

other refractories from which moulds are made. One of the Association's major problems has been to evolve quantitative techniques for the measurement of such phenomena as the friability of moulding sands on drying, the erosion of moulds that occurs when molten steel flows over the surface, the penetration of molten steel into the interstices between sand grains and the 'flowability' of moulding sands, that is, the ease or difficulty with which they may be compacted in narrow pockets, etc. Techniques have been evolved for these and similar measurements; for example, it has been possible, by using a test casting in which a controlled air pressure is applied to the liquid steel, to synthesize in a casting only 15 in. high the ferrostatic head experienced at the bottom of a casting 20 ft. in height. This technique has greatly facilitated the study of the penetration of liquid steel into moulding materials.

Much attention has been given to the development of mould paints and washes, and new formulations based on the dispersion of refractory particles in alginate suspensions have been developed which produce paint films that do not crack on drying or when molten steel is poured into the mould. These are a considerable advance on commercially available washes and are being applied on an increasing scale in the foundries of the Association's members.

The engineering section of the Association devotes considerable effort to studies of plant and equipment used in foundries and is actively engaged on investigations of factors affecting the performance of moulding machines and shot-blasting equipment. Studies are also being made of both wet and dry methods for the reclamation of used foundry sand. Here the problem is to remove from sand grains the layer of dead bonding clay to enable the sand to be re-bonded for cores and moulds.

From its inception the Association has always maintained a lively interest in problems relating to industrial health in foundries. Its recent activities have included the development of an exhausted fettling bench which combines control of fine dust with a substantial reduction in noise pressure-level when castings are cleaned with pneumatic chipping

hammers. These benches are now being made by two manufacturers.

Studies are also being made of atmospheric pollution from foundry steel-making furnaces, and a survey has recently been completed of the fume emission of arc furnaces varying from 30 cwt. to 80 tons capacity and from side blown ('Tropenas') converters.

The Association attaches considerable importance to liaison with its member companies, and they are regularly visited by senior members of the staff to discuss aspects of the Association's work ripe for development and also to advise on technical problems arising in production. Conferences and discussion groups are also organized both on a national and a regional basis, and during the past year an average of eight representatives per member company participated in these meetings. The Association also organizes short training courses for representatives of members on subjects such as moulding sand control, steelmaking techniques, etc. During 1961 a training course is to be organized on work simplification in foundries.

The seventh annual report of the Association has recently been published, and in presenting this to the annual general meeting on June 28, Dr. R. Hunter (Clyde Alloy Steel Co., Ltd.), the chairman of the Association's Council, invited members' attention to notable features of the report. He directed special attention to the expanded programme of liaison with industry referred to above and also to the establishment of a joint committee, the Steel Castings Development Committee, between the Research Association and the trade association, the British Steel Founders' Association. The function of this Committee is to disseminate data designed to promote the greater use of steel castings, and the Research Association has in hand a substantial programme of work for this Committee to determine properties of steel castings on which data are now lacking. A useful start has also been made in the provision of lectures and lecture material for presentation to engineering societies and engineering departments of technical colleges.

A. H. SULLY

CULTURE, SOCIETY AND HEALTH

DURING June 1-3, 1960, the Division of Anthropology of the New York Academy of Sciences and the Research Institute for the Study of Man jointly arranged a conference on culture, society and health. Among the many interesting papers was one dealing with cancer frequency and socio-cultural factors and another which examined the frequency of coronary artery disease in population groups. The study of socio-cultural factors in cancer was carried out by Walter B. Quisenberry, Division of Preventative Medicine, State Department of Health, Honolulu.

The population of Hawaii is made up of approximately 35 per cent Japanese, 23 per cent Caucasians, 18 per cent Hawaiians and part-Hawaiians, 12 per cent Filipinos, 6 per cent Chinese and 6 per cent others such as Koreans, Samoans, and Puerto Ricans.

Quisenberry's investigations showed that the incidence of stomach cancer is highest in Japanese men. There are probably many socio-cultural factors such as dietary habits which play a part in causing

this. Primary cancer of the liver, however, is most frequent in Filipino men. Filipino men probably eat foods which are higher in carbohydrates and lower in protein and vitamin B₁ than those of other ethnic groups.

Filipino and Japanese men have the lowest incidence of lung cancer in Hawaii; Japanese men and Filipino men have probably smoked fewer cigarettes over the years than Caucasian men. The Caucasian breast cancer rate is five times the Japanese rate; Japanese women have been slower in giving up the nursing of children than have the Caucasians. Cancer of the large intestine is more frequent in Caucasian women than in any other ethnic groups; the diet habits and, perhaps, the bowel habits of Caucasian and Japanese women are different.

