GENERAL SCIENCE

Critical Shortage

Wastage of scientific talent in making war has led to deficit of over 150,000 in training in science. National science scholarships urged to meet need.

By WATSON DAVIS

➤ THE greatest and most critical shortage in America, when viewed from a few years in the future, is the lack and wastage of scientific talent.

Science and technology in making war have been given the highest priority. Industry and government are making large and promising plans for the expansion of scientific research now that the war is over. Nevertheless, the young men who should be the scientists of the future have been inducted into the armed forces without any opportunity to contribute to the nation and the world their unusual and relatively rare abilities. By the thousands they are still in the armed forces doing non-scientific tasks.

Almost alone among the nations of the world, the United States has, through a series of expediencies and unhappy decisions in high places, left the scientific research abilities of the nation relatively unprotected from the ravages of war.

In England and in Russia, and even in Germany, young scientists were not allowed to join the fighting forces even if they wished to do so. They were set at tasks for which their abilities and training fitted them so that they could be best used in the war effort.

The recent report by Dr. Vannevar Bush, director of the Office of Scientific Research and Development, to the President stated:

Few Over 18

"Among the young men and women qualified to take up scientific work, since 1940 there have been few students over 18, except some in medicine and engineering in Army and Navy programs and a few 4-F's, who have followed an integrated scientific course of studies Neither our allies nor, so far as we know, our enemies have done anything so radical as thus to suspend almost completely their educational activities in scientific pursuits during the war period."

In the United States the question of whether a young scientist in college, or working in a research laboratory, would be inducted into the armed service was left largely to the discretion of the local draft board. Draft boards, of course, have only limited information as to the needs, methods and urgencies of research. They are under the democratic pressure "that your boy is no better than my boy."

As a consequence, it is estimated by a careful inquiry of experts that the deficit of science and technology students who but for the war would have received bachelor's degrees, is about 150,000. And the deficit of those obtaining Ph.D. degrees in these fields will amount in 1955 to about 17,000. It takes at least six years from college entry to achieve a doctor's degree or its equivalent in science and engineering. This advanced training is quite necessary these days for those who are to explore the unknown and make the necessary developments out of which will come new cures for disease, new industries and better living conditions.

Only Part of the Story

These figures from the Bush report on our great endless frontier, which is science, tell only part of the story. These figures show only the great lack of scientific research personnel in order to keep our nation's scientific and technological resources at the level that they were before the war.

Now that the war is ended, truly tremendous research programs are being announced and discussed. One industrial operation alone is to spend $20,000,000 on a new research laboratory and expand manyfold its already extensive investigational facilities. The Bush report recommends federal research expenditures of $33,000,000 for the first year, rising to $122,500,000 at the end of five years, this expenditure to be in addition to the regular federal expenditures for research at a peacetime level.

Real need of scientists of the future is for this reason much greater than the estimates of deficits would indicate. For every scientist that worked before or during the war, two or three will be needed after the war. At least a quarter of a million young men and women should get back to college as fast as possible and begin studying these science and technical courses which they have been unable to pursue due to the interruption of the war.

This figure does not include the need for medical students to augment and maintain our supply of doctors in this country, nor does it include the related specialties of dentistry, pharmacy, veterinary medicine, etc.

Neither does it include the need of technically trained workers for control and development in industrial plants that make chemicals, metals, machinery and the other thousand and one things that are needed in the peacetime world.

One of the greatest blows to the continuance of scientific training by young men in the armed services was the placing in the infantry of approximately 100,000 Army specialized training corps men, about the middle of 1943. Up to that time the Army, as well as the Navy, had a college training program in many institutions throughout the country in order to provide the armed services with the technical and scientific personnel that was needed. This program was for all practical purposes wiped out in 1943 by the decision that placed all of these young men in the infantry, preparatory to the European invasion. Whether this sacrifice was needed to provide additional strength to the infantry will be a judgment of history. It is indisputable, however, that our scientific forces would, in all probability, be in much better condition now if this well-thought-out program had not been abandoned at that time.

