# SCIENCE NEWS

*Science Service, Washington, D. C.*

## PAPERS READ BEFORE THE PACIFIC DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### THE MT. PALOMAR TELESCOPE

COMPLETION of the great 200-inch telescope to be erected on Mount Palomar as part of the department of astrophysics of the California Institute of Technology is at last in sight, thirteen years after the late Dr. George Ellery Hale convinced the Rockefeller Boards of the feasibility of such an instrument and obtained funds for its construction.

This was announced by Dr. Max Mason, chairman of the Observatory Council, speaking before the Pacific Division of the American Association for the Advancement of Science and the Astronomical Society of the Pacific. He reported that the difficulty caused by a sagging of the great disk of glass for the big mirror which will collect and concentrate the light of distant stars, had been overcome.

The disk, which is 17 feet in diameter and originally weighed 21 tons before some four tons of glass were removed in grinding, is solid in front, but the back is ribbed, mainly to lighten it. By a system of 36 levers, the mirror is held in the holes formed between these ribs. Both the method of support and the structure of the mirror are new in this instrument.

"The supporting system must operate so perfectly that no bending of the reflecting surface beyond one or two millionths of an inch will occur as the telescope moves. As the surface of the mirror was brought by polishing close to a spherical form it became clear that the disk, when tipped from the grinding table to a vertical position for optical test, sagged slightly under gravity. After months of study, as the polishing continued, this sag was eliminated by installing a system of twenty-four squeeze levers, operated by counter weights, distributed around the rim of the glass."

Dr. Mason announced that the mounting of the great telescope on Palomar Mountain is now completed. After five years work on the mirror in Pasadena, more than four tons of glass have been removed. It has nearly reached the spherical surface which it must have before it is changed to a paraboloid by deepening the center concavity five thousandths of an inch. It is doubtful, he stated, whether the new instrument will be useful for photographing moon or planets, due to shakiness of the air, which destroys detail. Instead it will be used to study faint and distant galaxies and to analyze into high detail light received from stars and planets.

When the 200-inch telescope finally does swing into use, one of its employments will be the study of radiations from the planets, was reported by Dr. John Strong. Planets not only reflect visible light which they receive from the sun; they absorb and then re-radiate considerable quantities of solar energy, largely in the form of the invisible infra-red rays. These will be caught by the great mirror and analyzed in a number of specially constructed instruments.

These instruments are now being constructed and the special techniques necessary for their operation are being developed by members of the institute staff. Much of the information necessary for comparison of conditions on the planets with those on the earth can be obtained only by a more careful and exact study of physical processes taking place on our own planet's surface and in its atmosphere. Determinations, on an entirely new order of exactness, of what happens to earth radiations when they pass through water vapor, carbon dioxide, ozone and the major atmospheric gases, are on the program of research. Incidentally, Dr. Strong pointed out, data obtained in these researches will probably have considerable value to meteorologists as well as to astronomers.

### THE METAL CADMIUM

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, was announced at the meeting of the American Physical Society, meeting with the Pacific Division, by Dr. A. C. Helmholz, of the University of California. Although radioactive forms of all the elements have been made in this way, most of them quickly decompose, in a matter of minutes or even seconds. The cadmium, however, is relatively long-lived. At the end of about 158 days, Dr. Helmholz finds that half the original amount will remain.

### SWING OF LIGHT BEAM

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 sensitive 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 develop 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.

### SPRING GROWTH IN SEA PASTURES

Spring is the time of most rapid growth in the pastures of the sea as well as in the pastures ashore, it appears from observations on the waters off the coast of California, was reported by Professor W. E. Allen, of the Scripps Institution of Oceanography. The minute one-celled plants known as diatoms, which are the ultimate food of all sea creatures, tend to reach maximum abundance dur-

ing the second quarter of the year. Warmth in itself seems not to favor these plants, for in years when the water has been warmest, as in 1926 and 1931, production of this "grass of the sea" has been very poor.

### Sea Winds Trim Trees

Winds from the sea can trim trees well inland, giving them the distorted, fantastic shapes most often seen on dunes and rocky shores, was described by Professor R. W. Richardson, of San Diego State College. Golden Gate is a great wind-gap as well as a great doorway of commerce, for sea winds pour in through this opening in the coastal range and spread far into California's inland valley. Before the coming of white men, this valley was fully wooded, but even in early Spanish days axe and fire began their work, and now it is principally an area of farms and open pastures. Individual trees in the valley have their forms changed drastically by the persistent strong winds that are now free to blow over the denuded landscape. Professor Richardson supported the theory that such wind-blown forms in trees are produced mainly by simple mechanical effects, rather than by salt particles carried in the wind or by greater evaporation on the windward side.

### The Mysteries of Living Cells

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 in Pasadena at a symposium on the electron microscope, held by the American Physical Society, meeting with the Pacific Division, 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. 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. Chlorophyl, the green coloring matter of plants, does not show this process, called photosynthesis when in solution. It does so in plant cells, where there are chlorophyl-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."

### 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, reported to 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 neutral 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."

### "Tagged" Atoms and Biological Research

How chemical elements "tagged" by making them artificially radioactive with atomic-particle bombardment in a cyclotron are being used in biological research and in medical treatment was described at the meeting by Dr. John H. Lawrence, of the University of California. Although this new tool of research is only about half-a-dozen years old, it is being extensively used.

