tific worlds to conquer. Despite the large number of scientists now at work there is no lack of interesting and important problems. The very nature of science is such that the solving of an important problem usually only serves to uncover other new and important problems. Thus, although progress is being made, the scientific horizon is becoming broader and broader, and the need for well trained young scientists is becoming more intense.

Although diseases caused by viruses have been recognized for hundreds of years, the viruses themselves were recognized only about 50 years ago, and they seemed to have the properties of small living organisms. But most viruses proved to be so small that they couldn't be seen with even the best light microscopes and their true nature remained somewhat a mystery.

Tobacco Mosaic Virus

Now you might think when I obtained tobacco mosaic virus in the form of a crystalline nucleoprotein in 1935, that the mystery surrounding the nature of viruses would disappear. But this did not prove to be the case. Although a few other viruses were found to be crystalline nucleoproteins, still other viruses were found to consist of large particles having a morphology somewhat similar to that of living organisms. These viruses seem to consist of a series of structures of gradually increasing complexity and to provide a connecting link between the molecules of the chemist and the organisms of the biologist. They exist at the very twilight zone of life and as one learns more about them, many new problems arise.

One of these problems might be: How do viruses grow or reproduce? And we also have the problem of how they change or mutate to form new strains which cause different patterns of disease.

Because viruses represent the simplest structures we know having properties characteristic of living organisms, studies on viruses should help solve the many problems relating to the nature of life. You see, there are exciting and important problems that face us today. I can assure you that some of these or other new, equally exciting and important problems will be with us and ready for you, five, ten and even 50 years hence.

Dr. Karl Lark-Horovitz

Dr. Karl Lark-Horovitz, head of the department of physics of Purdue University in Indiana, said:

We must learn to understand the nature of elementary particles, the forces with which they interact and the manner in which they can be arranged. Solve this general problem and we would understand the behavior of the atom with its electrons and nucleus and the cosmic radiation. The construction and operation of giant new high-voltage machines has resulted from our understanding of the way in which fast-moving particles act.

Research in Realm of Volts

We know already that production of new chemical elements and new reactions result from investigations in the realm of hundreds of millions of volts reached so far. One exciting result of recent research has been the large-scale production of materials which at will can be made into insulators or conductors of electricity. This is a discovery which promises much for the future of electronics.

The machine age in physics has just begun. We may confidently expect, within the next decade, to see high energy experiments in the laboratory in the billion-volt range. We shall thus produce systematically what are nowadays only sporadic events in nature. The fields of radiation chemistry and radio-biology have been barely tapped. To succeed fully in these new fields there must be cooperation between physicists, chemists, and biologists to study the way radiation and matter interact whether it is living or inorganic. Physical methods may change the whole aspect of chemical analysis within the next decade. When we get more insight into the basic nature of the way particles and radiation interact, we shall have to reformulate our philosophy. We've known since the days of Gilbert, over 300 years ago, that the earth is a giant magnet. But we don't know why. That is a problem and a challenge for you. Living organisms have a tremendous sensitivity that makes our electronic instruments seem clumsy indeed. There will be many new things to do in the future particularly in the borderlands between physics and biology and physics, astronomy, and geology.

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STS Winner Writes

"With the development of the remarkable silicones and other new commercial compounds, such as many of the synthetic sex hormones, the importance of Grignard reagents in industry has assumed new meaning.

"In my work with organic silicon polymers, the usefulness and disadvantages of Grignard reactions soon became apparent. The outstanding drawback of Grignard processes is the always present fire hazard due to the explosive vapors of the commonly used solvent, ethyl ether.

"The purpose of my project is the elimination, or at least reduction of the danger of working with this flammable, volatile liquid, without seriously inhibiting the vigor of the reaction. It is well known that higher alkyl ethers as well as aromatic ethers are less volatile and considerably less hazardous than ethyl ether. Specifically then, I was interested in establishing whether or not some or all of these different ether types could be used, instead of ethyl ether, to make a Grignard reagent.

"It has been shown that certain relatively non-volatile ethers can be used in Grignard reactions. . . . These are dibutyl ether, anisole, and diphenyl ether."—From the essay of Andrew S. Kende.

GENERAL SCIENCE

From Many Walks of Life

By GWILYM A. PRICE

President, Westinghouse Electric Corp. Member of the Board, Westinghouse Educational Foundation

Message delivered at the Awards Banquet of the Seventh Annual Science Talent Search, Washington, D. C.

➤ MY compliments to you, Mr. Davis, and to all the others who have made this Science Talent Institute the success it has been. And I extend the gratitude of our organization to all the guests who have taken their time from busy days to do honor to our 40 Science Talent Search finalists for their high achievements.

To the 40 young men and women, my warmest congratulations.

