

## PHYSICS

# New Electron Spectrometer May Identify Molecules

## Submicroscopic Objects, "Seen" for First Time With Electron Microscope, Will Now Be Analyzed

**S**HOOTING an invisible beam of electrons through a tiny, invisible specimen may eventually permit identification of individual molecules.

The first electron spectrometer, an instrument for finding the composition of such small bits of matter, is being completed by Dr. Albert Prebus at Ohio State University. Dr. Prebus, with co-workers, is also noted for having built the first electron microscope to be used in America.

Pictures taken under the electron microscope, like those in the family album, give a physical portrait but seldom reveal the true nature of the individual. Therefore, submicroscopic objects, seen for the first time by using the powerful electron microscope, will now be examined with the spectrometer to determine their composition and properties.

A better chemical understanding of the mysterious viruses is likely. And it should be possible to follow the reactions which occur in the battle between our virus enemies and the antibody defenses of the blood. Disease-producing germs are in for a similar scrutiny.

Just how drugs in turn attack the germs can be investigated by the analyzing beam of electron particles. What makes the sulfa drugs so effective, for example, is one of many such medical controversies.

Rare earth metals are to be used in one of the first research applications of the new device. These rare earths can be recognized even when mixed with other complex materials. Thus they serve as identification tags when attached to other substances. Adventures of these tagged materials in their associations with minute plant and animal organisms can then be followed by using the new spectrometer.

The main advantage of such experiments is that the sample of material can be thousands of times smaller than that required by the best chemical methods. About a hundred thousand such tests can be made from material piled on the head of a pin.

While examining such small particles

under the electron microscope, Dr. Prebus got the idea for the spectrometer from a defect in the microscope's operation. This is how it happened.

A beam of electrons is used here instead of light to form the magnified image. As these particles of electricity pass through the specimen, they collide with the chemical elements present. Dr. Prebus found that this causes some of the electrons to lose part of their energy and not focus properly. These "tired" electrons were a nuisance.

But this loss of energy, it was observed, is always the same for a particular substance. On this basis the electron spectrometer was constructed. By measuring the losses of energy after shooting elec-

trons through a specimen, chemical composition can be interpreted.

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## ASTRONOMY

## "David" Comet Loses Fight With "Goliath" Jupiter

**A** COMET with its best days behind it and a story of a David and Goliath battle of the heavens has been unearthed by astronomers at Harvard Observatory, according to a paper on Comet Whipple 1933f presented by Richard N. Thomas at the American Astronomical Society meeting in New Haven. This comet was discovered by Dr. Fred L. Whipple, of Harvard, in 1933; it is an inconspicuous object, but in 1922 and prior years it traveled close to Jupiter, and the tremendous attraction of that planet, the largest in the system, altered its orbit greatly.

Mr. Thomas reported that in 1922 the orbit of this interesting comet was nearly circular, as comets' orbits go, and almost as large as that of Jupiter. But when the comet and Jupiter traveled together for a time the orbit of the comet was



### PROTECTION

*A life vest for U. S. Army Air Corps flyers is here demonstrated by Elaine Eversole, speed swimmer. Deflated, the vest can be worn without interfering with the movements of the wearer. Pulling a cord at the bottom of the vest punctures a carbon dioxide cartridge which inflates it in less than three seconds. Even if the wearer is unconscious, the vest will hold his face above water. It is manufactured for the Army Air Corps by the Firestone Tire and Rubber Company.*

affected tremendously, so that now the comet alternately comes within 270 million miles of the sun and goes as far away as 480 million miles, nearly twice as far. This latter is Jupiter's average distance from the sun, so there will be future occasions when the comet and the mighty planet will wage their battle.

The comet will always lose. It lost three years of its "life" in 1922, so in-

stead of taking 10 years for a trip around the sun, it now takes only about seven years. Before 1920 its history is uncertain, but an astronomer, with time on his hands, can compute backwards and find out whether or not this comet may have had a much larger orbit than Jupiter's and possibly have been "captured" by the Goliath of the solar system.

