in the history of research on the control of the mammary gland In the earliest stage, the control appeared to be mainly of neural origin; but the establisl ment of the fact that mammary tissue could actively secrete when removed from any nerve connexion with the rest of the body, together with experiments showing the great importance of hormonal influences on the gland, led for a time to mammary physiology becoming almost a branch of endocrinology. The more balanced, modern view that neural and hormonal influences must be considered together in obtaining a satisfactory picture of the growth and function of this gland is now supported by increasing evidence. Thus the sucking stimulus apparently causes reflex secretion of prolactin by the anterior pituitary, by a pathway not yet understood, and is of importance not only in initiating milk secretion but also in maintaining it and in indirectly preserving the structural integrity of the milk-producing tissue.

The milk already secreted by the gland is, before suckling or cowshed milking, present in two portions. One can be obtained from the gland cisterns in the cow by careful cannulation (avoiding nervous stimulation); the other portion of the milk is more tenaciously held in the smaller ducts and capillaries and has to be forced out by an active (but involuntary) process. This latter process, 'let-down', though activated by a posterior-pituitary hormone, is in the intact animal a nervous reflex that can become conditioned, and is easily inhibited, both in the bovine and in the human. In the denervated udder, or in the isolated, perfused gland, 'let-down' can, however, be readily brought about by the introduction of oxytocin into the circulating blood. There is no evidence for the 'erection' of udder tissue by engorgement with blood; the true nature of the contractile tissue in the gland, hitherto uncertain, has now been established for the first time by the experiments just described by Mr. Richardson.

Dr. K. L. Blaxter (Hannah Dairy Research Institute, Ayr) described recent applications to dairy cattle of hormonal treatment for initiating or increasing milk secretion. Widespread treatment of thousands of normal animals presupposes a large supply of endocrine preparations, and for this reason synthetic sources of hormones are of the greatest potential use; synthetic œstrogens and iodinated proteins containing thyroxine can now be made on a large scale.

Lactation in barren cows and virgin heifers can be induced in a large proportion of such animals, though not, apparently, in all, by administration of synthetic œstrogens of the stilbœstrol type. There is great individual variability in the quantitative response to such treatment, for reasons that are not yet clear. Another practical handicap is that the treated animals are 'on heat' during the whole period during which the œstrogen is being administered; this leads, if the treated animals are allowed to run with other cows, to coital mimicry and the serious risk of pelvic fracture, since the œstrogen causes relaxation of the pelvic ligaments.

The feeding of iodinated proteins to lactating cows induces an increase in milk production, the magnitude of which depends on the dose given to the cows. A reasonable practical increase, say, of 20–25 per cent, can readily be obtained. Experiments were described showing the effect of such treatment on both milk-yield and composition and on the condition and behaviour of the animals. The milk obtained after feeding iodinated protein shows no thyroxine-like effect when taken in quite large quantities by human consumers, though its iodine content is increased. From the economic point of view, the value of the extra milk produced is considerably greater than the cost of the iodinated protein plus the extra feeding stuffs required. The margin of safety between an optimal dose and one which causes breakdown in the cow is not sufficiently large to allow the material to be used by other than competent farm staff. So far, in experiments lasting several months during which carefully controlled quantities were fed, there were no bad effects on the cow's health either at the time or in the next lactation; but until long-range experiments, now in progress, are completed, iodinated protein feeding cannot be regarded as a practical method for increasing the nation's milk supply.

Dr. Gaines (Glasgow) showed, by lantern and microscope, recent results of histological examination of human nipples. There are very abundant nerve endings in the nipple, many of them associated with smooth muscle cells, and associated with the erection that takes place after stimulus. The sucking stimulus of the infant is remarkable—the suction on the nipple could be as great as 100 or even 200 mm. of mercury. So far, though their presence had formerly been assumed in the nipple, no Meissner corpuscles had been found.

A discussion followed the papers referred to above.

