destroyed or decreased by proteolytic enzymes, or in other procedures directed to remove all proteins, or by heating to 80° C., or concentration by evaporation on a water-bath. Further evidence for the absence of protein was obtained by the negative result of standard protein tests and by the fact that the material did not induce antibody formation. Ultra-violet absorption spectra were typical of nucleic acids, and chromatographic analysis showed good correlation with the properties of polynucleotides. Prof. Binkley emphasized that there is no evidence to suggest that any dipeptidase is a protein, and no real surprise should be caused by the discovery that they may be something other than protein. Electrophoretically homogeneous preparations could be prepared by extraction with aqueous acetone and autolysis at 50° C. Subsequent fractional precipitation with ethanol leaves the active component in the supernatant, and a crystalline product can be isolated of extremely high activity compared with that of proteolytic enzymes composed of protein. Some of the difficulties of this interpretation were mentioned, particularly that ribonuclease or snake venom does not destroy the enzyme activity, except at a low pH at which activity is rapidly lost even without added enzymes. However, these enzymes do combine in 1:1 proportions with the active material and inhibit it. A second difficulty is that commercial nucleic acids are not active as dipeptidases; but they may be made active by a purification procedure. Further experiments have shown that plant viruses have similar peptidase activities and that these are actually enhanced by digestion with proteolytic enzymes.

In the discussion of Prof. Binkley's paper, no convincing difficulties in his interpretation were raised. Prof. J. D. Bernal emphasized the extent to which our views on protein synthesis would be clarified if we could start with the presumption that nucleic acids were themselves proteolytic enzymes.

The localization of enzymes in muscle were discussed by Dr. S. V. Perry (School of Biochemistry, Cambridge), showing in particular that adenosine triphosphate cannot be free in the cell. The myofibrils probably contain bound adenosine triphosphate and the mitochondria an enzyme responsible for splitting it.

Prof. A. Claude (Laboratory of Cytology and Experimental Cancerology, University of Brussels) described his methods for separating cells into fractions of distinct particle size and enzymic activity. He showed that, even with small differences of density, sharp separation is possible by successive centrifugation, though this may be interfered with by agglutination. He compared quantitative determinations of the quantity of glycogen obtained by centrifugation and by chemical separation, and also clearly illustrated the value of this technique as a preparative method by showing gram samples of cell constituents isolated in a short working-time. Prof. Claude then surveyed the morphological features of cells and discussed the fine structure of mitochondria, as revealed by electron microscopy. In conclusion, he pointed out the need for developing more refined centrifugation techniques for the further separation of similar particles, such as mitochondria, into types with different enzymic activities.

Prof. H. A. Krebs (Department of Biochemistry, University of Sheffield) outlined experiments on the distribution of ions and inorganic substances in cells. He emphasized that an understanding of these dis-

tributions depends upon our treating the cell as not being in osmotic equilibrium, for the osmotic pressure in a cell may be two or three times that of the blood plasma. The conception that the cell is enveloped by a semi-permeable membrane is not complete because there are many intracellular boundaries; many substances may thus penetrate the cell and yet not gain access to all parts of it. Distribution of sodium ions is maintained by the mechanism of a 'sodium pump' actively removing the ion, and this may occur not only at the cell surface, but also at surfaces within the cell.

Experiments with slices of guinea pig brain and kidney cortex in which the potassium loss and sodium gain were studied were next described by Dr. R. E. Davies (Department of Biochemistry, University of Sheffield). Under proper conditions reversible interchanges can be recorded. The water content of the tissue depends more on its metabolic activity than on the composition of the medium. Thus the turnover number of sodium ions to oxygen consumed was very high (5,000:1), and it is necessary to postulate an energy-linking system between entry to and escape from the cell. Treatment with dinitrophenol unlinks the process of transport from its energy sources and allows accumulation of sodium within the cell. The whole of the sodium and potassium content of a cell was found to be able to exchange in a very short time. Dr. Davies then presented evidence that these activities are controlled by enzymes located in the mitochondria. Fractions consisting mainly of mitochondria are thus able to concentrate ions and pump out water.

