over the educational system and produce technologists on a compulsory basis. But that would destroy the concept of local control. Only with caution can there be outright aid.

The National Science Foundation in 1953 inaugurated a series of summer institutes for high school and college science teachers, offering an opportunity of contact with first-rate minds. Traveling high school science libraries bring technical volumes to scattered areas.

Some believe the federal government should go further. A bill in the Senate would increase to \$25,000,000 the scholarship program of the National Science Foundation. Most educators hope, however, that extensive scholarship efforts will be carried on by private interests.

In attacking the problem, industrialists, educators and government officials agree we must never forget other fields of learning. Samuel M. Brownell, U. S. commissioner of education, has pointed out that it is unwise to rob the potential of diplomacy, law or economics, for example, to produce more scientists. And at the same time we must never lose sight of the ideal that scientific training in a free land necessitates a firm grounding in the humanities.

At mid-century, then, this is a challenge America must meet in answering the onslaught of communism. Russia has embraced the Baconian edict that "Knowledge is power." To the Soviet that means scientific knowledge. Our answer is brainpower. With the proper education, it will be sufficient.