

small unmanned free-flight balloons which would transmit by radio the data being obtained in automatic instruments miles above the earth.

Cosmic ray measurements 820 feet below the surface of the Red Sea indicate that a large share of cosmic radiation consists of electrical particles, contends Prof. W. F. G. Swann of Bartol Research Foundation.

Radiation resembling cosmic rays but less penetrating is thrown out by the tops of thunderstorm clouds, Dr. B. F. G. Schonland, South African physicist reported.

Hardest cosmic rays so far discovered (penetrating more than 800 meters or 2620 feet of water) were discovered by Dr. Axel Corlin, University of Lund, Sweden, through experiments in an iron mine.

The formation of positrons from cosmic or gamma rays received support from calculations by Drs. W. Heitler and F. Sauter, of Bristol and Berlin.

Cosmic rays are charged particles, not radiation, Drs. A. H. Compton and R. J. Stephenson, University of Chicago, concluded on the basis of cosmic ray meter records of the Settle-Fordney stratosphere 11-mile high flight.

Evidence accumulated that a trinity of particles—neutron, positron and electron—compose all the matter of the universe.

Following Dr. R. M. Langer's and Dr. Carl Anderson's early prediction, renewed suggestions that there exists a new atomic particle—the negative proton—were advanced by Dr. S. Tolansky of the Imperial College of Science, London, and Prof. G. Gamow of the Polytechnical Institute, Leningrad, U. S. S. R.

A new atomic particle—a double weight neutron—was suggested by Dr. M. A. Tuve of Carnegie Institution in Washington.

Experimental proof of conversion of radiation (cosmic or gamma rays) into matter (electrons or positrons) was questioned by Dr. Carl D. Anderson, California Institute of Technology, who holds that when lead or aluminum is bombarded rays merely knock out particles already existing in atomic nuclei.

A new source of protons for atomic bombardments, consisting of an electric arc operating in hydrogen at low pressure between an incandescent filament and a metal electrode, was devised by Drs. Edward S. Lamar and Overton Luhr, Massachusetts Institute of Technology.

Fast electrons, as well as cosmic and gamma rays, may give rise to pairs of negative and positive particles when they hit nuclei of atoms, Dr. D. Skobelzyn, Leningrad, found.

Prof. Enrico Fermi of Italy discovered the type of artificial radioactivity in which a negative electron or beta particle is liberated—as contrasted with the liberation of the positron in the Joliot experiments—by bombarding elements with neutrons.

That the half-life or rate of decay, of artificial radioactive materials is different for the same substance when produced in different ways was shown by the experiments of Drs. C. C. Lauritsen, R. Crane, and W. Harper, California Institute of Technology, who found that, when they turned carbon into nitrogen by bombarding it with deuterons, the half-life of the material was different from the nitrogen made by the Joliot in Paris by bombarding carbon with alpha particles.

The positron is the shortest lived thing in the universe and dies when absorbed by matter as predicted by the Dirac theory, Prof. F. Joliot and Prof. Jean Thibaud, French scientists, determined independently.

Using instruments counting individual photons of light, Swiss scientists, Edgar Meyer, M. Schein and B. Stoll have been able to detect a new band of invisible light in the ultraviolet in the region from 2,400 to 1,900 Angstrom units.

By free-flight balloon ascensions Prof. Erich Regener of the Physical Institute of Stuttgart, Germany, indicated that 70 per cent. of the ozone is below 19.5 miles altitude, much lower than the height previously supposed.

Invention by Prof. G. R. Harrison of Massachusetts Institute of Technology of two devices for measuring and analyzing complicated spectra are: (1) a wavelength computing machine which automatically prints wavelengths and intensities with all correction factors directly on a photographic plate, and (2) an interval sorter which performs and sorts 50,000 subtractions of wave numbers per minute.

Analysis of the observations made by American investigators during the Polar Year indicates that the temperature of the region from 62 to 124 miles above the earth is probably in the neighborhood of 80 degrees Fahrenheit.

Small periodic variations in the measurements of the velocity of light were found in the course of extensions of Michelson's experiments at Mt. Wilson Observatory, which gave a new average value, 299,774 kilometers per second, but these were attributed not to a real variation in light's speed but to other undiscovered causes.

