between their mean number and mean energy, (iii) the relation between the standard deviation of the number and that of the energy. The fluctuations in the number are sufficiently small for this alone to give a good indication of the excitation energy. The calculations of negative meson capture by light nuclei, reported on by Miss Ruddlesden, lead to the relative probabilities of different modes of disintegration of the nucleus, and also to the energy spectrum of the charged particles ejected. Two types of meson-nuclear interaction have been considered. The lightest nuclei producing charged particles, namely, helium-3 and -4, were dealt with first, and later carbon and other α-particle nuclei. The energy spectrum of α-particles issuing from carbon can be made to agree quite well with experimental results from Bristol[10], by adjustment of one available parameter.

The final afternoon of the meeting was occupied with an inspection of the new Nuclear Physics Laboratory and the George Holt Physics Laboratory, after an introductory talk by Prof. H. W. B. Skinner on the layout and purpose of the former. He stated that the new Laboratory has been designed to accommodate two particle accelerators, a large synchro-cyclotron and a Cockcroft–Walton generator. Started in the middle of 1948, the main part of the building was completed by the end of 1949. It is hoped that the large cyclotron will be running by the end of 1951. The one-million-volt high-tension set which is now nearly complete follows conventional design. Two new features are incorporated: the ion source is of the radio-frequency type suggested by Thonemann, and the magnet used to deflect the beam through 90° is of the permanent type. This has a motor-driven shunt which enables the magnetic field to be varied between zero and a maximum of 10,000 gauss. The synchro-cyclotron is designed to accelerate protons to an energy of 400 MeV. The electromagnet has poles 156 in. in diameter and contains 1,640 tons of steel, which have already been delivered. The two energizing coils are wound from 1½-in. square-section aluminium and are cooled by passing water through a ⅝-in. diameter hole in the centre of the conductor. The coils weigh 30 tons each. The magnet will produce a field of at least 18,000 gauss at an input power of 840 kW. The cyclotron is surrounded by a concrete wall 6 ft. thick. Additional screening is effected by means of a bank of pulverized sandstone 15 ft. thick. A concrete wall of at least 12 ft. effective thickness, part of which will be constructed in removable blocks of loaded concrete, will separate the cyclotron from the experimental room. Easy access will be provided by means of a 30-ton cylindrical door which may be raised or lowered as required. Above the cyclotron room and separated from it by a concrete roof 5 ft. thick is the equipment room which will house most of the auxiliary gear. The control room will be situated in the main laboratory block.

R. HUBY


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# ROYAL GREENWICH OBSERVATORY

## ANNUAL REPORT

THE report of the Astronomer Royal to the Board of Visitors of the Royal Greenwich Observatory, presented at the annual visitation of the Royal Observatory, held on June 3, refers to the period from May 1, 1949 to April 30, 1950, and exhibits the state of the Observatory on the latter date. Although a certain amount of progress has been made, things are still far from satisfactory, and the public should realize the serious difficulties under which the Royal Greenwich Observatory is struggling at present.

The temporary repair to the two large domes by placing tarpaulin inside them is only a partial success, and rainwater is able to percolate. The famous Octagon Room, Flamsteed's observatory, is without glass and requires a considerable amount of internal repair; meanwhile, further deterioration is taking place in historic buildings—a condition of affairs which has given rise to much adverse comment. Equally unsatisfactory are the housing conditions for the staff at Herstmonceux. Although the council houses made available through the Ministry of Health are sufficient for the needs of the junior and industrial staff, they are unsuitable for the senior staff, and the lack of houses for the latter is a serious handicap to recruitment for senior grades. It is pointed out that the only solution is for the Admiralty to build houses which are suitable to the status of the officers concerned. The proposal has been made to the Admiralty that houses should be built for the senior observing staff, who could thus reside fairly close to the Observatory; but unfortunately no decision has yet been given on the proposal. This is a matter of grave urgency, and, unless it is attended to forthwith, the work of the Royal Greenwich Observatory will be very seriously handicapped.

In addition to these drawbacks to the personnel, there is great disappointment at the slow rate of progress in the construction of new buildings for the instruments at Herstmonceux, and delays in this work are partly due to the remarkable decision that detailed requirements for every new building must be known before the construction of one of them can be commenced. A ray of hope illuminates a doubtful future—if these delays are not cumulative in their effect and if the new construction (when it commences) is sufficiently accelerated, the whole of the removal to the new site will be completed by the end of 1953.

Among a number of satisfactory features may be mentioned the move of the Solar Department and also, in part, the section of the Magnetic and Meteorological Department which was at Greenwich, and of the Nautical Almanac Office from Bath. The adaptation of the Great Hall of the Castle as a library is making good progress, and the conversion of the permanent chronometer rating and storage rooms under the Great Hall has been completed, the rooms now being in use.

