FIFTH INTERNATIONAL WEST AFRICAN CONFERENCE

SCIENTISTS working in the several territories of West Africa were long hampered by lack of opportunities for contact with one another. Contiguity of territory enabled the French to extend much of their work over the whole or greater part of French West Africa; but studies in the separate British, Spanish and Portuguese areas lacked correlation. A very important function is thus served by the International West African Conference, which meets every second year, alternating between British, French, Spanish and Portuguese territories. The fifth conference was held at Abidjan (Côte d'Ivoire) during December 7–10, 1953, followed by excursions during December 11–19. Difficulties of accommodation, not the least being space on air lines, necessitated the participation being restricted to official delegates; but those present represented a wide range of interests and regions.

The conference met under the presidency of Prof. G. Mangenot, director of the Institut de Recherche Scientifique et d'Études Tropicales of the Office de la Recherche Scientifique Outre-Mer, and most of the meetings were held at the Research Station of the Institut at Adjopodoumé some 18 km. from Abidjan. Other meetings were held at the Museum and Research Station in Abidjan of the Institut Français d'Afrique Noire, the headquarters director of which is Prof. Th. Monod (Dakar). The smooth running of the conference owed everything to the organizing ability of M. J. L. Tournier, of the Institut Français d'Afrique Noire, who acted as secretary.

Delegates included a dozen from British West African territories and two from Britain (Profs. C. Daryll Forde and L. Dudley Stamp), and the conference opened with a gathering at the Palace of the Governor, followed in the evening by a brilliant and lavish reception at Adjopodoumé attended by leading citizens, both African and European, of Abidjan.

The working sections were those of zoology, botany (including forestry), geography (including geology) and ethnology–sociology (including economics). For some sessions the last two met jointly, and papers of general interest were read to plenary meetings.

It would be difficult to speak too highly of the lavish hospitality of the French hosts. A conference where delegates have no need of money at all, their every wish being anticipated by a system of vouchers, must be almost unique. The insight given into the cultural life of a remarkable tropical city with fourteen thousand white inhabitants was a revelation to many of the delegates long familiar only with their own territories. The conference was in other ways ideal in that it gave abundant opportunities for discussion amid delightful surroundings, and local excursions arranged for all interests formed a pleasant prelude to the two long excursions. Of the latter, one studied the ecology and forestry of the coastal belt, and the other undertook the long journey across to the Liberian border and the eventual ascent of the massif of Nimba.

The conference revealed in a striking way the large volume of fundamental research now in progress in West Africa. In the French territories this is now focused by the Institutes; in the British territories the influence of the University Colleges of the Gold Coast and Ibadan is very marked. Young enthusiastic scientists, not overburdened with routine teaching, are bringing to bear on African problems techniques acquired in universities all over the world. At present, those of European descent play the leading part; but Africans are beginning to take their places in the ranks of the research workers. Detailed studies ranging from the distribution of population, so bafflingly irregular, and the ecology of disease to the measurement of evaporo-transpiration and the economics of fisheries cannot fail to throw light on the innumerable problems which at present hinder the development of tropical Africa and at the moment make nonsense of 'planning'.

L. DUDLEY STAMP

THE GOLGI APPARATUS

SYMPOSIUM OF THE ROYAL MICROSCOPICAL SOCIETY

ON May 5 the Royal Microscopical Society held a symposium on "The Golgi Apparatus". The opening address was made to a large gathering by the chairman for the morning session, Dr. L. Foulds, who directed attention to the present controversy regarding the intrinsic morphology of the Golgi apparatus.

