

condition, then the different otolith organs the maculae of which face in different directions would give contradictory information, and a feeling of 'space-sickness' might exist. However, it has been shown by both Adrian and Lowenstein that some nerve fibres of the otolith organs do not carry impulses when the head is in certain positions. In the weightless condition, therefore, it seems improbable that any impulses would be present. Some forms of deafness are due to both middle ears being out of action. No impulses can be transmitted under these conditions, and yet no ill-effects are felt. It is therefore thought that weightlessness also would bring no ill-effects. The main function of the otolith organs is almost certainly that of adapting the body to the effects of gravity by controlling the tone of the muscles used for balancing, and causing instant adjustments of muscular tension whenever necessary.

J. HUMPHRIES

¹ Hohmann, "Die Erreichbarkeit der Himmelskörper" (Oldenbourg, Berlin, 1925).

PAN-AMERICAN INSTITUTE OF GEOGRAPHY AND HISTORY

AMONG the specialist agencies set up by the Governments of the American Republics is the Pan-American Institute of Geography and History (PAIGH). Much of the work of the Institute is carried out by the three Commissions which were set up at the fourth general assembly held at Caracas in 1946. These three Commissions deal, respectively, with cartography, geography and history.

The first meeting of the Commission on Geography or, as it has come to be called, the Pan-American Consultation on Geography, was held in Rio de Janeiro during September 1949; the second in Santiago, Chile, during October 1950; and the third in Washington, D.C., during July 25–August 4, 1952. Future plans are to hold meetings of the Commission every two years. The twenty governments which are members each send official representatives, and interested international organizations, such as Unesco, participate in an observer capacity; the Canadian Government also sends observers.

The chairman of the Consultation meeting at Washington, D.C., was Prof. Preston E. James (United States). All the proceedings were in English, Spanish or Portuguese, with simultaneous translation available for all meetings, which were held in conference rooms provided by the United States State Department. As an official gathering, attendance was limited to delegates officially appointed or special invitees.

Some indication of the wide range of subjects covered by the conference is indicated by the existence of five sections which carried on their meetings simultaneously, and which dealt, respectively, with physical geography and biogeography, human geography, regional geography, geography of the Americas, teaching and methodology.

Between Consultations the action programme of the Commission is entrusted to five permanent committees, which deal, respectively, with basic natural resources, settlement and colonization, land classification and survey of land use, geography of the Americas, and teaching and methodology.

The American republics are acutely aware of the need for a comprehensive study of their geographical

resources as a prelude to schemes of land planning and conservation of resources. Not only are land-use surveys planned and in progress in many areas, but also active steps are being taken to set up a training centre or training centres where those with a basic university training can be given the necessary instruction to enable them to take their place in the survey teams which are planned. It is proposed to set up a government-sponsored college for this purpose, probably in Rio de Janeiro.

L. DUDLEY STAMP

REACTIVITY OF PROTEIN FIBRES

DURING the annual conference of the Society of Leather Trades' Chemists, held at the University of Leeds during September 19–20, the fifth Procter Memorial Lecture was delivered by Prof. J. B. Speakman, professor of textile industries in the University of Leeds, his subject being "The Reactivity of Protein Fibres: Some Analogies between Keratin and Collagen".

After paying tribute to Prof. Procter, and those members of the staff of the Department of Leather Industries in the University of Leeds—Mr. F. C. Thompson and Prof. W. R. Atkin—who had worked with him, Prof. Speakman began to develop his comparison of keratin and collagen in terms of the amino-acid composition. Because of the close similarity in the proportions of basic and (free) carboxylic acid side-chains, close similarity in the reactions with acids and alkalis is to be expected, apart from complications due to the presence of cystine in keratin. The titration curves of the two proteins were compared and their reaction with acids discussed in detail. Prof. Speakman suggested that differences in the acid titration curves of different forms of collagen are due to neglect of differences in swelling, and to errors in the calculated amount of combined acid when no account is taken of the difference in concentration of acid inside and outside the collagen. In terms of the Donnan theory of membrane equilibrium, methods of calculating the 'true' titration curve were outlined, the 'true' curve representing the correct amounts of acid combined at different internal pH values.

Prof. Speakman next turned his attention to the action of neutral salts on keratin, potassium chloride and lithium bromide being chosen as examples of two main types. It was shown that the former causes breakdown of salt linkage through the association of potassium and chlorine ions with the oppositely charged ions of the linkage. Lithium bromide has the same effect but, in addition, causes breakdown of hydrogen bond at concentrations below about 5.8 M. Above this concentration, co-ordination with hydrophilic groups in neighbouring chains leads to some measure of cross-linking.

Close analogy between keratin and collagen is also found in the supercontraction of the former and the hydrothermal shrinkage of the latter. Although the molecular structure of keratin is more stable than that of collagen, because of cystine linkages in the former, breakdown of hydrogen bond by means of a 50 per cent solution of phenol promotes the contraction of wool fibres at high temperatures. By determining the temperature at which 20 per cent contraction occurs in 20 minutes, in accordance with

Zahn's procedure, it was shown that the least plastic wool fibres have greater cohesion than the most plastic.