Cancer of the prostate gland is about nine times more frequent in Caucasian men than in Japanese men; the socio-cultural factors which may be responsible for this great variance in incidence of prostatic cancer may be related to differences in love-

making and mating habits of the two ethnic groups. Cancer of the nasopharynx is most frequent in Chinese; it is possible that there is irritation of the nasopharynx in Chinese from hot liquids such as tea.

Cancer of the uterine cervix is most frequent among Hawaiian and part-Hawaiian women; because Hawaiians are by nature phlegmatic, the women probably do not receive as good care following pregnancies as do women of other ethnic groups. Skin cancer is most frequent among Caucasians; this is due probably more to differences in skin pigmentation than to socio-cultural factors.

Quisenberry suggests that some of the ethnic differences in the frequency of cancer may disappear with the integration of different racial groups in Hawaii. The changes may bring about either lower or higher incidences of cancer. For example, cancer of the breast seems to be increasing in Japanese women due to the stopping of nursing of children.

The study of coronary artery disease was carried out by David M. Spain of Beth El Hospital, New York, and indicates that there has been a significant

increase in the incidence of coronary atherosclerotic heart disease over the past twenty-five years in the United States. The possible environmental factors associated with this increase have been evaluated in relation to the possible common denominators in the environment believed to be associated with the reported low incidence of coronary artery disease in the South African Bantu, the Eskimo and the Chinese.

The preliminary findings of factors thought to be associated with coronary atherosclerotic heart disease in a study on several thousand males of the same ethnic origins from the New York metropolitan area were presented to illustrate the complex problems involved in the validation of the significance of such data. Such questions as standards of measurement, criteria for diagnosis, body build, occupational physical activity, obesity, hypertension, serum lipids, urinary oestrogens, diet and smoking habits were analysed while the limitations of studying coronary artery disease in living population groups, as well as the fallacy of generalizing from the findings in autopsy populations, were clearly shown.

THE STRENGTH OF SOLIDS

PROF. A. H. COTTRELL in his discourse to the Royal Institution on June 15, entitled "The Strength of Solids", emphasized the importance of this subject in engineering, and also in the functioning of the bones and muscles of the human machine he distinguished between two kinds of strength—that limited by plastic yielding and that limited by fracture. The manner in which a material fails depends on the relative values of strength against such ductile or brittle failure.

Those brittle materials which have very high inter-atomic forces and which should therefore have very high strengths are nevertheless weak due to the presence of small cracks or notches which act as stress concentrations. When a relatively flawless specimen of such a material can be prepared, it is found to have a strength that approaches the theoretical value. It is not, however, practicable to make such specimens in large enough size or sufficient quantity to be of use for structural components in engineering.

The ultimate strength of a ductile material depends on the stress at which a neck begins to form in a tensile test, that is to say, on its plastic behaviour, which involves the yield stress and work-hardening characteristics. An over-hardened material will not be ductile. The plastic deformation of crystalline

solids is due to the sliding of crystal layers over one another. Slip over any layer is not simultaneous, but is due to the movement of a dislocation line which separates the slipped from the unslipped portion. Ordinary solids in engineering contain many sources of dislocations so that they are intrinsically soft and ductile. The vast amount of plastic deformation permissible enables a ductile material to absorb the energy of shock loading and is a protection against fracture. Strengthening is achieved by placing obstacles in the paths of the dislocations—by alloying, heat treatment, neutron bombardment, etc. If, however, too much strengthening is given the plastic yielding strength may exceed the fracture strength and the material would become brittle.

Steel, though normally ductile, is a borderline case, low-temperatures or impact loading or a combination of these factors can cause brittle failure—a phenomenon which has led to many engineering failures.

Prof. Cottrell concluded with some remarks on fatigue failure, which is not yet fully understood. It is observed that in fatigue, plastic deformation becomes concentrated on a few slip planes, so that slip bands develop and then initiate cracks. It would appear that this is a process of local work softening.

K. J. PASCOE

RESEARCH IN CASE STUDIES

THE use of case studies in management training is well acknowledged as an important method of linking practical problems with management theory. However, as a training technique it is still unfamiliar to many people; and many who have heard about it have had no experience of it. Such was the basis and cause of a proposal by the South London Committee during the 1959-60 session to explore the methods of using case studies. This promised to bring significant benefits to members of the British Institute of Management in the South London area.

The effective use of a case-study discussion demands considerable skill on the part of the chairman if it is to have a real impact on every member of a case-study discussion group, from the vociferous to the reticent, and worth-while contributions from all are to be obtained. On account of this, the Committee felt that it should obtain guidance and training from an authoritative source. Co-operation was therefore established with Miss Avice V. Turnbull, research officer on case studies, Royal Institute of Public Administration, and special lecturer in management