The first speaker was Prof. J. Brontë Gatenby (Trinity College, Dublin), who expressed his gratitude to the Society for its recent award to him of an honorary fellowship. He then went on to review the various controversies which have been in vogue concerning the morphology of the Golgi apparatus. The most important controversy of all, he said, arose with the vacuome theory of the Parat school (1924–33); but this work has been discredited by many cytologists. It is significant that Parat's term 'lépidosome' instead of 'dictyosome' has not been used in the new great French text-book "Traité de Zoologie". With regard to the recent controversial views, held mainly by the Oxford school, Prof. Gatenby said that on the whole, apart from their use of Parat's word lepidosome, he is in agreement with much that they have written about the structure of the Golgi apparatus of invertebrate cells. However, he cannot accept the view that the Golgi apparatus or network of vertebrate neurones is an artefact. Both Dr. T. A. Moussa and he have seen the network in living neurones, and this has been confirmed by the vital observations of the Americans Adamstone and Taylor. Similar networks have also been seen in living cells of the epididymis by Dr. A. J. Dalton and Mrs. M. Felix. In addition, these latter workers have supplied him with some remarkable electron micrographs which agree with his conception of the networks as being a series of vacuoles, compressed spaces and canals, to the walls of which a chromophile substance is attached.

Finally, Prof. Gatenby gave seven reasons why he believes that the Golgi dictyosomes of invertebrate cells may be regarded as being homologous with the

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Golgi networks seen in vertebrate cells. These inclusions occupy similar positions in the undifferentiated cell; play an important part in cell secretion; can be shown by the classical technique; have the same specific gravity when ultracentrifuged; unless dispersed are attached to the centriolar part of the amphiaster at some stage in cell division; cannot be vitally stained in neutral red and methylene blue; and both have the same dictyosome-like appearance in amphibian nerve cells.

After the long paper by Prof. Gatenby, two shorter papers were given by Dr. G. H. Bourne (Department of Histology, London Hospital Medical College) and Dr. A. L. Roque (Department of Zoology, Oxford). Dr. Bourne concentrated on some chemical and biochemical aspects of the Golgi region of certain cells, and pointed out that there is good evidence to suppose that such regions, and therefore possibly the Golgi apparatus, contain lipoidal substances and polysaccharide. Also, in some cells of the adrenal cortex there is a localization of ascorbic acid which corresponds with the position usually occupied by the Golgi apparatus. There is also good evidence to suppose that the Golgi apparatus of the epithelial cells of the small intestine contain alkaline phosphatase and some other phosphatases, including one which dephosphorylates œstrogen phosphate. The epithelial cells of the mouse prostate also contain acid phosphatase in the Golgi region. Dr. Bourne concluded that these results indicate that the Golgi region, or Golgi apparatus, is of considerable biochemical importance.

Dr. Roque made a report on a detailed study of the form of the lepidosomes (dictyosomes) in the male germ-cells of *Helix*, as revealed by phase-contrast and interference microscopy and by the use of vital dyes. He compared these lepidosomes with the lipochondria of the nerve cells of *Helix* and showed that they are distinct morphologically.

For the afternoon session, the chair was taken by the president of the Society, Dr. T. E. Wallis. Each of the four speakers in this session were from the Department of Zoology, Oxford. The first paper was read by Mr. S. A. Shafiq, who said that in the neurones of *Locusta migratoria* Kolachev preparations reveal the Golgi apparatus as a number of curved rods (dictyosomes) scattered about the cytoplasm. When lipid preparations are made the lipid appears in the form of spheroids also scattered about the cell. In order to see if any relationship exists between the two inclusions, Kolachev preparations were made, but were osmicated for only a short time. Faintly impregnated dictyosomes were seen. On colouring these sections with sudan black it was apparent that the dictyosomes were a deposit of osmium on the curved surface of the lipoidal spheroids. Further proof for this view has been adduced by a study of the developing neurone. As a result of this work, Mr. Shafiq pointed out that the dictyosomes of these invertebrate neurones, being an artefact, cannot be homologized with the Golgi apparatus of vertebrate neurones.

The next paper was read by Dr. W. G. Bruce Casselman and dealt with the histochemistry of the sites in certain cells where osmium tetroxide or silver nitrate are reduced in classical Golgi methods. The study was based on the work of Mr. Shafiq and Dr. John R. Baker, who found that the classical methods when used on the motor neurones of *L. migratoria*, and intestinal epithelial cells and Paneth cells of the mouse, were impregnating mainly lipoidal bodies. Dr. Casselman said that in the motor neurones the lipochondria (= lipoidal bodies) consist principally of phospholipids and cerebrosides. In the intestinal epithelial cells of the mouse, the lipochondria apparently contain only neutral lipids and are embedded in a neutral mucopolysaccharide. The lipoidal bodies of the Paneth cells are embedded in what is probably a mucoprotein and, in addition, are at least partly covered by neutral lipid.

