direct-reading spectrograph have been designed so as to eliminate the photographic plate and thus speed up spectrochemical analysis.

Considerable progress has been made in establishing facilities for research in mechanical engineering. An investigation on the influence of predeformation on the plastic properties of metals continued, and a fundamental investigation was commenced into the effect of interrupted loading and periodic overloading on the fatigue of metals. Considerable progress was made with the construction of apparatus for examining the use of South African coal as gas-turbine fuel and for the study of heat transfer between solid boundaries and fluids, while equipment has been designed for the study of heat transfer under condensing conditions. Facilities are also being developed for testing and calibrating instruments to measure accurately the low air-speeds which often prevail in ventilated spaces, and a study of fan design in relation to noise has been started.

The work of the Telecommunications Research Laboratory has included the measurement of radio noise-levels at 100 kc./s. with the view of assessing the effect of atmospheric radio noise on navigational aids, the study of the occurrence of precipitation static and corona effects in aircraft in flight, a survey of the effect of soil and terrain on the propagation of low-frequency radio waves in South Africa, and the study by radar of lightning discharges, while for the Department of Defence radar equipment specially suited to South African conditions is being developed. The National Building Research Institute has occupied its new Building Research Laboratory; although the move considerably interrupted laboratory work, fundamental work was carried out on foundations on expansive clay soils and on the behaviour of the hydration products of cement minerals in aggressive solutions; a brochure of house plans for the urban Bantu was prepared as well as a guide to the planning of Bantu primary schools and a paper of climatic data for use in the design of buildings in the Union.

The work of the National Institute for Personnel Research has been handicapped by a shortage of graduate staff and a labour turnover as high as 27 per cent. Considerable work continues to be done on personnel selection, although the work generally is now directed to the efficient use of personnel, including aptitude tests for native labour, field studies of the mentality of indigenous African peoples, and studies on the nature and measurement of personality and of the forensic and sociological implications of electroencephalography. Defence research included a study of methods of assessing flying proficiency and a new general screening and classification test for the Union Defence Forces. Besides collecting data on road accidents in a large passenger transport corporation, the Institute is investigating the causes of motor-cycle accidents.

The Leather Industries Research Institute records progress in its studies on the structure and molecular weight of wattle tannin fractions, the structure of the chromium complex, the theories of vegetable and chrome tannage, the physical properties of the globular proteins of hides and the shape characteristics of various South African groups of feet. Much of the work of the Fishing Industry Research Institute was again on a short-term basis, but it included attempts to discover a satisfactory objective test for freshness and to determine nutritional values and trace elements in marine products. The Sugar Milling Research Institute continued to study methods of juice clarification, and much attention was paid to the occurrence of starch in cane juice and in sugars. The Paint Industries Research Institute's examination of paint performance has indicated that the climate in Durban is exceptionally severe, and that the simpler kinds of finish do not give good results. The most notable achievement of the South African Wool Textile Research Institute has been the development of a theory of the origin of medium- and long-term irregularity in worsted yarn which permits detection of a machine that is not drawing properly and also forecasts the minimum number of drawing operations required to draw and spin a given wool top. The Bituminous Binder Research Unit has completed a preliminary investigation of photo-oxidation in the weathering of binders on the road and is attempting to establish the physical mechanism of binder failure under traffic. Medical research has included further work on the culture of amœba, the pathology of bilharziasis in experimental animals, the serological diagnosis of cercariæ, the use of the ballistocardiogram in assessing the functioning of the heart, studies in the nutrition of Bantu infants and young children, the macromolecular syndrome and the experimental physiology and metabolism of the baboon, physico-chemical studies on animal viruses, and studies on bacteriophage inhibitors and the isolation of viruses.

TECHNICAL CO-OPERATION SCHEME OF THE COLOMBO PLAN

IN June 1955 the Technical Co-operation Scheme of the Colombo Plan, the main purpose of which is to help member countries to raise the level of technical skills among agricultural, industrial and other workers, in co-operation with the technical assistance programmes of the United States and of the United Nations and its Specialized Agencies, completed its fifth year, and the report for 1954–55*, issued by the Council for Technical Co-operation in South and South-East Asia, records that all four main developments noted last year gathered momentum.

There was an increased flow of technical aid experts, trainees and equipment: 1,023 training places were provided in 1954–55, compared with 508 in 1953–54, bringing the total to 2,676, of which 440 were for training in agriculture, 428 in administration, 331 in engineering, 305 in education, 293 in medicine and health, 219 in industry and trade, 195 in transport and communications and 146 in power and fuel. Australia took 916 trainees, Great Britain 853, India 340, Canada 311 and New Zealand 226. The demand for experts, 129 of whom were provided in 1954–55 (compared with 86 in 1953–54), making a total of 392 against applications for 672, was heaviest in medicine and health (117), with transport and communications (54), engineering (51), food, agriculture and forestry (47), education (42) and industry and trade (27) following. Great Britain provided 157 experts, of whom 65 went to Ceylon, 64 to India and 23 to Pakistan; Australia 115 (35 to Malaya, 28 to Ceylon, 28 to Pakistan), Canada 59 (26 to Ceylon, 11 to Pakistan); New

* Colombo Plan. Technical Co-operation Scheme. Report for 1954–55 by the Council for Technical Co-operation in South and South-East Asia. (London: H.M.S.O., 1955.) 1s. 3d. net.