In relation to tanning, it was shown that formaldehyde, benzoquinone and basic chromium acetate cross-link keratin, and that cross-linking reactions are to be expected with collagen. The fact that the strength of collagen is reduced by tanning is probably due to the effect of cross-linking on the extensibility and surface friction of the ultimate fibres. It was suggested that frictional measurements on tanned and untanned collagen fibres would be a profitable study.

Finally, some attention was given to the proportions of crystalline and amorphous material in protein fibres. A new method of measuring the proportions with heavy water was described, and it was suggested that the polymerization of suitable monomers within the fibres, with subsequent cross-linking where possible, provides an interesting possibility of overcoming the accessibility problem and, at the same time, of developing new tanning processes.

NATIONAL RESEARCH COUNCIL OF CANADA

REPORT FOR THE YEAR 1951-52

THE thirty-fifth annual report for 1951-52 of the National Research Council of Canada* is the last to appear over the name of Dr. C. J. Mackenzie as president, for he has now become president of the new Crown company, Atomic Energy of Canada, Ltd., an organization to which the responsibility of operating the Chalk River project was transferred from the Research Council on April 1, 1952.

Considerable expansion occurred in the work of the National Research Laboratories during the year, but especially in the field of defence production; new buildings are being erected to provide much-needed accommodation for several Divisions, and that for the Applied Chemistry Branch was expected to be occupied during the summer of this year. The largest outside unit now operated by the Council is the Prairie Regional Laboratory at Saskatoon. This is primarily concerned with research designed to promote new uses for agricultural products. Fundamental studies on the mechanism of the biosynthesis of ustilagic acid, a product of the corn smut fermentation, in which the fungus is grown in media containing radioactive carbon compounds, have been started, and many samples of ustilagic acid have been despatched for testing. Investigations on the control of loose smut of barley by treating infected seed with antibiotics are being continued. The carbohydrate metabolism of bacteria is being studied with radioactive carbon dioxide, and the concentration of the active carbon atom in the fermentation products shows that different organisms vary in their ability to incorporate carbon dioxide in their metabolic products. A new method has been developed for preparing radioactive cyanide, and fundamental studies in sugar chemistry were continued. The development of a rapid continuous process, which will produce a chemical pulp having properties similar to ball-milled straw, is being investigated and also the

* Thirty-fifth Annual Report of the National Research Council of Canada, 1951-52 (N.R.C. No. 2780). Pp. 46. (From the Council, Ottawa, 1952.)

factors responsible for the increased resistance of these strawboards to water, while the fractionation of rape-seed oil with furfuraldehyde as solvent was being tested on a pilot scale.

Food investigations have had a major share in the Division of Applied Biology; but emphasis on long-term fundamental research is increasing. The Wiltshire bacon project was concluded with a study of the effects of varying temperatures and salt concentrations on storage life. Production of butylene glycol from beet molasses and sulphite liquor reached the pilot-plant stage, and a rapid method giving high yields of citric acid by the submerged fermentation of beet molasses has been developed in the laboratory. Studies in photosynthesis have shown that the Hill reaction is stimulated by anions at pH levels above the optimum, and that malic enzyme has a possible role in photosynthesis. Activity in the colloid section of the Division of Chemistry has been mainly concerned with the properties of suspensions, but the physical properties of anhydrous soaps have also been examined. The Division has continued its calorimetric investigation of the thermodynamic properties of simple gases adsorbed on solid surfaces; its study of the chemistry of liquid ammonia solutions; and its work on the thermal decomposition of gaseous organic compounds, using a mass-spectrometer, designed for the quantitative analysis of the stable products and of the short-lived intermediates, such as free radicals, which are formed. Investigations of critical-temperature phenomena have led to a better understanding of the nature of the liquid-vapour transition, and many measurements were made, in the project on the permeability of fabrics, of the air flow through wire gauze of varying fineness for different drops of pressure. The structures of all the alkaloids of the sparteine group have been established, and much attention given to the preparation of steroids containing deuterium.

In the Division of Applied Chemistry work on the simultaneous drying and thermal cracking of Alberta wet crude water-separated bitumen has given a cheap dry oil of low viscosity in a single operation. A very sensitive microbalance has been constructed for use in investigating the first stages of the oxidation of metals, and an automatic-recording balance has been designed and built to measure the oxidation-rates of heat-resistant alloys. A moisture-permeable white paint has been formulated for exterior use, and the adsorption of anionic- and non-ionic-type synthetic detergents has been studied on three types of carbon taken as representing the important components of normal 'dirt', and also their adsorption on textile fibres. Two new reactors with multi-point sampling and feed connexions have been built for the small-scale plant for the oxidation of ethylene to ethylene oxide to determine optimum conditions and flow design for a full-scale pilot plant.

The Canadian defence programme has particularly affected the Division of Mechanical Engineering, and assistance to industry in the design and development of new aircraft constitutes a large part of the work of the Division's aerodynamics and flight research laboratories. A thermodynamics laboratory was being constructed for work on compressors and gas turbines, and in the low-temperature laboratory work on aircraft-icing included measurement of the physical characteristics of icing-clouds and the development of electrothermal protection for aircraft wings, propellers, windscreens and tail units. The Division of Medical Research made special provision