A new theory of relativity developed by Sir Shah Sulaiman, distinguished mathematician and justice at Allahabad, India, links the classical mechanics of Isaac Newton with results predicted by Einstein's relativity.

"Photographs" of atoms magnified, in effect, 200,000,000 times obtained by the use of X-rays were exhibited by Prof. A. H. Compton and Dr. E. O. Wollan of the University of Chicago.

X-ray studies of the structure of wood fibers reveal that even, soft tone accompanies the non-orientation of the wood fibers in the maple back of a violin, Dr. K. Lark-Horovitz and W. I. Caldwell of Purdue University have discovered.

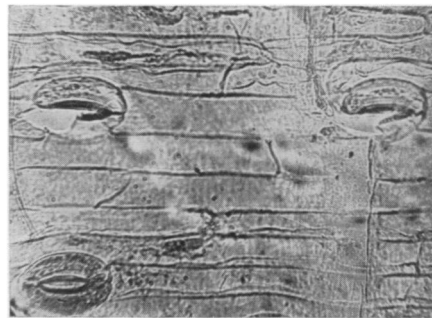
Heat-absorbing glass which removes 52 per cent. of the "hot" but invisible infrared rays and which is expected to prove useful for skylight in southern factories during hot summer months, was reported by Dr. Roger S. Estey, physicist of the Electrical Testing Laboratories, New York City, to the Optical Society of America.

Sextants and binoculars can be improved for use under certain light conditions by attaching polarizing prisms, Dr. E. O. Hulbert, Naval Research Laboratory, found.

A precise value for the velocity of sound, 1087.13 feet per second at zero degrees Centigrade, was announced by Dr. Dayton C. Miller, Case School of Applied Science, who computed data from big gun firing just after the close of the World War.

By firing a gun into the barrel of a similar gun, Dr. C. Ramsauer, German physicist, developed a method of producing high pressures and high temperatures simultaneously.

The Raman effect of heavy water (containing hydrogen isotope mass two) is different



#### BURST BY LIGHT

*The two cells above, stomatal guard cells on the leaf of a hyacinth, are completely shattered by the action of polarized sunlight on the starch contained in them. The cell in the lower left has burst at one corner and the contents are beginning to spill out. See story on page 387.*

from that of ordinary water, Dr. R. W. Wood, Johns Hopkins University, found.

Production of clear crystals of lithium fluoride transparent to 900 Angstrom units in the ultraviolet and with practically no variation in dispersion over visible spectrum, have been developed as a practical optical material in large sizes by Prof. D. C. Stockbarger of Massachusetts Institute of Technology.

## Psychology and Psychiatry

Learning of the simple type known as "conditioned reflex" may take place when the brain cortex is completely missing, but a form of conditioning involving adaptation was found to depend upon functioning of the cortex in dog experiments by Dr. Elmer Culler, University of Illinois.

The association area of the frontal lobes of the brain is essential to memory of the immediate past, or ability to keep in mind several aspects of a problem while seeking the solution, it was learned from experiments with apes and monkeys performed by Drs. C. F. Jacobsen and J. B. Wolfe, Laboratories of Comparative Psychobiology, Yale University.

High frequency radio currents were used by Dr. Clarence W. Brown, University of California, to block out certain nervous centers of the brain for study of their functions without pain or injury to the animal involved and without affecting the higher cortical centers of its brain.

The successful planting of small coils beneath the skin on the heads of dogs, with direct connection to the brain, made possible, by means of induced currents, the study of special functions of brain areas without pain or injury to the animals, Dr. Roger B. Loucks, Phipps Psychiatric Clinic, Johns Hopkins University, reported.

Complete loss of the occipital lobes of the brain does not prevent dogs from learning to respond to a signal of light, although without this "visual" area the animals are unable to see objects or forms, it was discovered by Dr. Donald G. Marquis, Yale.

Salt is not a taste, but is discerned by a skin mechanism, is the conclusion of Dr. Samuel Renshaw, Ohio State University, who found that salt, unlike tastes, is more notice-