PRIMITIVE TECHNIQUES, AGRICULTURE AND ECONOMIC ORGANISATION

PRIMITIVE techniques and their influence upon economic organisation was the subject of a discussion in Section H (Anthropology) of the British Association on September 10 at Brighton. Mr. R. U. Sayce, president of Section H, was in the chair.

The discussion was opened by Mr. Adrian Digby, who laid stress on the importance of the time factor. The study of society and the study of technology have, he said, been drifting apart under the influence of the functional school. The welter of closely integrated, not to say tangled, data with which social anthropologists have to deal has led those with leanings towards sociology to jettison the study of material culture as of least value to their particular interests and to specialize in social structure as a way out of their difficulties. On the other hand, those interested in material culture have paid more attention to the 'anatomy', as it were, than to the 'physiology' of their material. But there is a very close relation between social organisation and the manner in which people set about satisfying their needs in life.

There are, said Mr. Digby, six essential factors necessary to the daily life of any community: namely, (i) food, (ii) clothing, (iii) housing, (iv) fuel, (v) social integration for the distribution of the results of labour, and for security, and (vi) social integration for emotional and intellectual satisfaction. Under this latter head he included religion, marriage and relaxation. The relative importance of these six factors would vary according to circumstances, but the growth of any one in importance, or in time occupied, would be at the expense of some

other factor or factors of the six enumerated. This he illustrated by reference to the Australians, whose dependence on hunting and food-gathering, a slow method of producing food, leaves relatively little time for anything else except the elaborate rituals which satisfy the sixth need in their case and were also partially or largely directed to improving the food supply. With the Australians he contrasted the modern Maya, who, cultivating maize on the *milpa* system (analogous to the dry cultivation of rice), can with 190 days work in the year produce nearly twice as much maize on a ten-acre plot as a family of five needs for consumption, and have 175 days left for the other five basic needs. These figures, derived from Steggerda, represent an economy that relies upon steel tools; the ancient Maya relied upon stone ones. Their production would therefore be much less, but one could still assume that they produced sufficient food to give them, without surplus, a similar 175 days of leisure. With that they built themselves ample wooden dwelling-houses, developed textile and ceramic arts to a high degree, attained great intellectual achievement in mathematics and astronomy, and constructed elaborate ceremonial centres such as Copan and Tikal. The bulk of the population seem to have been peasant farmers; but the life occupation of each child was predetermined by a system of casting horoscopes—direction of labour by divine sanction which any bureaucratic government might envy to-day. If more time had been required for food production, all these other developments could not have occurred in the same degree; greater or less stress on any one of these would have had a major effect on their culture as a whole. No general rule can be deduced owing to lack of data from a quantitative point of view.

In the case of techniques other than agriculture, data are even scantier. Thus in West Africa men and women use different looms with entirely different technique of weaving; the differentiation is not based apparently on any physiological grounds; the reasons for it may be historical or psychological; but, without data as to time, labour and production, it is impossible to tell how these different methods of weaving fitted into the social and economic organisation of the people who practised them. New tools may create demands requiring a departure from traditional practice; new methods may involve changes, economic or social, which social or psychological considerations are unlikely to invalidate. Changes in material culture tend to be adopted far more rapidly than social changes; but the impact of Western civilization on the social side is none the less great for being exercised through material objects.

The corrective element to the unfortunate centrifugal tendencies of modern anthropology is to be found in the study of the time factor as applied to all productive techniques and the labour forces available. It was for the more careful study, by field workers, of technical processes, and especially of the time and labour required for them, that Mr. Digby particularly pleaded.

