engineers; and the collection, distribution and publication of meteorological data. These routine duties, which do not often reach the headlines (except when a forecast goes badly wrong on a Bank Holiday!), but which assume an ever-increasing importance in modern society, bear heavily on the Meteorological Office, which is under-staffed, poorly housed and under-financed. The total annual budget of the Office is less than £3 million—little more than the cost of a modern bomber. This is not a large sum on which to carry out its multifarious activities at home, to meet its overseas and international commitments, to develop new instruments and improved techniques and to undertake an extensive programme of research in meteorology and geophysics.

It is, of course, largely by the quality and scope of its research that the vitality and scientific reputation of such an organization must be judged. Considerable progress has been made during the past few years, and the present report shows that this has been maintained. There have been encouraging developments in the study of numerical forecasting with the aid of electronic computers, and it has recently been announced that the Office is to have a machine of its own. The Meteorological Research Flight has continued its investigations on the distribution of water vapour and ozone and the occurrence of clear-air turbulence at high altitudes, and into the structure and constitution of clouds. Progress was made in the measurement of solar radiation and in the development of the new radar-sonde. Some attention has also been given to the possibility of increasing rainfall by cloud-seeding, and preliminary field-trials have been started on Salisbury Plain.

The pace of all this work has necessarily been limited by the availability of personnel, and the Director stresses that the continued shortage of scientific staff and the high turnover-rate (about 20 per cent per year) of assistants are matters of some concern. The total number of scientific officers on the staff of the Office is only 155, not all of whom are actively or mainly engaged on research. More serious still, only four new officers were recruited during the year—barely enough to compensate for losses through retirement and resignation. How to attract sufficient numbers of high-quality physicists and mathematicians into a field which, after all, has great opportunities for research, is perhaps the main problem facing the Meteorological Office at the present time. One welcomes, therefore, the continued and extended co-operation between the Office and the universities, both of which have a responsibility for ensuring that Britain is not left behind in the great expansion now taking place in atmospheric physics.

B. J. Mason

PHYTOPLANKTON OF LAKE TANGANYIKA

For one who is not conversant with all the recent work in the biological study of lakes, there is much of interest in the volume by L. van Meel, entitled "Le Phytoplancton", one of a series of reports of the Belgian Expedition (1946–47) for the "Exploration Hydrobiologique du Lac Tanganika" (Institut Royal des Sciences Naturelles de Belgique. Bruxelles, 1954. **4**, Fasc. 1. *A*, Texte (pp. 681); *B*, Atlas (pls. 76)). Likewise it will be particularly interesting to all those whose experience is limited to small temperate lakes. On the other hand, the title does not prepare the reader for the table of contents, which shows that geobotany, geochemistry and geophysics of all the central and eastern African lakes (and of nineteen in particular) fill pp. 7–250. The next two hundred and twenty-five pages are devoted to a list of the algae of these lakes, and the third section dealing with the ecology of the plankton occupies one hundred and seventeen pages, the phytoplankton of Lake Tanganyika being covered in thirty-four. This indicates that a more suitable title should have been chosen for a volume which is mainly a compilation of the available information of certain aspects of these African lakes, with the additional information collected by the Expedition about the phytoplankton of Lake Tanganyika. As a compilation, it will be a most useful book of reference to many, and the information gathered together here about any one lake will provide the basis for a fuller and more searching investigation of it. The contribution by British workers to our knowledge of these lakes is clearly brought out.

The size of Lake Tanganyika is one of its most striking characters. It is the second largest of the African lakes, with a volume approximately half that of the North Sea. It is also very deep (1,470 metres in the deepest trough), being exceeded only by Lake Baikal. These facts, together with its situation near the equator and the protection given by high land from the full force of the south winds, are some of the factors combining to preserve the stratification of the water and to reduce mixing to a minimum. It is stated to have greater thermal stability than any other lake, the variation in temperature at two hundred metres being less than 5/100 deg. throughout the year. The water is clear and well oxygenated down to a depth of 40–100 m., depending on the place and season, but from 100–225 m. to the bottom (the equivalent of three-quarters of the volume of the lake) there is no oxygen but an abundance of sulphuretted hydrogen. This is the result of the stratification (scarcely ever disturbed at these depths) and the reason for the statement that a total 'turn-over' would have disastrous consequences. It is supposed that even a partial 'turn-over' may not take place annually.

Tanganyika is a diatom lake, and in his investigations van Meel found no new species in the phytoplankton. The new information concerns rather the geographical distribution of the algæ, chiefly at the surface. The plankton of the bays is much richer than the pelagic plankton, which is poor in species (*Oocystis*, *Nitzschia*, *Anabaena*, *Anabaenopsis* being the common genera) rather than in individuals. During the Expedition's stay, the volume of plankton, however, was poor throughout most of the year, but an increase occurred in October 1946, at the end of the dry season. The permanent stratification of the deepest layers of water would appear to be an obvious reason for the poverty of the plankton, as the author suggests; but van Meel considers the inhibiting effect of light on chlorophyll to be an added reason. This would seem to control its position in depth in the Lake rather than its quantity. A certain amount of sampling at different depths leads to no obvious conclusions. With a small amount of plankton in such a large body of water, it is possible that its distribution is uneven due to currents and micro-stratifications. One set of readings appears to show a correlation with the diurnal movement of the zoo-

plankton ; but as a result of the general consideration of the food-supply of the latter, van Meel puts forward a hypothesis that it may be provided by a bacterial flora rather than by the phytoplankton.