The next speaker was Dr. John R. Baker, who said that a single name can be properly given to an object in a cell if there is reason to believe that it always has essentially the same structure and always essentially the same chemical composition. This does not apply to the term 'Golgi apparatus'. Not only were the 'Golgi dictyosomes' studied by Mr. Shafiq an artefact, but also they were morphologically different from the 'Golgi networks' which Dr. Baker himself had examined in vertebrate neurones. He believed, too, that these networks are an artefact produced in neurones by the over-impregnation of lipochondria. In gland cells a similar network may be an artefact of a different kind, for it may simply result from the deposition of metals on chemically modified cytoplasm between crowded secretion granules. A special study on the intestinal epithelial cells of the mouse had shown that the 'Golgi apparatus' of these cells is an artefact formed by the deposition of osmium on to the lipochondria. Dr. Baker then emphasized the work of Dr. Casselman as showing the lack of specificity of the classical Golgi methods which may reveal 'sites' of dissimilar chemical composition. He urged the discontinuance of the term 'Golgi apparatus', for there cannot be any homology, as the term implies, between objects or regions which differ both structurally and chemically. Further emphasis was placed on the unsuitability of the term 'Golgi substance', for Dr. Baker pointed out that it means nothing to anyone with a biochemical outlook.

The last paper of the afternoon was read by Dr. A. J. Cain, who discussed mainly the concept of homology at intracellular levels. He indicated that, in view of what had already been said by other Oxford workers, objects lumped under the term 'Golgi apparatus' may have been wrongly homologized due to the imperfections of the classical technique.

The chair for the evening session was taken by Dr. R. J. Ludford, and the one paper at this session was read by Mr. Dennis Lacy (Department of Zoology, St. Bartholomew's Hospital Medical College), speaking on the Golgi apparatus of the exocrine and endocrine cells of the pancreas of the mouse. He showed that the various distorting effects which the classical fixatives are supposed to have on the lipoidal bodies are erroneous, and also that the Golgi network of these cells do not result from either the over-impregnation of lipoidal bodies or from the laying-down of metals between secretion granules. Emphasis was placed on the delicate appearance of the networks of these cells as shown by Nassanov, Morelle, Gatenby, Ludford, Hirsch, Bensley, Beams and other distinguished cytologists. None has produced gross over-impregnated structures. The network of these cells was then shown to be a net-like canalicular system, distinct from lipoidal bodies, neutral-red granules or mitochondria. These canals were shown by Mr. Lacy after the use of a variety of fixatives, in frozen-dried preparations and in living cells.

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Dr. Ludford then opened up the meeting for discussion. Many interesting points were raised, among which was a question by Dr. A. J. Marshall as to whether the Oxford workers had at any time, in their numerous preparations, seen a canalicular structure. Dr. Baker said that Dr. W. S. Morgan (late of Oxford) had seen the canals in fixed preparations of acinous cells of the pancreas; but that he [Dr. Baker] could not say whether or not they existed, though he could say that they should not be called Golgi bodies.

The main issue which emerged from this symposium was whether or not the term 'Golgi apparatus' (or 'Golgi body', etc.) should be used. According to the Oxford workers it denotes homology between objects believed by these workers to be mainly artefacts, the true form of which is represented by lipoidal bodies which may differ chemically from one another. The Oxford work is, however, based mainly on the results of one invertebrate cell (the neurones of *L. migratoria*) and on two kinds of intestinal cells (epithelial and Paneth). Further, their artefact theory probably cannot be accepted in at least four very different kinds of vertebrate cells (neurones, exocrine and endocrine cells of the pancreas, and epididymis cells), where the evidence from so many sources (fixed, ultracentrifuged, frozen-dried, electron microscope studies and vital examination) leaves little doubt that the Golgi network does exist in life. This latter work shows clearly, too, that the network is not represented by lipoidal bodies, and all the Oxford studies emphasizing chemical dissimilarity are studies on the lipoidal bodies. It is clear that such lipoidal bodies may not be homologous. From the classical point of view, Prof. Gatenby has given seven reasons why he accepts homology between the Golgi dictyosomes of invertebrates and the Golgi network (or canals) of vertebrates and retains the general term Golgi apparatus. The crux of the matter is whether, as yet, there is sufficient evidence of an incontrovertible nature, on a large enough number of invertebrate and vertebrate cells, to justify a change in nomenclature which will affect some two thousand papers.

