

SCIENTIFIC EVENTS

THE ROYAL OBSERVATORY, GREENWICH¹

THE annual report of the Astronomer Royal, just published, refers to the work of the Royal Observatory during the period May 1, 1940–April 30, 1941. To those who know the position of the observatory, in the midst of military and industrial objectives, it will come as no surprise that much of the work has been curtailed by enemy action. The last report mentioned the dismantling of much of the optical apparatus; most of the mirrors and lenses have now been sent away from Greenwich for safety. Since heavy bombing of London started last September, night observations have been impossible on such of the telescopes as had not already been dismantled at the outbreak of hostilities; in fact, the only observing programs still carried on at Greenwich are daylight ones, namely, the routine meteorological work and the photographic and visual solar observations.

The public time service functions well from two emergency outstations, as the familiar "six pips" regularly testify. The Rugby rhythmic signals, however, in present circumstances fall short of the high precision needed for control of frequency standards, though they are, of course, quite adequate for navigation. Rating of chronometers and watches and their issue to the Royal Navy continue as usual, though the entire establishment concerned has been moved for the second time in two years.

Work has ceased on the Airy transit circle after continuous observation with this instrument for ninety years. More than 650,000 observations have been made with it, forming the most important contribution from a single instrument to fundamental positional astronomy. The new reversible transit circle which is to take its place has obtained nearly 10,000 transits during the last three years. When observing ceased in September, 1940, the work of determining the division errors had been completed and an investigation started on the irregularities of the pivots. These latter have already been found to be extremely small.

The photoheliograph and spectrohelioscope observations show the expected decline in solar activity from the 1937–38 maximum, the sunspot frequency having dropped to about half that at maximum. Nevertheless, twenty-one large groups of spots occurred, six of them being later associated with magnetic storms. One of these latter, that of March 1, 1941, ranks high among the most severe disturbances of the past ninety years. The associated spot could not be extensively observed because of cloud,

but the number of short-wave radio fade-outs occurring during its central meridian passage suggests that it was chromospherically very active. Over the year as a whole, however, both chromospheric eruptions and radio fade-outs were few.

The meteorological department of the observatory has celebrated its centenary of routine observations. Features of the year's weather include an August drier than any for 122 years, and a period from December to April during which each month was considerably colder than normal, the temperature in the Stevenson screen never reaching 59° F. for the whole five months.

Discussion of the photographic material, comprising nearly 3,000 plates, obtained during the 1931 opposition of Eros, is now practically complete. The solar parallax deduced from these observations at stations all over the world is $8.790'' \pm 0.001''$, the previously accepted value being $8.80''$.

The "Nautical Almanac" office continues its essential work, though it has had to contend with the destruction by fire of the whole of the type and plates for all its publications except the "Astronomical Navigation Tables." The consequent delay in publication is being rapidly made good, in some cases by using photographic reproduction in lieu of printing from type.

Astronomers all over the world will join in sympathizing with the Astronomer Royal and his staff on the interruption of many of their long-established programs, and in congratulating them on their maintenance of essential services throughout a very trying period.

COSMIC RAY INVESTIGATIONS

RESULTS of cosmic ray investigations in the Andes ranging up to 19,200 feet—nearly a mile higher than the highest peak in the United States—were reported on his return to the United States on August 22 by Dr. Arthur H. Compton, of the University of Chicago, leader of the expedition. These are, according to the official announcement:

1. At an altitude of more than 15,600 feet on the site of a Cerro de Pasco Corporation mine near Oroya in central Peru, Drs. Ernest O. Wollan and Donald Hughes photographed tracks of cosmic ray particles with a cloud chamber. They had 9,000 pounds of equipment, including the large permanent magnet used in high altitude experimental airplane flights in this country. Their chief finding was clear photographic evidence of the production of groups of positive and negative mesotrons.

2. Working on Mount El Misti in southern Peru at altitudes up to 19,200 feet, Dr. Norman Hilberry and his wife, Dr. Ann Hepburn Hilberry, verified fundamental

¹ From *Nature*.

theories on the origin of giant cosmic ray showers, establishing the "peak" of their occurrence at approximately 16,000 feet.

