GENERAL SCIENCE

Many Problems Unsolved

Leading scientists point to broadening scientific horizons that require young trained minds in fields of astronomy, medicine and physics.

➤ THREE leading scientists answered questions about astronomy, viruses, and physics of talented teen-agers over the Columbia Broadcasting System.

This was one of the highlights of the five-day Science Talent Institute held in Washington (Feb. 27-March 2) and attended by 40 boy and girl honor-trip winners. It marked the culminating event of the Science Talent Search for $11,000 in Westinghouse Science Scholarships. This search is conducted by Science Clubs of America, administered by Science Service.

Dr. Harlow Shapley

Dr. Harlow Shapley, director of the Harvard College Observatory and president of Science Service, informed all high school future scientists that:

The world is very far from finished, and there are many, many problems that we older scientists won't have time to solve or even start to solve. And each new advance in science brings new problems, like the development of atomic energy.

You might think that the oldest of the sciences, astronomy, would have succeeded in two thousand years in finding all the answers. But it hasn't. With our modern telescopes and our modern ideas we have increased the volume of explorable space by a billion times during the past generation; but that big advance does not answer all the problems. In fact, it opens up many that we did not know were in existence. I believe I could talk off now, in the next ten minutes, without referring to a note, 40 investigations in the fields of stars and galaxies, each of which would justify a doctor's degree, if satisfactorily completed. And in the fields of shooting stars, the planets, comets, and especially of the sun and its radiation, there are equally many unsolved problems which we now know how to get hold of.

Also there is being born at this time a new branch of astronomy practically unknown ten years ago. Its triumphs are nearly all in the future, and it will have a tremendous appeal, not only to the pioneer scientists, but to the radio hams and the electronic gadgeteers.

I am referring to what we might call microwave astronomy, or radio astronomy. I've just been summarizing the principal contents of this new branch of astronomy which we add to the three other general fields of research—photometry, astrometry, and spectroscopy. There are, of course, the theoretical branches of astronomy like celestial mechanics, the theory of radiation and atomic transformations—but I'm talking about observational astronomy.

In this new field of microwave astronomy, or radio astronomy, we have such adventures as the exploration of the ionosphere and its various layers; the measurement by radio of the heights and numbers and motions of shooting stars in our Earth's atmosphere; the bouncing of radio waves off the Moon, which is not nearly as silly as it sounds, because this two-way connection with the Moon will help us explore our own upper atmosphere and especially explore the so-called empty space between the Earth and Moon; and finally there is solar noise, and cosmic static. And in addition to those five fields of this new branch of astronomy we must mention the measurement of cosmic radiation somewhere —the measurement of those highly penetrating cosmic rays, for which the origin is unknown.

Personally, I am hoping to make use of the radio noises from the region of the constellation Sagittarius in the Milky Way as a part of my exploration of what I call the Hub of the Universe, which lies more than 20,000 lightyears away, and sends us not only the light of the billions of stars in the nucleus but apparently broadcasts in the ten meter band.

Dr. Wendell M. Stanley

Dr. Wendell M. Stanley of the Rockefeller Institute for Medical Research, a Nobel prize winner in medicine and physiology, told the science-minded high school audience that:

I think that I can give you, and the host of young scientists who may be listening in, every assurance that you need have no worry about lack of scien-

HOBBIES BRING HONORS — Barbara Wolff shows phenocopies in fruit flies; Andrew Kende, new solvents to reduce explosion hazards; Kurt Kohn, ant colony; Ursel Blumenheim, planarians; Stanley Zisk, radio transmitter; Walter Scheider, electronic photoflash; Lawrence Schaad, apparatus for growing organisms under glass; Gerald Howett, three dimensional graphs; Gene Baraff, home-built telescope; Laura Maurer, electrical formula test; David Geller, hard-water-effect on soaps, detergents; John Jamieson, apparatus for high frequency directive antenna measurement. Read left to right.

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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