When a radioactive atom has been introduced into the blood stream of an animal or the sap stream of a plant, its course and final lodgment can be followed by means of an instrument called a Geiger counter, which clicks whenever one of the radioactive particles given off by the atom passes through it. Formerly it was necessary to kill and dissect the animals before testing their organs and tissues for the presence of these tagged atoms, but technique has been improved to a point where this is not necessary in many cases. This Dr. Lawrence demonstrated by holding a Geiger counter over the thyroid gland of a colleague who some time before had drunk a "cocktail" of a radioactive iodine compound.

Conspicuous among possible medical uses of artificially radioactive substances is the treatment of cancer and several other diseases by means of radioactive phosphorus. It has been discovered that tumor cells absorb much more phosphorus than do healthy cells. At the same time, it has long been known that such diseased cells are very sensitive to radiations. By giving doses of radioactive phosphorus, the anarchistic cells of malignant tumors are in effect induced to commit suicide, for they eagerly absorb the phosphorus and are then killed by its radiation.

### Vitamin $B_1$ and Plant Disease Control

The story of a vitamin experiment that backfired was told to plant pathologists attending the meeting, by Dr. Dean E. Pryor, of the U. S. Department of Agriculture. He undertook to test a theory that if cantaloupe vines were given doses of vitamin $B_1$ they would acquire extra vigor and thus become resistant to the troublesome fungus disease known as powdery mildew. Under both greenhouse and field conditions, the vitamin seemed, if anything, to impart more vigor to the fungus than it did to the vines. From these preliminary results, he concluded, it would seem that the vitamin "offers little possibility

for control of cantaloupe powdery mildew.'' More hope would seem to be found in breeding and selection of strains resistant to the disease, for in experiments which Dr. Pryor carried on jointly with Dr. Thomas E. Whitaker, also of the Department of Agriculture, a number of plants were found that showed no gross signs of the mildew, even in the midst of plantings that were heavily infested. Further search for resistant strains is still going on.

### ORANGE TREES AND VITAMIN $B_1$

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.''

## ITEMS

A SPOT in the ocean, centered between Iceland, Greenland and Newfoundland, was severely jolted on its underlying sea bed on June 18, by a strong earthquake shock. As determined by the U. S. Coast and Geodetic Survey on the basis of data collected by Science Service, the epicenter was in latitude 52 degrees north, longitude 52 degrees west. This puts it about 900 miles northeast of Newfoundland, 900 miles southwest of Iceland, and 750 miles southeast of the tip of Greenland. The quake began at 6:09 A.M., Eastern Standard Time. Seismological stations furnishing telegraphic data were those of St. Louis University, Georgetown University, the Dominion Observatory at Ottawa and the U. S. Coast and Geodetic Survey at Tucson, Ariz.

DROUGHT relief came last week to the Southeast, with a spread of the rains that had already ended the anxieties of the farmers in all except the extreme tip of the Northeast, the U. S. Weather Bureau reports. More rain, however, would be helpful; there is still a considerable moisture deficit for the season. Farther west, excessive wetness continued. Farmers in the southern part of the Wheat Belt, from Texas to Kansas, began harvest under difficulties. Cornfields in the Southwest have become troublesomely weedy because of the impossibility of getting cultivators into the muddy fields. Last week was a week of low temperatures generally, with nothing above 90 degrees reported north of Virginia, Tennessee and northern Louisiana. There was even a little frost in the northern Great Lakes region.

A NEW model, graphically depicting the great submarine canyon that gashes the ocean bottom off the mouth of the Hudson River, has been placed on display at the American Museum of Natural History. This canyon, 50 miles long and with a depth comparable to that of the Grand Canyon of Arizona, will be invisible to human sight as long as the ocean lasts, yet modern echo-sounding methods have made it possible to learn its topography in great detail. The new relief model, constructed under the direction of Dr. Harold E. Vokes of the museum staff, is eleven feet long and three and one half feet wide. It represents an area 164 miles long and 53 miles wide.

STRATOSPHERE conditions of low atmospheric pressure and great cold are duplicated in a three-foot-square cabinet known as a ''flight similitude chamber,'' developed by a University of Chicago meteorologist, Dr. Michael Ference, Jr. The apparatus will be used in training weather observers for service in military and civil aviation, as well as in calibrating the radiosonde instruments carried up into the stratosphere by small balloons to record conditions there and report them back to earth by means of robot radio sets. In the laboratory, the radiosonde instruments are placed in the flight similitude chamber. A vacuum pump partially exhausts the air, while a combination of dry ice and alcohol evaporation reduces the temperature. The radiosonde faithfully reports the changing conditions to the listening students, while an instructor checks accuracy of their interpretations. Conditions duplicating those of 20 miles above the earth's surface, with atmospheric pressure reduced to one per cent. of normal and temperature at 100 degrees below zero Fahrenheit, have been produced in the laboratory with the new apparatus.

THE mystery of the suppressed mathematical tables—that is a problem for which an answer is sought by E. H. Neville, of the University of Reading. The tables in question were prepared by James W. L. Glaisher, mathematician of Cambridge University, who died in 1928 at the age of eighty years. He seems to have had the curious habit of preparing tables of mathematical functions of various kinds, tools of great value in many kinds of scientific work, and then, despite the great labor expended, keeping them hidden. One of these was a table of squares, cubes and other powers up to the twelfth of the numbers from one to 1,000. ''This table,'' writes Mr. Neville in a communication to *Nature*, ''was finished in 1873 and was stereotyped, but it was not published. The plates were presumably destroyed, and the proofs seem to have been systematically hunted down; one copy survived in secret.'' This copy was used as the basis for a Table of Powers just published by the British Association for the Advancement of Science.