

THE CARNEGIE INSTITUTION OF WASHINGTON

YEAR Book 64 of the Carnegie Institution of Washington, covering the activities of the Institution in the year ended June 30, 1965, includes, besides the President's review, reports from the several Departments of Terrestrial Magnetism, Plant Biology and Embryology, the Mount Wilson and Palomar Observatories, the Geophysical and Cytogenetics Laboratories, the Committee on Image Tubes for Telescopes and the Genetics Research Unit*. There is also a bibliography of publications during the year, the report of the Executive Committee and a list of officers and staff.

The president comments that the work of the Institution again illustrates the important part played to-day in many scientific fields by programmes of relatively low cost built around the work of the gifted individual investigator, and refers first to the Institution's activities in the planetary sciences, astrophysics and astronomy (see also *Nature*, 209, 743; 1966). Spectacular red-shifts were observed for some of the quasi-stellar radio sources first catalogued by radio astronomers, and much progress was made towards the optical identification of radio sources. An analysis of the new data suggests that we may be on the verge of conclusive evidence about the validity of important hypotheses concerning the dynamic structure of the Universe. A theoretical investigation of background cosmic light from galaxies completed during the year indicated that the combined light of the zodiac and the galaxy would be more than 100 times stronger than the cosmic signal.

The staff of the Observatories were actively concerned with investigations for the site of a possible new major observatory in the Southern Hemisphere. Two prospective sites in Chili offer superlatively good observing conditions, and the Institution is prepared to co-operate in establishing such an observatory. A 200-in. mirror-size instrument would be the most effective, subject to appropriate sponsorship. The Committee on Image Tubes for Telescopes has now met the rather stringent requirements by a 'cascaded' image tube developed for the Committee by the Electron Tube Division of the Radio Corporation of America. Twenty of the tubes were delivered during the year, and the Committee has now designed five different optical systems for efficiently presenting the optical image from a telescope to the tube and for projecting its output on to a photographic plate for recording; these tubes have been made available to five observatories. The Mount Wilson and Palomar Observatories continued their investigations of the spectra of Mars, Venus, Jupiter and Galilean satellites, the asteroid Vesta and the Moon.

The Geophysical Laboratory continued its investigations into the magnetic properties of the Earth meteorite minerals and the organic components of ancient rocks. Much attention was given to present and potential petrographic applications of discriminant function analysis, with particular emphasis on the interesting properties of linear and higher-order discriminants in the closed array. The influence of water on the melting behaviour of simple silicate systems was studied as a contribution to the understanding of volcanic eruptions. A detailed investigation was begun, at the recently developed Strathcona Mine at Sudbury, Ontario, into the formation of copper-iron-nickel sulphide ore. Investigations of the melting relations of the members of volcanic basalt-trachyte associations have confirmed a direct relation between liquid iron enrichment and liquidus temperatures for the rocks of

the oceanic alkali provinces of Hawaii and Tristan da Cunha.

The Department of Terrestrial Magnetism continued its Andes seismic programme, and efforts were made to extend the scope of indigenous analysis procedures for the local groups by establishing a 'Carnegie Analysis Centre' in Antofagasta. The nuclear physics programme continued to be directed towards the interactions of polarized nuclear particles. It was observed that the size-frequency-of-occurrence pattern of the foreshocks of the large Chilean earthquake of 1960 differed remarkably from the pattern of aftershocks for the same region. Apparently each seismically active region has a characteristic 'normal' ratio of small shocks to those of moderate intensity. Investigations of heat flow and thermal properties at the bottom of Lake Superior and of Seneca Lake have suggested a possible new method of measuring the outward flow of heat from the inside of the Earth's crust that avoids the costly drilling of large numbers of very deep holes. The Biophysics Group of the Department has further examined the processes of replication and preservation of the genetic information which is transmitted from cell to cell in the coded form of base sequences in the deoxyribonucleic acid of the cell. Animal deoxyribonucleic acid was found to possess numerous copies of, or very nearly identical, gene sequences when fragmented in suitable suspension and eluted from single-stranded deoxyribonucleic acid immobilized in agar. The degree of homology indicated by the varying firmness of binding is tied to the degree of sameness or identity of the gene fragments, both for the same species or for related animals. Selective repression of lysogenic cells among susceptible bacteria can be effectively obtained by: (1) introduction of defects into deoxyribonucleic acid by radiation or radiomimetic drugs, such as mitomycin; (2) inhibition of repair mechanisms in the deoxyribonucleic acid by agents like hydroxyurea or phenethyl alcohol inhibiting the deoxyribonucleic acid synthesis; (3) inhibition of protein synthesis by drugs such as chloramphenicol, puromycin, or amino-acid analogues; (4) addition of chelators, such as ethylenediamine sodium tetraacetate to amplify the increasing effectiveness of the initial radiation or radiomimetic agents. It remains to be seen if this combination chemotherapy can be effective in inhibiting solid tumours of animals and man.

In the Department of Plant Biology the chemical composition and the function in photosynthesis of the pigment complexes in plants have been a major concern, and efforts were intensified to separate the two pigment systems without altering their characteristic absorption spectra or photochemical activity. Attempts were made to determine what step in the photosynthetic process is responsible for oxygen utilization, and changes in rates of oxygen uptake lasting some minutes were induced in *Chlorella* by illumination for only 1 sec. but not in cells treated with glucose or with antimycin. The location of the copper-containing protein plastocyanin in the electron transport chain of photosynthesis has been more specifically established, while in experimental taxonomy differences continued to be found in the photosynthetic ability of plants native to various climates. Races of *Mimulus lewisii* from high altitudes require considerably higher light intensities to saturate photosynthesis than races of *Mimulus cardinalis* from lower altitudes. Further investigation of the mechanics of light absorption and utilization in *Mimulus* showed that the capacity to absorb light varies between races, and the study of evolutionary relations in *Mimulus* has been extended to the genetics

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of other related species in the Erythranthe section of *Mimulus*.