In closing the discussion, Prof. Young thanked the contributors for the various original observations reported during the day; he directed attention to the fact that the only mention of a new model was Prof. Krebs's comparison of the cell with a leaky ship kept afloat by pumps.

SAMPLE TABLES FOR THE 1951 CENSUS OF GREAT BRITAIN

IN the past, the General Register Office has often been severely criticized for its delay in the publication of the results of the decennial census of population. The critics often ignored the fact that the professional staff of the Office was very small, and that they had to cope with the routine work of the Office in addition to the census. It is therefore most creditable to the Office that a summary of the main results of the 1951 census came into the hands of the public within nineteen months of the date of enumeration*.

This was only made possible by the decision—for the first time in the history of censuses in Great Britain—to make a preliminary analysis of a sample of 1 per cent of the census schedules. Sampling had an additional advantage—tabulations which would have been prohibitively expensive and complicated in a full census were quite feasible for a sample. A sample of census schedules is also likely to be more accurate than an *ad hoc* inquiry: the completion of the schedule is compulsory, and sample selection can therefore be strictly controlled. The problem of non-response is minimized, and there is probably

* General Register Office and General Registry Office Scotland. Census 1951, Great Britain: One Per Cent Sample Tables. Pp. 367. (London: H.M.S.O., 1952.) Part 1, 17s. 6d.; Part 2, 2s.

more goodwill among the general public towards the census. The sample itself will be so large that sampling error will be negligible, and it is therefore to be hoped that the sampling procedure will be continued in the future. Although the sampling error is negligible, it is unfortunate that it is not discussed at greater length in the introductory pages. Those responsible for the publication of the report surely owe a duty to the public to explain their working methods fully, rather than treat them as esoteric mysteries. This is a small point; but there has recently been a general tendency on the part of those at the Office to explain their working methods in such general terms that it is not possible to follow their work in detail, so that criticism is made unduly difficult. (For example, the number of 'schedules' drawn in the sample as distinct from the number of 'persons' is nowhere given.) A second innovation must be gratefully mentioned. For the first time for a hundred years, the results for Great Britain are given in a single volume. It is to be hoped that the co-operation between the two registrars-general of England and Wales and of Scotland will continue, and that the national tables of the full census will also be given for Great Britain as a whole, as well as for the two constituent countries. It has been one of the minor irritations of persons working on British population figures to have to work with two different fat volumes, and occasionally to discover irritating minor differences in the definition of terms.

The sample tables in the two parts are numbered consecutively, so that the report may be regarded as a single whole. It is divided into different sections, and it would be invidious as well as presuming to try to deal with the results and their significance in a short article. I shall therefore content myself with describing the tabulations, indicating the innovations and commenting on some of the methods.

One of the main functions of the census is to give detailed statistics for local areas. In a 1 per cent sample the details must necessarily be less extensive than in a full enumeration, and the local tabulations are confined to the counties and larger towns. There is one welcome innovation, however: the provision of separate tables for the seven large conurbations centred on London, Birmingham, Manchester, Liverpool, Leeds, Newcastle and Glasgow.

Ages, Marital Condition, Occupations and Industries. These subjects are, of course, the main concern of the census-taker. The treatment follows conventional lines, but there are some minor innovations. The occupations are divided into thirteen 'socio-economic groups' in addition to the conventional five so-called 'social classes'. Any attempt at social classification which is based on occupations only must of necessity be rough, and can at best only approximate to what the sociologist understands by 'social class'; but given these limitations, a division into thirteen groups will, of course, be much more useful than one which makes use of five groups only, particularly when housing and fertility differentials are studied.