Mr. G. I. Jones followed Mr. Digby with a paper on the north-eastern tribes of south-east Nigeria, known to their neighbours as the Ndi Ogu Uku—the People of the Big Hoe. These tribes have a social and economic structure very different from their neighbours, and Mr. Jones suggested that this is primarily and mainly due to the use and development of their superior agricultural tool. The normal Ibo tribal structure lays emphasis on concentration and consolidation into compact, and therefore politically safe, communities subsisting on hoe cultivation, but using the normal small hoe at the end of a crook-shaped handle. The Ndi Ogu Uku, however, use a hoe with a blade of similar shape, but much larger and hafted into a heavy club-shaped handle. This implement makes it possible to extend yam plantations rapidly over a much larger area, thus shifting the basis of economic importance from labour to land. Other Ibo tribes also have a colonizing system; but, apparently owing to the slower rate of cultivating and to the concentration of populations, colonies once thrown off tend to become independent units, with their own separate communal life, at a distance from the parent community. In the case of the Big Hoe people, however, their rapidity of expansion in uncultivated land has led to the throwing out of colonies on a periphery of perhaps twenty miles or more without any break in family or political organisation, the younger members of a family retaining an interest in the parent village site and sending back colonists to replace elder members of their line in tribal councils and in family properties as places fall vacant. The peripheral communities of Big Hoe Ibo may be numerically weak in themselves, but the retention of close integration with their parent villages provides the reliance on numbers necessary to political security; while the use of the big hoe makes possible a rapid territorial expansion and a rapid increase in population and in organised *political* power. The Ibo communities therefore illustrate the very marked change in social and economic structures which can be brought about by a very minor change in material culture.

In the short discussion that followed Mr. Jones' paper, it was made clear that the use of the big hoe among the Ibo seemed to have developed gradually and was not attributed to any particular invention or to any given 'culture hero'; the other tribes using the traditional small hoe professed inability to use the big hoe, but this was due rather to the absence of the tradition than to any physical incapacity. Prof. Gordon Childe congratulated Mr. Digby on having illustrated the true function of functionalism in anthropology.

Prof. J. H. Hutton followed with a comparison between the cultivation of wet and dry rice in the Naga Hills of Assam. Food was clearly the most important of Mr. Digby's six basic needs, since without it the others would not arise; the available leisure, and the surplus food, after the needs of the community were assured, would vary, and their utilization would vary, and different patterns of society would be determined accordingly. The common physical affinities and common ecological background of the Naga Hills has made possible the elimination of many variables and therefore a valid comparison between the two contrasting economies. The hilly terrain had probably led to some sort of terracing even for dry crops; rice was later in time than millet and had possibly been first introduced as an irrigated crop purely, and used also as a dry crop afterwards. Terraced irrigation on the very steep hillsides involves very long-term commitments and a much greater initial effort than dry cultivation, and the occupation of permanent village sites is implicit. But the periodic labour is very much less than in dry cultivation, and much greater periods of leisure are made possible as well as a generally greater economic surplus. Only when very long-standing forest is felled for dry rice is the yield greater than

from irrigated fields, and even then the labour of felling is greatly enhanced and leisure correspondingly restricted.

Prof. Hutton illustrated the point by describing the comparative agricultural years of the Angami and Sema Nagas, emphasizing the much more continuous labour of the latter on their dry fields, and the much greater leisure enjoyed by the former as well as a greater economic surplus from their irrigated terraces. This gave the Angami a much richer and more colourful social life, since more leisure and wealth are available for the fifth and sixth needs. Moreover, a concentration of population is possible, with consequent political influence and stability. He suggested further that the absence of leisure in dry cultivation may be a contributory factor in the specialization of village industries like pot-making and weaving, which (in the Naga Hills) are often alternatively practised in one village and *taboo* in a neighbouring one, and may thus have contributed to the formation of occupational castes. He described the difficulty, enhanced by ritual considerations and by the absence of perennial forest, of effecting a change from a dry to a wet economy; but when once achieved, such a change leads to much greater independence on the part of individual villagers and tends to reduce the power of individual chieftains.