It is concluded that Lake Tanganyika should be classed as pseudo-eutrophic since it shows characters of both oligotrophic and eutrophic lakes. On the other hand, this unusual combination of characters might suggest the need for a revision of the classification of lakes.

This is a very lavish production, information being well displayed with the aid of a liberal supply of maps, tables and diagrams. A separate volume of seventy-six plates illustrates many species of the phytoplankton of these African lakes.

KATHLEEN M. DREW

THE PRODUCT OF THE HUMAN BLOOD GROUP *A* AND *B* GENES IN INDIVIDUALS BELONGING TO GROUP *AB*

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INTEREST in the chemical nature and serological relationships of the substances which are responsible for the differentiation of human red blood cells into well-defined groups arises from two sources: these materials are of importance in the field of immunochemistry because each possesses a distinct serological specificity, and in the field of biochemical genetics because each characteristic specificity is believed to be the result of the action of a single gene.

The only human blood-group substances for which the chemical nature is known with any degree of certainty are those which characterize the *ABO* and *Lewis* systems, since these specific materials occur in the tissue fluids and secretions in a water-soluble form. The *A* and *B* substances have been isolated in an essentially homogeneous condition and a thorough study has been made of the chemical, physical and serological properties of these materials[1]. Comparatively little work has been carried out, however, on the material showing both *A* and *B* properties which is secreted by individuals belonging to group *AB*. The question arises whether the secretions in these heterozygous individuals contain molecules which carry both *A* and *B* specific groupings, or whether they contain a mixture of molecules some of which carry *A*, and others *B*, specificity. Wiener and Karowe[2], in their development of a diagrammatic representation of human blood-group reactions, assumed that in group *AB* individuals the molecules possess dual specificity ; but chemical or serological evidence for the association of both specificities with one molecular species, or for the presence of molecules with single specificity only, has been lacking.

The close chemical and physical similarity of the *A* and *B* substances means that they are not separable by the usual fractionation procedures, including electrophoresis and ultracentrifugation, and therefore an attempt has been made to obtain evidence on this question by means of serological precipitation tests. The methods employed involved the precipitation of the specific group substance in (i) an artificial mixture of *A* and *B* substances, and (ii) the material obtained from *AB* individuals, with anti-*A* or anti-*B* precipitating sera ; the specific activity of the original materials, the solutions remaining after removal of the precipitates and the redissolved precipitates was determined by means of agglutination inhibition tests. It was hoped thus to separate the specific materials contained in an artificial mixture of *A* and *B* substances and to determine the behaviour of the *A*- and *B*-specific activities present in the secretions of an *AB* person.

The blood-group materials used were preparations derived from human ovarian cyst fluids[3] which had been subjected to the phenol-extraction procedure[4], or fresh saliva samples which had received no treatment other than heating in a boiling water-bath, followed by centrifugation to remove insoluble material. Anti-*A* and anti-*B* sera prepared in the rabbit were used as precipitating reagents, and some additional experiments were carried out with a purified extract of Sieva Lima beans[5], which contains powerful anti-*A* precipitins. The precipitating reagents were freed from heterologous agglutinins or precipitins before use. The concentration of *A*, *B* or *AB* substance giving suitable precipitation with the appropriate reagent was determined and 1 ml. of a solution containing this concentration of material was then mixed with 1 ml. of the precipitating reagent. The mixtures were incubated 1 hr. at 37°, followed by standing over night at 0–4°, and the precipitates were then spun down at 0°, redispersed by high-speed stirring, washed three times with ice-cold saline, and dissolved in 0·2 ml. of *N*/10 sodium hydroxide. The solution was neutralized and the volume made up to 1 ml. with saline ; finally, when rabbit precipitating sera were used, the solutions were heated 10 min. in a boiling water-bath to destroy the activity of any remaining antibody. This step was unnecessary when Sieva protein was used because its specific anti-*A* properties are rapidly destroyed by treatment with dilute alkali.

The results of an experiment using a rabbit anti-*A* serum as precipitant with a mixture of *A* and *B* cyst materials and with a substance obtained from a group *AB* cyst are shown in Table 1. The agglutination inhibition tests were carried out using a twofold dilution series of the test substance and a constant amount of antibody. The inhibition is expressed as the number of tubes which failed to show agglutination. When one considers the results obtained with the artificial mixture of *A* and *B* substances, it is evident that the supernatant solution remaining after removal of the specific precipitate has lost its capacity to neutralize the agglutinating action of anti-*A* serum on *A* cells, but retains, unimpaired, its capacity to inhibit the action of anti-*B* serum on *B* cells. The results given by the redissolved precipitate from the *A* and *B* mixture support these observations ; the precipitate shows *A*-inhibiting activity but is without *B*-activity. These findings demonstrate, therefore, that it is possible to separate an artificial mixture of *A* and *B* substances by the precipitation technique.

Examination of the results obtained with the *AB* cyst material, on the other hand, reveals that after removal of the precipitate the supernatant solution shows an almost complete loss of *B* activity in addition to loss of *A* activity, and the precipitate