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#### GENERAL SCIENCE

## Nine Girls, 31 Boys Awarded Science Talent Search Trips

### Ages of Winners Range From 15 to 18; More Than Half Stood at Head of Their High School Senior Classes

**N**INE girls and 31 boys have been invited to Washington, July 13-15, to compete for twenty Westinghouse science scholarships in the Science Talent Search conducted by Science Clubs of America, sponsored by Science Service.

The names of the trip winners were selected as the result of a strenuous competition in which superior seniors of all secondary schools in the United States were invited to participate. The 40 winners were selected from more than 10,000 entrants and some 3,200 who completed a science aptitude examination, submitted recommendations and scholarship records and wrote an essay on "How Science Can Help Win the War."

The trip winners come from 31 localities in 13 states. Entries were received from every state in the union.

Twenty of those who come to Washington the middle of next month on the all-expense trips will be selected for scholarships which will allow them to go to any college of their own selection, so that they may continue science or engineering training. One boy and one girl will be awarded \$2,400 Westinghouse Grand Science Scholarships (\$600 a year for four years), while 15 boys and 3 girls will be awarded \$200 Westinghouse Science Scholarships.

Selected without regard to geographical considerations, the results showed that three high schools among the more than 25,000 have more than one winner among the 40. The Herbert Hoover High School at Glendale, Calif., furnished three trip winners, all boys, the Shorewood High School at Shorewood, Wis., had among the winners a boy and a

girl, and Walton High School in the Bronx, New York City, placed two girls in the list of winners. Evansville, Ind., also furnished two winners, a boy from Reitz Memorial High School and a girl from Benjamin Bosse High School.

More than half, 52.4%, of the Science Talent Search trip winners stood first in their high school classes. Twenty-two of the winners were members of science clubs and six of them were club presidents.

The ages of the trip winners range from 15 to 18, with the average age 16 years, six months.

Of the trip winners, 14 intend to study chemistry, 10 are headed for engineering careers, 8 have selected physics as their field of study, 7 will study some field of medicine or biology, while one is headed for higher studies in astronomy.

The proportion of boys and girls who submitted completed entries in the Science Talent Search determined the distribution of boys and girls among the trips awarded. Girls accounted for 22% of the entries. The scholarships, with the exception of the two grand scholarships, will be distributed among boys and girls in the same ratio.

Science Talent Search judges have authorized the issuance of a list of 260 boys and girls who, in the Science Talent Search, have been awarded honorable mentions. A copy of this list will be sent to any official of an institution of higher learning who desires it.

"A major need for America today is the discovery and development of scientific ability among boys and girls now in high school," the Science Service announcement states. "Real ability for

creative research and engineering is rare. Many who do not now have the opportunity to develop their scientific talents will be discovered and made available for America's future progress through this Science Talent Search.

"This is more than a scholarship contest. It is a major step toward making available potential scientific talent to important tasks in war and peace. Within the next five years, either in war or peace, boys and girls now in high school must begin to take leadership in scientific research and engineering."

The Science Talent Search is conducted by Science Service as one of the activities of Science Clubs of America. Awards are provided and the Science Talent Search made financially possible by the Westinghouse Electric & Manufacturing Company, a leader in scientific research, engineering and manufacture in the electrical industry, as a contribution to the advancement of science in America.

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#### CHEMISTRY

## Plants, Like Steel, Require Many Chemicals

**H**EALTHY PLANTS, like good steel, need the addition of minute amounts of a number of chemical elements. Some of them are the same as those required for modern steel making, including manganese, molybdenum and copper.

The story of these "micro-nutrients" was told by Prof. D. R. Hoagland of the University of California, in his address as president of the Pacific Division, American Association for the Advancement of Science.

The need of plants for these minute traces of certain elements was completely unknown until a few years ago, and even now it is not certain that the list of micro-nutrients is complete. Of most of them, only a few parts in a million of soil solution are needed to maintain plant health, yet without them the plant sickens and perhaps dies.

Lack of some of these elements produces plant diseases that might formerly have been ascribed to the attack of sub-microscopic viruses. Fruit trees in soils without zinc, for example, produce symptoms known as "little leaf" and "mottle leaf." Most soils have sufficient quantities of the micro-nutrient elements for all practical purposes, but where they are lacking it is important to detect which ones are short and to remedy the defect.

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