From the tables it is possible to obtain information about the structure of the population by sex, age, marital status, occupation and industry, and about some of these factors in combination. One can study the age structure of the labour force, the number of women in different industries, the extent of the employment of married women, and similar topics.

Housing and Structure of Private Households. The census defines a private household as a "single person living alone or a group of individuals voluntarily

living together under a single menage in the sense of sharing the same living room or eating at the same table; boarders and domestic servants are included in the household with which they are enumerated as also are visitors when such are present. But a lodger or group of lodgers having or sharing separate accommodation to themselves should have been enumerated on separate schedules and are thus treated as separate private households, distinct from the main occupying household of the dwelling, whether or not they rely on the latter for incidental service in the matter of room cleaning, food preparation, etc."

It will be seen that the definition of a private household is necessarily a little vague, and that ambiguities are bound to arise. In the case of lodgers there is an almost infinite gradation between the boarder who lives *en famille*, on one hand, and the lodger who merely rents a room to sleep in and has no dealings with the rest of the household, on the other; and in marginal cases it is difficult to ensure uniform treatment. Moreover, there is the problem of visitors. It is not very easy administratively to allocate visitors who are away from their homes back to the area of their usual residence. It seems likely *a priori* that members of small households are more likely to be mobile than those from larger ones, so that errors do not necessarily cancel out. It is also evident that the term 'private household' is not synonymous with the term 'family'. This confusion has been partly caused by the use of the latter word in previous censuses.

The tables show the total number of households by size and by number of rooms occupied, distinguishing in general those households which have to share a dwelling. Crowding indices can be calculated from these data. It should, however, be borne in mind that the number of rooms in the dwelling is obtained by the enumerator in the course of a hurried visit. Though substantial inaccuracies are unlikely, these figures are probably of a lower reliability than the rest of the census data.

The foregoing remarks also apply to a new feature. In 1951 enumerators were instructed to inquire whether the household had the exclusive use of piped water, cooking stove, kitchen sink, water closet and fixed bath, or whether any or all of these amenities were shared with another household. The tabulated answers make it possible to compare housing conditions in different parts of the country.

The second volume begins with tables showing information on household structure. The households are classified by the number of earners and the number of children that they contain; but it is the section next following which is of particular interest. Here an attempt is made to study in greater detail the structure and composition of private households, and, for this purpose, visitors have been excluded. Households are divided into those containing 'primary family units' only—that is, consisting merely of the head of the household, his or her spouse, children, ancestors and unmarried sibs of the head, and resident domestic servants. Such households form 86 per cent of the total contained in the sample. In the remaining 'composite' households, the members not belonging to a primary family unit have been further analysed into 'family nuclei' consisting of married couples or lone parents with their children. Composite households containing such nuclei were regarded as less stable than other composite households, as it was believed that they would in most

cases desire separate accommodation of their own. Their number and distribution would give one index of the amount of involuntary 'doubling-up' that exists. It was found that roughly a half of all composite households contained family nuclei, the large majority of these consisting of married children of the head or his spouse.

This tabulation will not be repeated for the full census. It is therefore regrettable that the data are only broken down by geographical region and that no attempt has been made to obtain information regarding household structure by occupation or social class. Such information has not previously been available, and its publication might throw some light on the nature of the housing problem which we are facing.

Education. One of the new questions included in the census related to the age at which full-time educational instruction had ceased. For some incomprehensible reason, the question was confined to males and occupied females, so that no information is available about the education of housewives (whom the census authorities still regard as 'unoccupied'). Moreover, the figures are particularly difficult to interpret at present, as the education of many persons was interrupted by the Second World War and continued after demobilization, so that the proportion whose education ends comparatively late may well be abnormally high. More valuable results may be obtained at the next census, when the question should, however, be re-phrased, as the age at which education ends is only one of the factors influencing what might loosely be described as 'education status'.