The Department of Embryology continued to explore the relation of the egg deoxyribonucleic acids to the somatic deoxyribonucleic acids of the eggs of *Xenopus laevis* and *Rana pipiens* and also the mechanism and site of action of actinomycin A in inhibiting the developing heart and somites in chick embryo. A mitochondrial factor was isolated which affords protection against anmycin and also prevents the action of antimycin in monolayer cultures of embryonic skeletal muscle. Evidence was obtained that myoblasts can be infected by Rous sarcoma virus. Experiments are in progress to determine the amount and rate of viral synthesis in muscle at each major point in its development and to compare the infectivity of muscle clones with clones of cartilage cells and with clones of fibroblastic cells. Studies of the fate of small fragments of radioactively labelled chick embryos transplanted orthotopically in unlabelled hosts showed that cells of the epiblast may be found in

autoradiographic preparations in sites approaching the primitive streak and leaving it and in the streak itself.

In the Genetics Research Unit, progress was made towards the completely accurate physical mapping of phage genes. Work on the structure and function of phage deoxyribonucleic acids showed that the deoxyribonucleic acid fragments in the defective bacteriophage T4 particles terminate at random points in the genome of the phage and that the deoxyribonucleic acid molecule and the genome are collinear. Experiments with phage lambda afforded a first physical description of the sequence in the activity of different parts of the phage genome, and other work in the Unit was concerned with the components of actin of the regulators *Spru* and *Ac* present in maize. The Cytogenetics Laboratory reports investigations of the fine structure of chromosomes, the mitotic cycle and deoxyribonucleic acid replication of *Haplopappus gracilis*, the deoxyribonucleic acid of mitotic chromosomes of *Drosophila* and the base composition of heterochromatic deoxyribonucleic acid in *Drosophila melanogaster*.

THE ROYAL SOCIETY OF NEW ZEALAND

THE Royal Society of New Zealand Act, 1965, which came into force on January 1, 1966, consolidates and amends the previous Act of 1933. The Society was established as the New Zealand Institute in 1867 and had three primary functions. First, it provided scientists in New Zealand with an independent forum for scientific discussion, and an open channel for publishing their research findings and, secondly, it offered an independent and authoritative voice to the community and to the Government on scientific matters. Its third function was to act as a body through which New Zealand scientists were linked to the world organization of science, and it is the New Zealand section of the International Council for Scientific Unions.

From its inception, the Society has been federal in structure, linking the activities of regional scientific institutes or societies in the main New Zealand Centres. The new Act and constitution place the policy and control of the Society in the hands of the Fellows while retaining the links established with the member bodies. The Fellowship of the Society, established in 1919, is a self-perpetuating body, at present limited to one hundred scientists, and their part in administering the Society has hitherto been restricted to the appointment of two out of about thirty councillors.

Under the new Act, control of the Society is vested in a council of fourteen, of whom four officers and eight councillors are elected by the Fellows from among their number. The two other councillors represent the member bodies and are appointed by a Member Bodies Committee acting as an electoral college.

The objects of the Society are defined as to promote science, to encourage and stimulate high standards of scientific endeavour and achievement and to give recognition to notable achievements in the advancement of science in New Zealand; to inform the Minister of fields in which, in the opinion of the Council, the scientific effort of New Zealand should be increased, and to suggest how this may be done; to initiate and maintain contacts between New Zealand scientists and scientists in other parts of the world, especially through the unions of the International Council of Scientific Unions and other scientific bodies overseas; to administer funds for scientific research or scientific projects; to initiate meetings or participate in meetings of scientists in New Zealand; to initiate and maintain contacts between scientists in New Zealand, and provide liaison between co-relating efforts of its member bodies and other scientific bodies in New Zealand; and to publish and disseminate scientific knowledge and make available sources of scientific information. The present Council remains in office until the appointment of officers and councillors under the new Act at the annual general meetings of Fellows in May 1966, and one of the last acts of the Council was to adopt new rules which have now been published in the *New Zealand Gazette* of December 22, 1965. Besides the branches of the Royal Society itself, the member bodies listed in the first Schedule to the Act include the Auckland Institute, the Geological Society of New Zealand, the New Zealand Institute of Chemistry, the New Zealand Economic Society and the New Zealand Society of Soil Science.

BRITISH REPRESENTATIONAL SERVICES OVERSEAS

THE debate on a Ministry of External Affairs in the House of Lords on December 21 was opened by Lord Gladwyn, who asked whether the Government had now concluded that the time had arrived for establishing a single Ministry of External Affairs. After referring to the recommendation to this effect in the Plowden Report on Representational Services Overseas, Lord Gladwyn urged that it was now even more important for overseas matters to be handled by a single Ministry of External Affairs.

Lord Caccia supported him, and urged that all that had happened in the past 2 years strengthened the argument. He thought that the present pattern of events was unlikely to change.

Lord Inchyra, while agreeing with Lord Gladwyn, pointed out that the Foreign and Diplomatic Services had already been amalgamated and that the process seemed to be proceeding more smoothly than was anticipated; the time had come, he said, for change. Lord Sherfield also did not see why a single office should not be so organized as to avoid any additional burden on the Secretary of State. He was also supported by Lord Hankey, who thought that if the change was made it might be necessary to have an extra minister in the Foreign Office, though not necessarily a Cabinet Minister.

Lord Walston said that he had an open mind about the actual process of co-ordination of the two Offices, but he