

group differences are possibly larger; and there is some evidence to show that differences of so-called temperamental type may be associated with racial differences (*e.g.* the so-called "objective" type with Nordic physical features and the so-called "subjective" type with Mediterranean).

Mr. Fallaize pointed to the persistence of certain mental qualities in different races noted by the older travellers and historians.

Dr. Shrubsall said that he had observed that the children of Chinese fathers and English mothers in London schools, brought up in much the same environment as English children, were intellectually as quick

as the latter but showed no inclination to take part in games. Among English children differences in pigmentation appeared to be associated with differences in direction of aptitude.

In summing up the discussion, Mr. H. J. E. Peake, the president of the Anthropological Section, said that while no very definite conclusion had been reached, it was clear that the aim of investigators must be to eliminate the personal element, while psychologists should endeavour to break up mental characters into such simple factors as might be subjected to reaction tests, as courage had been shown to be the reaction to danger.

Scientific and Industrial Research.¹

THE Committee of the Privy Council for Scientific and Industrial Research has issued its seventh annual report, with that of its Advisory Council, covering the year 1921-1922. The first few pages deal with the income and expenditure of the Department of Scientific and Industrial Research, and with its efforts to observe the spirit of national economy. It is pleasing to record that the Geddes Committee on National Expenditure has not found it necessary or expedient to recommend any reduction in the estimates beyond that proposed by the Department itself. The total expenditure during the financial year 1921-1922 was nearly 525,585*l.*, made up of 190,024*l.* at the National Physical Laboratory (nearly 100,000*l.* being recovered in fees, etc.), 46,616*l.* at the Fuel Research Station, 57,423*l.* for the Geological Survey and Museum, 10,323*l.* at the Building Research Station, 17,750*l.* at the Low Temperature Research Station, 21,464*l.* on the work of the Co-ordinating Boards and Committees, 5988*l.* on minor research programmes, 86,355*l.* (from the million fund) in grants to the Research Associations, 8287*l.* in grants to other bodies, 43,793*l.* in research studentships, and 37,561*l.* on administration at headquarters.

By far the major portion of the report, however, deals with the plans and achievements of the various research organisations associated with the department. Considerable interest will be awakened in the twenty-four industrial research associations, twenty-two of which are already in active operation. A few of these associations have now been in existence long enough to have produced results of practical value, examples of which are given. Thus, the British Portland Cement Research Association has been able to effect considerable economies in fuel in many works through the results of its researches on rotary kilns and advice on scientific management. The British Scientific Instrument Research Association has introduced a new polishing powder and an abrasive for the production of lenses and prisms, by means of which grading and hand work are eliminated, and much time is saved. The British Cotton Industry Research Association has produced an instrument for the testing of yarns, continuous lengths being examined instead of short pieces as hitherto, with the result that important variations have been revealed in certain yarns, which are introduced by the method of spinning. Finally, the Linen Industry Research Association has developed a pedigree strain of flax seed which gives much higher yields of fibre than any existing variety, and has discovered methods whereby flax and hemp may be distinguished at all stages of manufacture. It is obvious that these are

not isolated pieces of work, but rather the first-fruits of a considerable harvest which has been patiently husbanded by the research associations, and it is no secret that a mere catalogue of the further results which have been published in the scientific press since the report was written would occupy considerable space.

The value of co-operation between the research associations is emphasised again. Several instances are mentioned of two or more associations attacking a common problem, the most interesting cases being those in which the participants are respectively consumers and producers of the materials investigated. Mutual efforts of this kind must result in improvements in useful commodities and possibly in a lowering of the cost of production.

Considerable space in the report is also devoted to the work of the co-ordinating research boards, which more directly serve national interests. Attention is directed to the commendable willingness of the Service departments to enlist the co-operation of outside bodies and to arrange for the open publication of the results of the work undertaken when these are of sufficient general interest. The co-ordinating research boards consider an enormous variety of problems in physics, chemistry, and engineering, including radio-telegraphy, the liquefaction and storage of gases, the deterioration of fabrics used by the fighting services, adhesives, and lubrication, and the report mentions several of the results obtained. Furthermore, public interest should be aroused in the work of the Fuel Research Board, which has issued most valuable information in a number of publications which have already been noted in these columns; *e.g.* in NATURE of November 25, 1922, p. 718, when the report on experiments on low temperature carbonisation was discussed. The work of the Food Investigation Board is also of common interest, and important advances are reported in the study of cold storage, and the bacteriology of canned meat and fish.