As I looked over the biographical information about these young people, I was impressed by the varied paths that have led them to Washington. They come from 16 different states, and five of them were born in other lands. Many of them have parents who were born abroad. And their parents follow many walks of life—a missionary, a machinist, a high school principal, a sheet metal

STS Winner Writes

"Four or five days after the first larvae appeared, they were removed from the tube and placed in a Syracuse dish in one-eighth of an inch of cynanin solution at a distance of nine inches from a 100-watt, 120-volt desk lamp. The larvae were irradiated for periods varying from 20 to 30 minutes. They were then rinsed in Solution A to remove the excess dye. The irradiated larvae were then placed in fresh medium, a record being kept of the number placed in each tube. They were allowed to develop, and as the flies hatched, they were examined for variations.

"I plan to continue this work, photographing and making slides of the variations. I shall attempt to produce phenocopies by varying the temperature during the critical period. I shall also attempt to improve my technique, to get the exact age at which the development of the larvae can be affected, and to determine the similarity of the somatic variations I have produced to mutations known to occur in Drosophila.

"Through my work with Drosophila, I am learning the technique and methods of experimentation in one branch of biology. I am learning that research work in science is hard and often discouraging, but a thrilling and rewarding experience."—From the essay of Barbara Wolff.

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worker, a doctor—to mention a few.

I doubt that there is any other nation in the world where a search of this kind would turn up youthful talent from so rich and varied a background. As an editorial writer for the *Newark Evening News* has said concerning this Search, "The American dream is many things and of it each writes his own definition, but its essence is the recognition that ability has nothing to do with racial origin or economic circumstances, and that opportunity for self-development is available to all."

Tonight's banquet is the final wind-up of five very busy and full days for this group of young people. But, like all graduations, it is really a commencement. Because they have been singled out from the 16,000 boys and girls who started toward this goal, from now on they are in the spotlight.

Their country will be watching their progress. For we all know that when everything is right with our young people, there is a good chance that everything else will work out all right.

I once heard a story that illustrates what I mean. A young father, finding his son with nothing to do, tore a map of the world out of a magazine, cut it up, and gave it to the boy to piece together again. A few minutes later the job was finished, and he asked his son how in the world he ever did it so fast. "Well, Daddy," said the lad, "on the back of the map was a picture of a boy. I knew that if I could build the boy right, the world would come out right, too."

In young people of the caliber of our STS winners lie the hopes of our country and the world in years to come.

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GENERAL SCIENCE

Employment in Science

➤ CHOOSE your field on the basis of your own abilities, rather than upon the considerations of economic outlook, is the advice of Ewan Clague, commissioner of Labor Statistics at the U. S. Department of Labor, to future young scientists.

Speaking before the Educational Conference of the Seventh Annual Science Talent Search, Dr. Clague said that although there is now a shortage of trained workers in leading scientific and technical professions, this condition should improve within a few years. "We are now training more young people in the colleges for the scientific professions than ever before," he declared.

Recent estimates made by the President's Commission on Higher Education indicated that on the basis of past trends college enrollments would rise to 2,900,000 by 1960, or more than one-fourth above the 1947 peak, he pointed out.

This means that competition will be keen and subject to rapid change, he predicted, as science opens new fields, as industrial use of research advances, or as the international situation changes.

In attempting to answer what these trends imply for the individual student interested in the sciences, he presented the analyses made by the Occupational Outlook Service of his department and gave this further advice:

"Each young person planning to go into the sciences must prepare to undertake a rigorous and thorough course of training and preferably to complete graduate study. The long term trend toward requiring more advanced education for scientific professions, as well as the competition foreseen in the next few years, recommends this.

"At the same time it will be desirable for each student to maintain the maximum degree of occupational flexibility, so that he can adapt to changing circumstances. This means getting the broadest basic scientific education as well as specializing in a particular field. It means also being prepared to make adjustments and keeping an open mind on the subject of one's occupational specialization."

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GENERAL SCIENCE

Spot Science Talent Early

➤ YOUTHFUL scientists should be made to feel that they are as important as athletes, Dr. Arthur S. Adams, provost of Cornell University, declared at the Educational Conference of the Seventh Annual Science Talent Search, meeting in conjunction with the Science Talent Institute held for the 40 winning high school scientists in the Search.

Dr. Adams told educators at the conference that the first job in solving the national problem of providing adequate scientific personnel was to spot science talent early.

He praised the Science Talent Search as "a fundamental effort to achieve such identification and to give important recognition to those who have given convincing evidence of their promise in scientific work."

Once science talent is discovered, it must be encouraged, Dr. Adams pointed out, adding that money is not the only requirement.

"The individual who is blessed with superior scientific aptitude should be made to feel that his talent is as important to society as is, for instance, the talent of an athlete," the educator asserted.

He warned against making the young scientist "a sort of intellectual curiosity."

Development of the relationship between professional work of the scientist and its social significance was urged, and Dr. Adams emphasized that the young scientist must learn to work effectively with other scientists.

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