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Zealand 44 (14 to Pakistan, 10 to Ceylon) and India 14 (10 to Ceylon, 4 to Indonesia). Posts of professors at universities and technical institutes remain hard to fill, and recruitment of some types of engineers and technicians is difficult. More inquiries are being made about the availability of firms of consultants. As regards equipment, the trend is towards equipment for establishing or expanding training and research facilities in the region with the object of training instructors. Equipment has already been supplied, ordered or offered to the value of £1·5 million against requests for more than £2 million, including £344,000 worth of laboratory equipment for research, £927,000 of training equipment and £97,000 of equipment for food and agriculture, most of this coming from Great Britain.

The movement to create or expand and improve training centres in South and South-East Asia continued. Among many examples given in the report are the assignment by Great Britain of four medical scientists to help the new medical colleges established by the Government of India by lecturing and demonstrating for ten weeks in India new techniques in diagnosis and treatment; the library facilities given by Australia and New Zealand to the University of Malaya, Singapore; the supply to Pakistan by Britain of equipment, an engineer and three demonstrator instructors to assist the change-over from manual control to automatic telecommunications; and the training of twenty-two teachers to help organize and administer technical high schools being established by the Pakistan Government.

Mutual aid in the region also made some further progress, and greater use continues to be made of technical assistance to promote economic development and raise the standard of living. Among new projects in this field the emphasis has now shifted from measures to avoid loss from pests, weeds and disease to measures to preserve food. Australia is giving equipment to the Dairy Research Institute, Bangalore, and is also arranging a tour for milk commissioners from Bombay and West Bengal and the head of the Dairy Technology Division of the Indian Dairy Research Institute to observe the large-scale handling and manufacture of milk and milk products. The Ceylon Government is taking steps to establish a rice research organization to help the drive towards self-sufficiency in rice, and Japan is sending two leading rice physiologists to study conditions in the main rice-growing areas and submit a detailed scheme for the proposed research organization. Britain has assigned an expert to the Indian Central Cotton Committee to review cotton research at the Institute of Plant Industry, Indore, and is supplying equipment to the newly established Pakistani Institute of Cotton Research and Technology at Karachi. Under the Colombo Plan agriculture is being promoted, along with industry, by irrigation and power projects, while output is being increased by the improvement of transport and communications. Britain, for example, is training the assistant director of soils for the Central Road Research Institute, Delhi, and has sent the Deputy Chief Engineer of the B.B.C. to review installation work already carried out by Radio Pakistan and to advise on the technical aspects of the future development plans; it has also assisted the Indian Central Glass and Ceramic Institute and the Central Leather Research Institute with technical facilities. Australia is providing research equipment for the brick and tile industry of Ceylon and is training a Pakistani officer who is to be employed on wool research testing, as well as five sugar technologists for Pakistan's new sugar factories.

While more trainees were sent abroad under the Scheme in 1954–55 than in any previous year, the training was also more closely fitted to the needs of the development projects. Under the Colombo Plan, including United States assistance, the countries of the area have now sent abroad 5,701 trainees and received 1,341 experts, mostly from outside the region; with the United Nations figures, the totals are 7,159 trainees and 3,741 experts. A large measure of co-operation has now been achieved, and the co-operating governments have a better idea of what forms of assistance the respective agencies can best provide.

MAN-POWER IN THE BRITISH COAL INDUSTRY

In a lecture to the Royal Institution of Public Administration on November 28, 1955, Mr. A. H. A. Wynn, scientific member of the National Coal Board, discussed the momentum of decline of the coal industry, which continued in spite of any increase in demand. Behind a fall in production from 287 million tons in 1913 to 174 million tons in 1945, the industry's ability to produce has also fallen. Mr. Wynn did not discuss many of the factors contributing to this momentum of decline, but pointed out that because of the gradual exhaustion of reserves in each individual mine, the productive capacity of the coal industry must decline by two or three per cent each year, if there is no large-scale reconstruction and no new collieries are opened. This decline affects adversely the standards of the industry's technology, its staff structure, its world reputation and its ability to recruit staff. Mr. Wynn did not discuss these imponderable psychological and educational problems, however, but rather the creation and growth of special administrative structures, some of which would be the responsibility of scientists and engineers. These organizations, he thought, are the most hopeful means of reversing the decline. He suggested that they fall under four headings: exploration, or the survey of natural resources; capital investment; the improvement of methods of production, primarily by promoting technological progress; and research and development, directed to increasing the commercial value of the industry's products. All are closely related; but only the first is peculiar to an extractive industry, and the inadequacy of our knowledge of coal resources is a factor in the momentum of decline that has delayed the reconstruction of the industry. The Board has also had to establish from slender resources the Planning Branch of the Production Department responsible for the large-scale reconstruction of old mines and the development of new ones, and its task has been made more difficult by the scarcity of suitable staff and the urgent demands for more coal.

Before 1947, the resources of the industry of Britain for promoting technological development were few; but the industry was profoundly dependent on heavy labour. A Mechanization Branch of the Production Department was established in 1947, supported by an Engineering Branch, and recently the Board has established a Central Engineering Establishment, near Burton-upon-Trent, for pursuing

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