A useful discussion of the terms "pure" and "industrial" research is given, the distinction being mainly a question of the source from which the impulse to the conduct of research is derived. It has been all too common on the part of workers engaged in "pure" research for a very few problems to be pursued through all inviting ramifications, with the result that while certain small areas may be very thoroughly cultivated, the worker remains unimpressed by the vastness of the unexplored territory outside his own subject. The problems facing any one industry are much more varied than is frequently imagined, and the gaps in scientific knowledge which they reveal are often astonishing. For example, the Cotton Research Association finds it necessary

¹ Report of the Committee of the Privy Council for Scientific and Industrial Research for the Year 1921-22. (Cmd. 1735.) Pp. iv+123. (London: H.M. Stationery Office, 1922.) 3s. net.

to study the fundamental properties of single cotton hairs, the existing data being very scanty; the Photographic Research Association is investigating the properties of silver haloids and gelatin; the Portland Cement Research Association is endeavouring to ascertain the exact nature of the compounds constituting Portland cement; and the perfection of an abrasive and a polishing powder by the Scientific Instrument Research Association followed an investigation of the primary phenomena of grinding and polishing.

Two interesting examples of the interplay of "pure" and "industrial" research are given. On one hand, the knowledge gained by an investigation into the fundamental physiology of living and dead food-stuffs has cleared up the mystery of the

"brown-heart" of apples, which has caused severe losses in shipments from Australia. The "disease" has been attributed to insect injury in the orchards, but is now known to be due to the effect of the carbon dioxide engendered by the fruit itself in the badly ventilated holds of the ships. On the other hand, the study of the structure of coke at the Fuel Research Station has led to the conclusion that carbon in this form is a vitreous substance of great hardness, which profoundly affects the problem of the allotropy of this element. Some of the results obtained were described in NATURE of January 27, p. 133.

The industrial research associations are comparatively young bodies, but such as have already issued reports on investigations undertaken have given ample justification for their existence.

The Gold Coast Survey.

THE Survey Department of the Gold Coast, which was closed during the war, was reopened in 1920 by the present Governor, Sir F. G. Guggisberg, who had formerly initiated the survey of a considerable portion of Nigeria. The long cessation of survey

warp and split the woodwork of boxes, instruments, and tent-poles. The surveyors, of course, have to face malaria and other forms of sickness.

An important part of the new Survey Department is the Survey School at Odumase for the training of



FIG. 1.—A field survey camp on the march.

work on the Gold Coast had left matters in a backward state. To cope with immediate needs the department was strengthened, and it is believed that by 1924 the lost ground will have been regained and the country will be provided with a modern survey department. Lieut.-Col. R. H. Rowe is in charge of the new department, with Maj. G. H. Bell at the head of the field-work. The survey parties are organised in three sections which refit in England from July to September, when they leave for the Gold Coast in order to take full advantage of the "dry" season. Each section is divided into several completely equipped "field camps," under European surveyors.

The country that has been surveyed during the last two field seasons has been mainly dense tropical forest, presenting great difficulties to the surveyor. Lines must often be cut through the forest in order to reveal the surface features. Even in the dry season there are climatic difficulties. From December to March the harmattan frequently occurs and obscures the vision. At other times the dry winds

native surveyors. A three years' course in the school, followed by four years' service with the Government, qualifies a native to start in private practice. There are apparently good openings in this profession for African surveyors.

In addition to the Topographical branch of the survey there are two others—the Cadastral and the Records and Reproduction branches. In the Cadastral branch a great deal of work on land surveys and town plans has been done. The Records branch is gathering material for gazetteers and handbooks of the country, and the Reproduction section is engaged in printing road-maps, statistical maps, and diagrams. The topographical sheets of the survey on a scale of 1 to 125,000 are not being printed in the colony, but by Messrs. W. and A. K. Johnston (see NATURE, November 11, p. 647), to whose courtesy we owe the accompanying illustration (Fig. 1). About 15,000 square miles have already been surveyed, and it is expected that the present season's field-work will practically complete the maps of the Gold Coast Colony itself and also a large area in Ashanti.