PHYSICS

Secrets of Living Cells Shown By Electron Microscope

Instrument Will Also Have Use in Industrial Research; Study of Smoke and Dust Facilitated, Fibers Compared

SECRETS of the structure and functioning of the parts of the cells of which all living plants and animals are made may be revealed by use of the electron microscope, which shows details far finer than can be detected with the old-style light microscope.

Speaking before the Pacific Division of the American Association for the Advancement of Science, Dr. A. Marshak, of the University of California, told of some of the biological problems that the new instrument may solve.

"The cell, which is the structural unit of the higher organisms, is itself a highly organized body," he said. "At its surface is a membrane which determines which molecules and ions of the surrounding medium will enter the cell body. It is known to be very selective in its permeability to simple ions. The biologist would like to know whether it has a reticulate or porous structure, whether it has a uniform thin lipoid surface or whether it is emulsoid. Different types of indirect evidence have suggested all of these possibilities. What is obviously needed is direct observation."

Other details, too, may be brought out, he said. One of these may tell more about the very important process by which plant cells, with the influence of sunlight, convert carbon dioxide and water into carbohydrates, which are foods for man and beast. Chlorophyll, the green coloring matter of plants, does not show this process, called photosynthesis, when in solution. It does so in the plant cells, where there are chlorophyll-containing bodies called plastids.

"A knowledge of the molecular structure and organization of the plastid may go far in helping us to determine what the photosynthetic unit really is and to understand the photosynthetic process itself," said Dr. Marshak.

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For Industrial Research

MANY industrial applications of the electron microscope have already been found, and others are in prospect, Dr. Otto Beeck, of the Shell Development Company, told the symposium. Among those he mentioned are:

"The investigation of industrial dust and smokes is a problem of sanitary importance.—Knowledge of the actual shapes of the photographic grains and how they are affected by the different developers will possibly revolutionize the photographic industry.—Producers of artificial fibers can compare their product with natural fibers to the most minute details.—The colloid chemist will see directly what he had heretofore to deduce through indirect methods. He will be able to measure particle size and obtain size distributions directly.—The structure of evaporated metal films can be investigated and of late it looks as though we soon shall be able to obtain pictures of the minute details of metal surfaces without the necessity of preparing specimens which are transparent to electrons."

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Cadmium from Silver

A FORM of the metal cadmium which gives off radium rays and lasts many weeks is the latest product of modern alchemists who turn one kind of matter into another. The radioactive cadmium is made by bombarding silver with deuterons, or atomic bullets, from the cyclotron, said Dr. A. C. Helmholz, of the University of California.

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Light Beam Recorded

IN MANY scientific instruments, the indication is by a weightless light beam pointer. That is, a mirror on the instrument swings, and the beam of light reflected from it moves to indicate the value being measured. To record such a moving beam, it is allowed to fall on a moving band of photographic paper.

However, such a record may now be made directly with a pen, using a device described to the meeting by D. J. Pompeo and C. J. Penther, of the Shell Development Company, Emeryville, Calif. This has the advantage that the record is obtained without having to bother developing the photographic paper.

What are essentially two photocells, or "electric eyes," are mounted on a moving carriage, which carries the pen. When the light on the two photocells is the same, the carriage is stationary. But as soon as the light swings, one cell receives more than the other, and motors are operated to move it until they are again equally illuminated. In this way the pen follows the light beam, and the pen writes its record on a moving strip of ordinary paper.

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AGRICULTURE

Vitamin B_1 in Irrigation Fails to Aid Orange Trees

HEALTHY valencia orange trees, grown under favorable conditions, failed to show any improvement from good to superior when vitamin B_1 and nicotinic acid were added to soil and irrigation water. This was the report of Dr. E. R. Parker and Dr. F. M. Turrell of the Citrus Experiment Station and Dr. James Bonner of the California Institute of Technology on experiments carried on at Riverside.

Young trees were planted in good soil, well drained and aerated. At the time of planting organic matter in the form of peat and dairy manure was added to the fill-in soil and as a surface mulch; the usual procedure.

As the trees grew, vitamin B_1 and nicotinic acid, another factor in the vitamin B complex, were added generously to the irrigation water continually throughout two seasons. Now vitamin B_1 can do remarkable things for humans deficient in the substance. It also stimulates growth in some plants. But healthy young valencia orange trees, according to the scientists, apparently have no use for vitamin B_1 or nicotinic acid.

"It appears," they said, "that vigorous young valencia trees synthesize sufficient vitamin B_1 for their own needs. The vitamin B_1 content of the mature leaves was not affected by any of the soil treatments. In all cases it was higher than that of species of plants which responded to treatment with vitamin B_1. The beneficial effects of the organic matter applied to newly planted trees appears to be due to factors which were not limiting in these experiments."

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