Dr. E. R. Leach, who followed with a paper on dry rice cultivation in Burma and Borneo, took a very different view from Prof. Hutton. He repudiated any general dichotomy in the wet and dry cultivation, regarding them as complementary rather than alternative methods of agriculture, and treating the administrative condemnation of dry rice cultivation as based on incomplete knowledge and mere prejudice; advocates of a change from dry to wet, he said, ignore problems such as that of redistribution of labour involved in the change. Dr. Leach had worked out a most detailed analysis to compare the labour and results of three methods of agriculture: 'slash and burn' methods of cultivating on dry ground, cultivating with the hoe for dry or wet rice, and cultivating with the plough. The difference between them, he said, is more fundamental than that between dry and irrigated rice. His general conclusion was that the cultivation of dry rice is more productive in yield per unit of labour than wet rice unless the plough be used. This conclusion, he maintained, is confirmed by the preference both among the Kachin of Upper Burma and the Dusun of Borneo for the cultivation of dry rather than wet rice where both methods were available. He suggested that the Angami terracing is due to military considerations rather than economic. With the plough, of course, the area cultivated by a normal household can be so much increased that there is a much greater economic surplus.

Prof. Christoph von Fürer-Haimendorf discussed the two preceding papers in the light of his experience on the north bank of the Brahmaputra in Assam, where the Apa Tani tribe, using hoes and not ploughs, support a population of 1,000 to the square mile on irrigated rice, of which they have a considerable surplus to trade for cattle and cloth to the neighbouring Daflas, who live in comparative poverty on the cultivation of dry rice, also by the use of the hoe, and have repeatedly to shift their villages as land becomes exhausted. This supported Prof. Hutton's view that irrigated rice is economically more profitable than dry. The Apa Tani system of wet cultivation preserves all the soil fertility and yields a perfectly balanced agricultural economy. The Apa Tani are a peace-loving people whereas it is the Daflas who have a bias towards war.

In the discussion that followed, it became pretty clear first that there was general agreement that, *provided* a long enough cycle of rest can be depended on, dry cultivation of the hillsides, which may be the only possible form of cultivation, need not in the long run be destructive of the soil fertility, or at any rate is not so wasteful or deleterious as administrative and forest officers are inclined to assert; and secondly, that the question of the economic return of irrigated as compared to dry rice, per unit of labour expended, depends very largely on the rainfall and on the presence of a perennial water supply, a point which largely accounts for the different views put forward by Prof. Hutton, from his experience of the Assam hills, and by Dr. Leach, whose experience is of the drier climate of Upper Burma.

It was perhaps a pity that the discussion of primitive techniques was so largely limited to agriculture; but the importance of the subject was not left in any doubt.

NEWS and VIEWS

Prof. G. R. Goldsbrough, C.B.E., F.R.S.

PROF. G. R. GOLDSBROUGH'S retirement from the chair of mathematics at King's College, Newcastle-upon-Tyne, breaks a long and distinguished association with the College. He is an old student of the College, who returned to it in 1919 as lecturer in applied mathematics; in 1928 he was promoted to a professorship, and he has been head of the Department of Mathematics for the last three years. His research work has been mainly on two lines: in hydrodynamics he has made important contributions to the dynamical theory of the tides, and in astronomy he has elucidated the classical problem of the divisions in Saturn's ring. He was elected to the Royal Society in 1929. His interest in astronomy and geodynamics has been of special value in connexion with the work of the University Observatory at Durham. In addition to teaching and research, Prof. Goldsbrough has taken a leading and influential part in administrative and other activities in the University, and his sound judgment and advice have been greatly appreciated. He was sub-rector of the College for the period 1942–47; and among many other duties he undertook the arduous task of chairmanship of the Joint Recruiting Board. He was awarded the C.B.E. in 1948. His colleagues and old students will wish him in his retirement many pleasant years of fruitful activity. He has been succeeded at King's College by Profs. A. E. Green and W. W. Rogosinski (see *Nature*, September 18, p. 445).

Biological Chemistry at Aberdeen: Dr. W. O. Kermack, F.R.S.

DR. W. O. KERMACK, for many years in charge of the Chemical Laboratories of the Royal College of Physicians, Edinburgh, has been appointed to the recently established chair of biological chemistry in