3. Staging the first stratosphere balloon flights at the equator seeking information on mesotrons, rays produced by collision of a cosmic ray and nucleus of an atom in the atmosphere, Drs. William P. Jesse, of the University of Chicago, and Paulus A. Pompeia, of the University of São Paulo, Brazil, have already recovered one flight which is now being studied and are continuing their investigations.

The University of Chicago expedition, aided by the Nelson Rockefeller Committee on Cultural and Commercial Relations between the American Republics, started two months ago. Its members included Dr. Pompeia, of the University of São Paulo, who had been at the University of Chicago for the last year; Professor Norman Hilberry, now of New York University, and other members of the scientific staff of the University of Chicago.

The expedition had as its scientific objectives procurement of data from equatorial locations and elaboration of experiments conducted in the United States at various elevations.

The Oroya investigations were similar to those conducted in the Denver mountain parks, cooperatively by the University of Denver, the Massachusetts Institute of Technology, Cornell University and the University of Chicago. At the Oroya site, however, the investigators were able to get the same equipment to a point a thousand feet higher than any mountain in this country. The resulting pictures of tracks of cosmic ray particles show production of groups of positive and negative mesotrons and lay the basis of possible analysis of the particles.

At the Oroya site, the same permanent magnet was used as in high-altitude plane flights made two years ago at Chicago for cosmic ray investigations. With the advantage of longer time and less cramped conditions for observations, evidence corroborating indications from the airplane observations was procured.

The Hilberrys set up three observation stations on El Misti, at 7,500, 15,500 and 19,200 feet, using a mule train to reach their posts and carrying oxygen, though they did not find it necessary to use it. The same height for observations was reached in the Himalayas nine years ago, but reaching this height required two weeks against a day and a half in the Andean location. The El Misti base was at Arequipa.

The chief finding of the El Misti investigation was the greatest abundance of giant showers of cosmic rays at approximately 16,000 feet and laying of groundwork for reliable estimates of the maximum energy in primary cosmic ray particles. The theory had been that the showers of cosmic rays developed as they came down through the atmosphere. With ob-

servations made at the 16,000-foot or peak-level, this theory was corroborated. The maximum energy in the primary cosmic ray particle is estimated by physicists at approximately ten billion times the energy released by a radium ray, or enough energy in a single atom to lift one's finger off the table.

The balloon flights staged by Drs. Pompeia and Jesse at São Paulo were designed to investigate further the hypothesis that the cosmic ray particle entering the earth from outside the atmosphere is the proton; and to discover whether mesotrons are produced with higher energy at the top of the atmosphere near the equator than at the top of the atmosphere over Chicago.

Other flights have been made from the equator, but these are the first flights designed for mesotron information. The results will be compared with results of similar flights in Texas and Chicago to determine the comparative energies in various parts of the ceiling of the atmosphere.

COMMISSION TO CHINA ON MALARIA CONTROL

At the request of the Chinese Government, this country will send a commission of medical and sanitary officers and entomologists to control malaria and supervise sanitation and medical care of 250,000 Chinese laborers to be employed in the construction of a railroad in the Chinese Province of Yunnan. The commission is appointed by Surgeon General Thomas Parran and will be headed by Dr. V. H. Haas, of the Public Health Service. It will consist of some sixteen American members.

The malaria control will be undertaken in one of the most highly malarious sections of China. In addition, general sanitary and medical supervision of the workers will be undertaken by the commission. Approximately \$1,140,000 has been supplied the project by this government under terms of the Lend-Lease Act. Salaries of laborers and of medical and sanitary officers supplied by the Chinese Government will be paid by China. The \$1,140,000 will pay for salaries and expenses of the American members of the commission and for drugs and chemicals and medical supplies.

The Rockefeller Foundation was asked to assist by making available the services of some of its personnel. D. E. Wright, a sanitary engineer on the staff of the International Health Division, has been assigned for full-time service with the commission. Dr. Marshall C. Balfour, regional director for the International Health Division in the Far East, is serving intermittently as consultant. There will also be cooperation with the laboratory for malaria investigations at Chefang on the Burma Road.

Members of the commission will leave for China at