Letters

Nuclear Arms Buildup

At present, with some 20,000 megatons of nuclear power in existence (equivalent to 1.6 million times the yield of the Hiroshima bomb, which in 1945 killed around 200,000 people) and with more being added every day, we are living in a period of uncertainty, of risk of extinction. There may be a holocaust in which the adversaries would use most or all of their weapons. The global effects would be so severe that virtually all life would be destroyed and the earth's atmosphere would suffer catastrophic breakdown.

The two most important components of radiation from fallout in a nuclear holocaust, the gamma rays and the beta particles, would destroy all animal life and vegetation with the sole exception of some types of insects and grasses. We are now in a situation where we can end in a few hours what evolution has built up in hundreds of millions of years and what humanity has created in thousands of years.

Extinction is intangible, less comprehensible to us than death. While death continually strikes around us, extinction can by definition occur only once and is therefore entirely hidden from our experience. We will not suffer the loss, nor will the unborn shed any tears over the lost chance to exist.

It is inevitable that, unless we rid ourselves of our nuclear arsenals, the end *will* occur, if not today then tomorrow. We are living on borrowed time; every year, day, second that human life continues on earth is borrowed. We live in two worlds: one of military might with instruments that make it possible to extinguish all forms of life, the other of citizens living as though extinction were not possible.

At present, the huge majority of us do nothing. We remain calm and silent, taking refuge in the blind hope that the holocaust will not happen. We put this ultimate catastrophe out of our minds and live indifferently toward the future.

Two paths lie ahead of us: one to possible extinction, the other to life. If we refuse to acknowledge the nearness of total annihilation and continue increasing our preparations to carry it out, we are the allies of extinction. If, on the other hand, we direct our efforts toward survival with the complete dismantling of nuclear arsenals, we will then be allies of life.

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ACDA Staffing

I would like to correct the statement in John Walsh's 17 December article "Arms control agency on hold" (News and Comment, p. 1203), attributed to sources at the Arms Control and Disarmament Agency (ACDA), that I withdrew from consideration for director of ACDA's bureau of strategic programs "after Rostow was unwilling to approve Cooper's terms for taking the post, which included a virtual free hand in appointing staff for his bureau."

My reason for withdrawing did relate to organizational and staffing considerations, but I did not seek a free hand in staffing the strategic programs bureau. I have worked in the federal bureaucracy and know that would be an unrealistic objective, no matter how desirable. Had Walsh discussed with me the information from his ACDA sources regarding my potential appointment, I would have corrected this misrepresentation.

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Supplemental Teachers of Science and Mathematics

The AAAS/Standard Oil Company of Ohio project (AAAS News, 14 Jan., p. 161), by utilizing "the resources of the AAAS to provide teachers, guidance counselors, administrators, librarians, and others with a variety of tools to enrich their own backgrounds in the sciences and in turn, stimulat[ing] student interest" may help "improve the typical student's classroom science education experience." It is probably not, however, an appropriate way to alleviate in the near future "the growing shortage" of "scientists, technicians, and mathematicians." To us at John Hopkins, having conducted the Study of Mathematically Precocious Youth (SMPY) for a dozen years and the Center for the Advancement of Academically Talented Youth (CTY) more recently, the persistent emphasis of current groups and projects such as the AAAS's Science Resources for the Schools (SRS) on students who are age-in-grade studying each school subject 45 or 50 minutes daily with regular, pedagogically certified teachers operating in the usual way, seems unnecessarily limited and perhaps futile.

We believe there exist plenty of well-qualified, part-time prospective teachers in colleges, universities, and industry who, under favorable conditions, would be glad to provide the training in science and mathematics that future scientists, mathematicians, and high-level technicians need from about age 12 on. Such persons could readily be developed into expert teachers of physics, chemistry, mathematics, or biology, perhaps for just one 3-hour period per week. Why must all teachers (except a few aides) have to be full time, handling a variety of courses and student activities? If medical education had used this model, its current situation would probably resemble that of the public schools or worse.

Why must all classes meet five times a week and virtually never at night or on weekends or during summers? Tradition, far more than logic and good sense, continues to reign.

Since 1972, SMPY has pioneered fast-paced classes in regular school subjects such as precalculus, calculus, biology, chemistry, and physics for youths who score higher than 99 percent of their age-mates on mathematical reasoning tests. These classes have been tried out in many different situations, typically on Saturdays or Sundays for one 2-hour period each week during the school year or one to three 5-hour days during six summer weeks. Three-week intensive residential summer courses have proved especially effective, academically and socially. Our high school biology class last summer is a good example. Twenty-five students, age 11 to 15, from 12 states as far away as Washington and Georgia enrolled in this course, which was conducted by CTY at Franklin and Marshall (F & M) College in Lancaster, Pennsylvania, as part of CTY's summer courses, in which about 700 young students were enrolled. The class was handled by a retired high school science teacher, Ir-

ving Reich, and an exceptionally able recent graduate from F & M who had majored in biology. No enrollee had ever before taken a course called biology.

Each student's success was evaluated partially by his or her score on the College Board's 100-item 60-minute biology achievement test. After only 3 weeks the median score was 727, better than 95 percent of the able senior high school students who choose to take this difficult examination do after at least a school year of biology. Scores ranged from 590 (61st percentile) to two 800's (30 points above the minimum 99th percentile). All 25 students stayed the course, and four of them were among the 13 who enrolled in chemistry for the next 3 weeks.

Results for chemistry were at least as good as for biology. A 14-year-old boy scored 790 and 780 on the biology and chemistry achievement tests; another 14-year-old boy, legally blind, scored 740 and 800, respectively; a 15-year-old girl scored 790 and 740; and a 14-year-old girl scored 720 and 700. Most of the 34 students are working on college-level biology or chemistry, or both, during the present school year.

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Science Resources for Schools does not claim that it can alleviate the shortage of scientists in the near future. This is one of several projects and activities that AAAS is undertaking to help bring some improvement in science education in the schools *in the long run*. Improving junior high school science teaching may not quickly solve the supply and demand problem, but eventually it could help make a difference.

The purpose of this particular AAAS project is to help the teachers, principals, librarians, and counselors in the schools do a better job of bringing science to all students. Goodness knows, much else remains to be done if there is to be real reform, including the use of part-time instructors and the challenging of gifted and talented students. Improvement ultimately depends upon many different people and organizations, including scientists and their professional organizations, working on various dimensions of the problem for an extended time.

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