It is impossible in the limited space available here to deal in detail with the report, which should be read by all who are interested in the future of the Royal Greenwich Observatory, and many will be specially interested in the plans for the installation of the Meridian Group and also the Equatorial Group. The latter will have three isolated domes for the 26-in., 28-in. and astrographic refractors, a three-dome building being in front of them to take the

30-in. and 36-in. reflectors as well as a Schmidt camera of 25–38 in., together with an aluminizing room and plant, and various other equipments. The aluminizing plant will be able to deal with the three main mirrors and, in addition, will serve as a pilot-model for the large reflector that will be later required for the Isaac Newton Observatory.

One point which is of special interest is the annual variation in the rotation of the earth, and this is dealt with under "Time Service". The rotation is such that the earth is slow in the spring and fast in the autumn, relative to the uniform time, by about 0·06 sec.; this subject is dealt with very fully by H. F. Finch[1]. The amplitude appears to be practically constant from year to year, and corrections for the effect are being made in the retrospective assessment of clock performance and also in the prediction of clock error and rate for the current operation of the time service.

In spite of the delay in the removal of the Observatory to Herstmonceux, perhaps its completion by the end of 1953, considering the international situation, will be accepted as something for which astronomers may, after all, be grateful.

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# SOUTH AFRICAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

## ANNUAL REPORT FOR 1948-49

THE fourth annual report of the South African Council for Scientific and Industrial Research* covers the year ending October 5, 1949, and includes the balance sheet and income and expenditure statement for the financial year ending March 31, 1949. While the buildings in which the headquarters staff and library and the national research laboratories for physics, chemistry and building have been housed during the past four years have been adapted to provide reasonably good facilities, the Council has now drawn up preliminary plans and estimates for a permanent building on a site offered by the University of Pretoria on its experimental farm.

Forty-three investigations, on contract, mainly industrial research, were completed during the year, and the system of industrial research fellowships has received further support. In addition to two research fellowships on lightning problems, two fellowships for the chemistry of wool and its by-products are being provided by the South African Wool Board. The Council also assisted in the incorporation of the Paint Industries Research Institute and the Sugar Milling Research Institute, and has discussed with the South African Wool Board the establishment of a wool textile research institute under its research association scheme. Satisfactory progress is also reported by the Fishing Industry Research Institute and the Leather Industries Research Institute. Of £46,130 provided by the Council for research workers in the universities and medical research units, £18,680 was for research in clinical medicine and surgery.

Special stress is laid in the report on the importance of the medical research units. Such units have been developed for research on tuberculosis, amœbiasis, bilharziasis and tropical diseases, nutrition, virus diseases, social medicine and cardio-pulmonary disease. A subcommittee of the Medical Research Committee advises the Council on the medical applications of radioisotopes, and the new new drugs, 'Miracil D' and 'aureomycin', have received attention from the Bilharziasis and Amœbiasis Research Units, respectively. The Library and Information Division continues to be handicapped by lack of sets of standard scientific periodicals. A special member of the staff has now been appointed to deal with requests for information, and the Division has also compiled a list of translators for scientific and technical work and organised a second one-day school of library methods for workers in small technical libraries.

The work of the National Building Research Institute has centred on four major problems to the solution of which all the more fundamental investigations have been directed. These are the provision of urban housing for Africans, building on the desiccated clay soils of the high veldt, the gain and loss of heat in buildings under high-insulation conditions, and problems associated with the use of high-magnesium limes. In the National Chemical Research Laboratory a study has been made of the constitution of South African clays, especially those being used to replace bentonite in foundry sands, of the dissolution of Transvaal chromite in sulphuric acid and the electrowinning of chromium, the colorimetric determination of citric acid with the Spekker absorptiometer, the submerged production of citric acid and the application of the anaerobic or methane fermentation process to the purification of molasses fermentation and wine distillation residues. Field research work carried out by the National Institute for Personnel Research has further increased, and much time has been given to research and routine testing on behalf of the Department of Defence. A Psychophysiological Research Unit was formed during the year, and the Statistical Section has worked out a new method of calculating standard scores which is applicable even to grossly abnormal distributions.

Most of the sections of the National Physical Laboratory are now well equipped and are capable of carrying out both applied and fundamental research. In the Electrotechnology and Electronics Division an instrument was developed for measuring and recording the thermocouple voltages generated in the differential thermal analysis of clays and the sine-wave generator brought to completion, while the construction of a saturated-diode transfer standard is nearly completed and a quantometer is being developed for use in spectro-chemical work. The Physics of Matter Division is developing a scintillation assay meter for the assay of uranium oxide in acid solution; a kevatron particle accelerator is receiving a trial run, and an X-ray spectrometer has been modified and fitted with a new slit-system to handle clay minerals with large basal spacings. A high-temperature camera has been designed and built, and a recording spectrophotometer installed. Considerable attention has been given to lens designing, The Telecommunications Research Laboratory has concentrated increasingly on the factors affecting radio-wave propagation in southern Africa, including the ionosphere, radio noise-levels and the physical constants of the ground. Other work includes the development of a high-performance communications receiver on a new principle, the development of an automatic weather station, the study of thunderstorms by radar, and lightning research.

* South African Council for Scientific and Industrial Research. Fourth Annual Report, 1948–1949. Pp. 84 + 7 plates. (Pretoria: South African Council for Scientific and Industrial Research, 1950.)