A full account of the symposium and the discussion which followed will be published in the *Journal of the Royal Microscopical Society*.

DENNIS LACY

THE IMMOBILIZATION OF MINERAL NUTRIENTS IN TROPICAL SOILS

MESSRS. W. V. Bartholomew, J. Meyer and H. Laudelout, of the Institut National pour l'Étude Agronomique du Congo Belge (I.N.E.A.C.), have published a paper which should be of considerable interest to all who are concerned with the underlying causes of fertility and infertility of tropical soils (*Publ. I.N.E.A.C.*, Sér. Sci. No. 57, 1–53, 1953; 30 f.). They have tackled the problem of the immobilization of mineral nutrients under forest and grass fallow in the Yangambi region of the Belgian Congo, and they have given some attention to the decomposition of plant debris on the forest floor. Some understanding of these matters is essential to rational agricultural practice, especially in those regions where the inherent soil fertility is not very great, where it may be of a fleeting character, or where it may indeed be almost incredibly low. In the native rain forest a large proportion of the available plant nutrients is immobilized in living organisms —mostly forest trees and vines—but large quantities of plant tissue (mainly leaves and branches) are constantly being deposited on the forest floor, where they decompose and return their nutrient content to the soil. The reabsorption of these nutrients by elements in the flora and fauna is so rapid in the rain forest that, in the case of an acid sandy soil which was studied, the available supply in the soil was found to be continually kept at an exceptionally low level. The authors consider that under a plant cover with high nutrient demands, it is unlikely that many nutrients are lost by fixation or leaching.

When a forest is felled and a crop established, the transition phase is often attended by the temporary liberation of large quantities of mineral nutrients to the soil and by an accelerated loss of nitrogen, particularly if the area is burned over, as is frequently the contemporary practice. In such instances there may be a considerable, even a high, loss of plant nutrients before the crop has grown sufficiently to re-immobilize most of them. In the usual cultivation practices, however, the new crop is typically established concurrently with the disintegration and decomposition of the forest debris; but even so the utilization of all the nutrients may not keep pace with mineralization, and excessive nutrient losses may result.

Native cropping practices in the Central Congo Basin usually permit the return of forest species within 2–3 years after the forest is felled, and the ensuing fallow or regeneration period may continue for about fifteen years, where there is government supervision; but it may be considerably less. While this kind of soil management has its defects both in terms of soil fertility and labour, it "appears to be a practical solution to the soil management problems where land is in good supply, demand is not great for agricultural products, transportation to market and supply is long and costly, and where local fertilizer resources are either non-existent or not developed".

In both forest and grass fallow the authors point to two factors as being of first importance in enhancing soil fertility, namely, the accumulation of nutrients in organic combinations and the prevention of their loss by plant immobilization, and the improvement of soil structure by rest from cultivation and by biological activity.

The use of grass fallow as an alternative for short rotations has been considered, but its value in native agriculture requires fuller exploration. The maximum usefulness of grasses as fallow crops is probably attained within a few years. It has been observed that after two to four years the rate of root formation reaches a maximum and that decomposition of the grass residues proceeds as rapidly as the new growth is formed; that is, a maximum immobilization of plant nutrients in organic form has been attained. Thereafter, the chief effects of an extension of the fallow period would be to improve the soil texture.

As the immobilization of mineral nutrients may be the most important means of evaluating the usefulness of fallow systems, an investigation was carried out to obtain some indication of the actual amounts of nutrients immobilized under forest fallow con-

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