Fertility of Marriage. In the present census questions relating to the fertility of marriage have been asked for the first time since 1911. All married women under the age of fifty were required to state the date of their present marriage, the total number of children born alive to them, and whether they had given birth to a live child in the year preceding the census. The information is tabulated in a special section of sixty pages, and the tables are well set out. The limitation of the questions to women under the age of fifty is, however, utterly incomprehensible and most deplorable. It means that no comparisons can be made with the fertility experience of older women who bore the greater part of their children in the early nineteen-twenties. It is true that the sample census of the Royal Commission on Population taken in 1946 will remedy some of the deficiency, but it is by no means certain that the material will be comparable.

Information is made available about the distribution of married women by marriage duration, age, age at marriage and total number of children. The figures for social class and socio-economic group are analysed, and the women who bore a child in the year preceding the census are separately distinguished. It is thus possible to obtain data on differential fertility without having to marry vital registration and census statistics, in which occupational and other definitions may sometimes differ, thus causing minor incomparabilities.

Minor Tabulations. Among other information presented there is a table dealing with non-private households, information regarding birthplace and nationality, and statistics on the Welsh- and Gaelic-speaking population.

Enough has been said to indicate the wealth of material available in the new publication. No full census has been taken in Britain since 1931, and the

information is therefore all the more welcome. The sample tables will probably contain sufficient detail for most purposes. The full evaluation of the data will take time, but they promise to throw light on some social problems about which hitherto relatively little was known.

E. GREBENIK

OBITUARIES

Sir Francis Knowles, Bart.

SIR FRANCIS HOWE SEYMOUR KNOWLES, fifth baronet, who died at Oxford on April 4, at the age of sixty-seven, made notable contributions to two branches of the complex discipline of anthropology. Like many other anthropologists, he began his studies in a different field of knowledge, for he read law at Oriel College, Oxford. He then took the diploma in anthropology at the first examination held in Oxford (1908), and afterwards the degree of B.Sc. During 1909-12 he taught physical anthropology under Prof. Arthur Thomson, helping to place the subject on a firm scientific foundation. During that period he catalogued and measured two large collections of skulls; he also collaborated with Sir Arthur Keith in a study of teeth of palaeolithic man from Jersey, and with Prof. W. J. Sollas in an examination of the Aurignacian skeleton from Paviland Cave, Gower.

He left Oxford to undertake field-work among the Iroquois in Ontario. In 1914 he was appointed physical anthropologist to the Canadian Government, a post which he held for five years. His work on the skeletal material from the Roebuck prehistoric village site, "The Physical Anthropology of the Roebuck Iroquois", was published by the National Museum of Canada. A severe attack of typhoid, contracted in the field, left his health permanently impaired, and brought his career as a physical anthropologist to a premature end.

Returning to Oxford, Knowles took up the study of a subject in which he had long been interested, namely, the techniques used by ancient and modern Stone Age peoples in the manufacture of their tools and weapons. Using only the materials and tools known to have been available to prehistoric man, he practised patiently until he had acquired a skill comparable to that of the best craftsmen of the past. In this way began his long association with the Pitt Rivers Museum, Oxford, where he studied, and added considerably to, the prehistoric collections, arranged exhibition cases showing the variety of techniques employed by stone-workers from ancient to modern times, and held practical classes whereby his pupils obtained an insight into the difficulties overcome by prehistoric man. One of his most important discoveries was described in "The Manufacture of a Flint Arrow-head by Quartzite Hammer-stone", published as the first of the Museum's "Occasional Papers on Technology". Shortly before his death, he completed "Stone-Worker's Progress" for the same series.

Knowles took nothing for granted, but taught and published only what he had learned and verified by personal observation and experiment, thus giving lasting value to his work. His scholarship, his enthusiasm for his subject, and the selfless devotion with which he applied himself even to the routine tasks inseparable from it, were greatly admired by his colleagues, who will long remember him with respect and affection.

B. M. BLACKWOOD