There would have been some loss in scientific training even if the Army specialized training program had continued because the subjects taken in these college courses as arranged by the Army were oriented toward military service rather than toward basic scientific technological service. The Navy's various V-programs for officer training in colleges were not interrupted in this manner, and it is to be expected that a larger percentage of the young men in the Navy with potential scientific research abilities will eventually have a larger and earlier opportunity to enter into scientific research and development work.

To rescue the generation of young potential scientists now in uniform, the Army and the Navy are being urged by Dr. Bush and his committee to search out, discover and send back to college immediately those men who prior to or

during the war have given evidence of talent for science.

These scientifically talented young men, under this plan, would be ordered, by name, to duty in the United States as students for training in science and engineering of a grade and quality available to civilians in normal times.

The total number that would be selected on merit alone would probably be no more than a 100,000 which, under present conditions, would hardly have military significance.

But for building up the nation's scientific strength, that number would be very significant. These men would constitute the premium crop of future scientists.

Although these careful recommendations have been on the President's desk for several months and the Bush report itself has been public property for several weeks, so far as is known no steps are being taken to put into effect the suggested program or any modification of it.

Officials Insistent

High military officials are insistent that there be continued scientific research along military lines in order that our fighting forces in time of peace may maintain a supremacy which will either prevent war or give us the necessary fighting power in case we are again attacked. Scientific research is considered of major importance in Army and Navy plans for the future. By inaugurating this salvage of scientific talent within the ranks of the Army and Navy, those in command now can provide for future emergencies a national resource which cannot be purchased with dollars or any amount of sacrifice when the emergency arises.

Believing that soldiers in the service being discharged from the Army will need more college training than they will be able to get under the GI Bill of Rights, the report urges that in the case of those who are found to have marked scientific talent, the amount of education given under the GI Bill of Rights, should be dependent upon the ability to profit from the education rather than just length of service.

The 18-year-old boys who are being inducted into the armed services month by month still include those of great scientific promise who in England and Russia under the most severe conditions of the war would not have been allowed to enter the armed services. Instead, they would have been ordered to go into preparation for scientific research careers.

In the interest of our future military defense as well as our peacetime progress, the Army and the Navy might well take the initiative in keeping these few boys at their scientific studies rather than allow them to join the fighting forces.

How to provide for the constant renewal of our scientific talent is another major problem and a national program to that end has been suggested.

To insure through the long future an adequate supply of scientists and engineers for America, the recommended national science talent program would discover, train and maintain as a National Science Reserve some 6,000 potential scientists each year.

This "army" of young scientists would, after their training in various colleges on national scholarships, go into universities, laboratories, or industrial or governmental research organizations as they wish. But, in a national emergency they would be liable for call into federal service for scientific or technical work.

Under the plan suggested by the science talent committee headed by Dr. Henry Allen Moe and included in the Bush report on postwar scientific research, a total of 24,000 national science scholarships would be in college at any one time. There would be 900 fellows doing advanced work for the Ph.D. degree at any one time.

Selected from all parts of the country solely on the basis of merit, without regard to sex, color, race, creed or need, these potential scientists would receive scholarships patterned after the educational provision of the GI Bill of Rights. Tuition in any approved college would be paid up to $500 a year, and personal support of $50 a month if single and $75 a month if married would be provided.

When fully in operation the plan would cost $29,000,000 a year, a sort of insurance premium for the nation against stagnation in invention, scientific discovery, and industry, and an investment in national defense. One thing industrialists are sure of is that new products and methods must come from research if business is to be good. Military men are convinced that the weapons of any next war will not be those of this war, but will come out of research laboratories of the future, manned by the young scientists to be discovered and nurtured under this science talent plan.

This plan for a federally supported science talent search is no untried innovation in educational and scientific method. For the past four years, the Science Talent Search for the Westinghouse Science Scholarships has been conducted by Science Clubs of America as a Science Service activity. While the numbers and

Do You Know?

Some *bacteria* emit enough light to photograph objects.

Turkeys would be nearly extinct if they had not been domesticated.

The best pasture for *hogs* is alfalfa, experts claim.

North American Indians had no *beasts of burden* prior to the coming of white men.

