

island in the West Indies, and family planning clinics have been set up by a voluntary organization and have been widely used. The discussion provoked by this paper lasted throughout the lunch hour.

In the afternoon Dr. Henry reported on the survey of diabetes in Trinidad. Of a random sample of more than 24,000 people, representative of the whole population of the Island, there was a 98 per cent response-rate. The total incidence of diabetes was found to be 1.88 per cent. Dr. Quamina demonstrated that the age of sexual maturation of Trinidadian schoolgirls was not earlier than that of girls in temperate climates. Dr. Miall described the surprisingly high incidence of angina found in a Jamaican rural population; this condition is associated with hypertension, high serum globulin-levels and abnormal haemoglobins. Dr. Milner reported³ a family with haemoglobin D which was found in the course of the aforementioned survey. Another rarity was described by

Dr. McDowall of Trinidad, who reported a syndromæ resembling rickets, but associated with hypercalcaemia, which only affected the girls of a large Indian family.

The meeting was attended not only by numerous medical workers from the Caribbean area but also by representatives of the Pan-American Health Organization (World Health Organization), the National Institutes of Health, Harvard University, the Communicable Diseases Center, Georgia, and the Massachusetts Institute of Technology in the United States, and the Department of Technical Co-operation, the Tropical Medicine Research Board and the Medical Research Council of Great Britain.

The meeting indicated that medical research under the auspices of the Standing Advisory Committee is in a healthy and developing state and further important scientific contributions from the area concerned can be confidently expected.

J. S. GARROW

METEOROLOGICAL SATELLITES AND THE WORLD WEATHER WATCH

THE fourth Congress of the World Meteorological Organization was held at Geneva during April, and among the major questions discussed were plans for future meteorological satellites and further steps towards a World Weather Watch. The Congress was informed of the agreements between Soviet and American authorities regarding their satellite programmes.

Weather satellites will not, of course, replace the present world-wide network of meteorological stations, but will, as one of their main tasks, fill in the 'blanks' in the weather charts over oceans, deserts and polar regions. The United States will launch several more *Tiros* satellites in 1963 and 1964 at approximately four-monthly intervals to ensure the continued availability of satellite picture data until their more advanced *Nimbus* satellite can be proved operationally successful. Various orbits will be tested and also equipment, including instruments for further measurements of infra-red radiation. It is hoped to test an automatic picture transmission system intended for use on *Nimbus*. The automatic picture transmission system is a remarkable new development designed to take and transmit pictures for reception by a relatively inexpensive receiving station. The Congress was cautioned, however, that the whole satellite programme is still in an experimental stage and further experience might lead to modifications in the apparatus.

The *Nimbus* meteorological satellite will be developed between 1963 and 1966 and will furnish higher quality data than the *Tiros* programme and in greater quantity. It will be Earth orientated so that one of its three cameras, pointing straight downwards, will view the Earth's

atmosphere or surface directly below the space-craft, thus simplifying the problem of adjusting cloud pictures to fit a map. The orbit will be nearly polar to allow almost total daily coverage of the Earth—every part of the Earth (except where there is polar darkness) will be seen in sunlight at least once every 24 h, and the same area can be seen day after day (whereas the *Tiros* satellite can see a given area for limited periods only). Electronic computers will be used to convert data into forms suitable for daily weather analysis and forecasting; for example, geographic grids (latitude and longitude) will be produced to superimpose on the pictures, and maps showing cloud cover and type will be made to help to interpret the picture data.

The solution of the problem of the general circulation of the atmosphere would assist the rapidly growing applications of meteorology to economic activities. Before progress can be made with this problem certain gaps must be filled in the existing network of observations, and adequate supporting communications systems established. The Congress decided on a comprehensive plan for a World Weather Watch which would include improvement of the present network, the organization of upper-air measurements from merchant ships, and the exploration of the possibilities of automatic weather stations, of weather satellites and of co-operation with oceanographic interests. The rapidity of scientific and technical developments has led the Congress to call for the establishment of an advisory committee of eminent scientists who will advise the Organization on research and operational problems, especially in the light of data obtainable from artificial satellites.

W. S. GARRICK

STATISTICS OF EDUCATION IN BRITAIN

THE Minister of Education has recently published Part I of the *Statistics of Education, 1962*, in an attractive new format*. This comprises the bulk of the data dealing with schools: the remainder, which deal with examinations for the General Certificate of Education, further education, awards, teacher training, school health and educational building, will appear later.

The first section deals with births, population of school age, and projections of these figures to 1985. The demographic part of the projection was undertaken by the

* Ministry of Education. *Statistics of Education, 1962*. Part 1. Pp. ii + 128. (London: H.M.S.O., 1963.) 20s. net.

Government Actuary and the General Register Office; in addition, it was assumed that the Christmas leaving date would be eliminated after 1963-64, and that the trend towards later leaving shown in the past nine years would continue up to 1985. On these assumptions, the increase in the school population in 1985 over 1960 would be 28 per cent at ages 5-10, 8 per cent at ages 11-14, and 159 per cent at ages 15 and over. The assumptions imply that by 1985, 35 per cent of the 16-year-olds and 20 per cent of the 17-year-olds will stay at school: the corresponding percentages in 1960 were 15 and 8. The magnitude of the tasks before the educational system will be apparent from these figures.

