ENGINEERING

Electron Microanalyzer

New instrument can identify in a few minutes the chemical elements in parts of the smallest germ and virus—particles 1/100,000 of an inch in diameter.

➤ CHEMICAL elements composing such extremely minute sub-microscopic objects as the tail or head of a germ or a virus, particles no larger than 1/100,000 of an inch in diameter, can be identified in a few minutes by a new instrument, the electron microanalyzer, developed by Dr. James Hillier of RCA Laboratories. (*Physical Review,* Nov. 1 and 15)

As a running mate to the electron microscope, the new instrument will allow the determination of the composition as well as the size, shape and internal structure of the particles which a few years ago were quite beyond the most powerful means of exploration in the microscopic world.

In the electron microanalyzer a very small area of the specimen is irradiated with an electron probe, a stream of these particles of electricity brought into a beam by a two-stage magnetic lens system. The electrons transmitted by the irradiated area of the specimen are focused by a third magnetic lens so that the electron probe is reformed. The amount of energy lost by the electrons is measured through a photographic exposure, and the position of markings in the electron velocity distribution indicates the presence of a chemical element in the specimen.

The new instrument is now in experimental use.

In discussing the future significance of the microanalyzer, Dr. Hillier said that before the extra information being revealed by the electron microscope can be applied by any of the physical, chemical, and biological sciences, it must be translated into a form that is of significance to the individual problems being investigated.

"After looking at an electron micrograph and noting the physical characteristics of the object," he continued, "the scientist invariably asks, 'What is this?' He knows that he had a test tube of a specimen consisting of a number of chemicals, but now he has within his vision a number of different types of particles which are undoubtedly made up of some of the chemicals from the original bulk specimen.

"If the original specimen was a test tube of bacteria, the scientist knew that it consisted of a number of proteins and other organic materials. But on looking at the electron micrograph, he finds that the bacteria have flagella, cell membranes, and structure in their protoplasm which often includes granules and particules surrounding it which he did not know existed. To find out the chemical structure of these particles, he must perform a number of tests on the bacteria. This procedure is very tedious, and not always successful."

Science News Letter, December 18, 1943

MICROANALYZER—Dr. James Hillier (left) and Dr. V. K. Zworykin, associate research director, RCA Laboratories, with the new instrument developed by Dr. Hillier.

MICROSCOPY

Device Cuts Ultra-Thin Slices for Microscope

➤ SLICES of animal and plant material only one five-hundredth as thick as a human hair are cut for use under the electron microscope by means of a high-speed cutting device developed by Dr. H. C. O'Brien and Dr. G. M. McKinley of the University of Pittsburgh. (*Science,* Nov. 19) The sections are only a hundredth as thick as those prepared on ordinary microtomes for use with conventional laboratory microscopes.

The customary microscopic sections are far too thick for examination with the electron microscope, the Pittsburgh scientists explain, because the effect of this new instrument is obtained by shooting beams of electrons right through the specimen, and this requires ultra-thinness not obtainable with the microtomes (laboratory slicing machines) now in use.

Difficulty of obtaining ultra-thin sections has been due to the yielding of the tissues when the knife strikes them, even when they have been embedded in wax or other material for support. Drs. O'Brien and McKinley solved this difficulty by making the knife come at the material so fast that it didn't have time to dodge. They mounted it on the edge of a rapidly revolving flywheel, turning at the rate of 10,000 times or more a minute. This gave the knife a rifle-bullet speed, so that when its edge struck the specimen it sheared off a slice before the tissue could yield or bend.

The ultra-thin slices floated off into the air, and were picked up directly on the specimen carriers used under the electron miscroscope.

Science News Letter, December 18, 1943