Licorice has its characteristic taste due to the glucoside, glycyrrhizin, which is sweet in alkaline, but not in acid liquids.

Devil's shoestring, a wild American plant of the legume family, may be a source of rotenone for insecticides, according to studies in progress in Texas.

War-developed *walkie-talkies* are promised for reliable two-way communication between farms and town.

Butterflies that give off repulsive odors do so as a protection from birds and other enemies, and are found in both sexes; attractive scents are confined to the males.

Old rooster meat is tender and juicy if, six weeks before killing, a tiny pellet of synthetic chemical diethylstilbestrol was inserted under the skin through a small cut; it causes fat to form in the muscles.

A *cereal beverage,* recently patented as a coffee-substitute, is made from bran, poplar bark, molasses and vinegar; it has a coffee-like flavor, it is claimed, and acts upon the membranes of the throat in the manner of coffee.

amounts of scholarships granted under this program are much smaller each year, 300 of the most scientifically talented boys and girls in the nation have been located and, with the exception of the boys who were inducted in the armed services, most of them have been given opportunities for intensive scientific or technical study.

The Science Talent Search utilizes the newest psychological selection techniques, and combines a science aptitude test rating with searching evaluation of personal qualities and scholastic record. These methods of selections are proposed for use in the larger federal plan, which would use national examinations leading to selection by boards of judges in each of the states.

Although the first Science Talent Search was held at the beginning of America's entry into the war, some of the winners have already graduated from college and are doing research for advanced degrees, in some cases on military problems.

These Science Talent Searches for the past four years (the fifth one is being conducted this fall and every high school senior is eligible to compete) have shown that science talent may be found in the big cities, the small towns and the farms, in those whose parents are poor and in those with millionaire fathers or mothers, in those born here and those who came to our land as refugees.

Good science teaching in school from the first grade through the high school is needed to be sure that the scientifically talented do not go through the educational mill without their interest in science being awakened.

The intelligent reporting by American newspapers of scientific news is of major value in bringing the importance, method and possibilities of science to the attention of young people who possess scientific talent but who, except for the press, might never know of the opportunities and needs in this important field.

There exists in America the largest science organization in the world, the more than 150,000 members of Science Clubs of America, organized in some 7,500 clubs in the nation's high schools. From among these boys and girls who make science their serious hobby, many of America's scientists of the future will come.

How good a job they will be able to do in building us all a better future will depend in large measure on how thoroughly America searches for latent science talent and whether this search is supported with the necessary dollars and intelligent planning.

Science News Letter, August 25, 1945

CHEMISTRY

Transmutation Preferred

➤ TRANSMUTATION, for centuries the alchemists' goal, has suddenly become the laboratory method of choice of the group of scientists who worked out the chemistry of the atomic bomb. The account appears in the report, released by the War Department, written by Dr. H. D. Smyth, of Princeton University.

The problem was to separate two or more kinds of the rare metal uranium, which differ from each other in no discoverable way except that one is slightly heavier than the other. To separate them by this difference would have been a slow, tedious and unsatisfactory task, especially since the part that would be valuable for the project makes up less than one part in a hundred in any quantity of the ore.

Here the knowledge and skill of chemists who have studied the behavior of radium and other radioactive elements was put to good advantage. It has been found in work with such elements that their weight and their chemical nature depend on two kinds of minute particles which make up the hearts of their atoms.

The number of one kind of particle, the proton, in the atom heart is responsible for the nature of the element. One proton makes hydrogen, 26 protons make iron, 92 protons make uranium. The other kind of particle in the atom heart is the neutron. Uranium 235 has a net result of 92 protons and 143 neutrons, adding up to 235, according to the chemists' calculations, while uranium 238 has three more neutrons than its lighter isotope.

These two uraniums had to be separated, because only U235 would split up the way the scientists wanted it to for use in the atomic bomb. U238 would not. By lucky chance, the very property of U238 which made it useless for the purposes of the bomb provided the clue which solved the separation problem.

The more plentiful form of uranium, U238, could be made to undergo transformation into another kind of element