In the space available, only brief extracts from the statistics can be quoted. Of the sixth-form population the proportion of boys taking mathematics and science only was 57 per cent in maintained grammar schools, 56 per cent in direct-grant schools, but only 46 per cent in other independent schools recognized as efficient. The corresponding figures for girls were 22, 23 and 17 per cent. Mixed arts and science courses were more frequently taken by girls (about 10 per cent of sixth formers) than by boys, where the figure was of the order of 5 per cent. The persistence of the differential in favour of arts subjects among the independent schools is of some interest.

As regards graduate grammar school teachers of science subjects, contrary to general belief, the proportion of graduates with first-class honours is higher than among teachers of arts subjects: 10.2 and 10.6 per cent in maintained and direct-grant schools respectively, as against

8.6 and 8.8 per cent in arts subjects. On the other hand, however, the proportion of those who have neither first nor second-class honours is much higher among science teachers than among their arts colleagues (49.3 and 51.6 per cent as against 28.6 and 40.8 per cent). Among the grammar school graduate teachers, therefore, the second-class graduate is most common on the arts side; the third-class graduate or pass degree man on the science side.

Among the teaching profession as a whole, the proportion of graduates is slowly rising, 30.5 per cent of men and 12.6 per cent of women teachers held degrees in 1962, against 25.2 per cent and 10.7 per cent in 1953. What is alarming, however, is the age structure of graduate teachers; 43 per cent of graduate teachers of mathematics are over 45, as against only 33 per cent of other graduate teachers.

THE RESEARCH COUNCIL OF ALBERTA

THE forty-third annual report of the Research Council of Alberta, covering the year 1962, includes a list of publications, 1958-62, and details of staff and of membership of advisory committees*.

A research and development project of direct industrial significance is the pipe-line transport of solid materials, which is under investigation in both the Petroleum and Coal Divisions. In the Petroleum Division particular attention is directed to the flow of capsules in a liquid stream, while in the Coal Division the transport of slugs of a coal-water paste in an oil stream is being studied. Pipe-line transportation could go far towards solving the problems of long freight hauls and small local markets which face most Western Canadian producers, and other commodities which might be so transported are sulphur, wood pulp and grain. The Geology Division is studying the production of iron from Clear Hills iron ore which promises to produce iron powder of high quality for powder metallurgy from an abundant but low-grade material. The Coal Division is also investigating the production of active carbons and the chemical structure of humic acids, while the Natural Gas Division is investigating types of high-temperature burners suitable for chemical processing. About one-fifth of the research effort of the Council is devoted to such industrial programmes, including almost the entire programme of the

Industrial Engineering Services Division. It is anticipated that the proportion will increase as the industrialization of the Province becomes more diversified and less limited to the production of raw materials.

Mapping and evaluation of resources are conducted primarily by the Geology, Ground-water, and Soils Divisions, and to a lesser extent by the Coal Division. A helicopter survey has proved very successful in the Geology Division in obtaining preliminary information on an area of some 30,000 square miles in north-western Alberta. A six-year programme to be completed next year by the Soils Division will provide a report on the soil resources of about 85 million acres of northern Alberta. The Ground-water Division is exploring for ground-water supplies in areas throughout Alberta and is making geological and hydrological studies for several large drainage areas. Mapping and survey projects constitute about 25 per cent of the Council's programme.

Almost half the activities of the Council are represented by long-range research projects, the remainder, including various co-operative investigations with other agencies, such as the highway research programme (which includes studies of physico-chemical aspects of soil behaviour, the evaluation of pavement behaviour and hydraulic studies), the hail studies programme, which attempts to elucidate the processes leading to the development of hail-storms and to the formation of hail, and the watershed research programme of the Eastern Rockies Forest Conservation Board.

* Research Council of Alberta. Forty-third Annual Report, 1962. Pp. 74. (Report No. 83.) (Edmonton: Research Council of Alberta, 1963.)

NUTATIONAL MOTION OF THE EARTH'S AXIS

By NIKOLAI POPOV

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THERE is a close relationship between the shape of the Earth, its inner structure and its rotation. Therefore it is possible to obtain results concerning the rotation of the Earth by making certain assumptions about its inner structure and drawing on some data furnished by investigations of astral motion. If, on the other hand, we have data on the Earth's rotation obtained by astronomical observations, we can solve the inverse problem, that is, we can obtain some idea of the Earth's inner structure. The Poltava Observatory has detected the nutation of the terrestrial axis predicted by the theory of the rotation of the Earth having a liquid core.

The Earth's diurnal motion is very complicated, since several perturbations different in magnitude and period

are superimposed in this case. Thus, the Earth's axis changes its position in space because of the attraction of both Moon and Sun. As a result, the terrestrial axis describes a cone with a period of some 26,000 years. Changes in the positions of the orbits of the Earth and Moon give rise to periodical oscillations of the terrestrial axis known as nutation oscillations. The nutation of the Earth's rotation axis in space is composed of several oscillations with different periods and amplitudes. The largest of these oscillations (known as the main term of nutation) has a period of approximately 19 years and an amplitude of 9.218 sec of arc. The other nutation terms have shorter periods and very small amplitudes.