produced by heating, and these gases may cause symptoms, especially when welding is done in confined spaces. Special risks exist when the metal which is being welded is covered with such protective coatings as zinc, which occurs on galvanized iron or steel, lead on painted metal, cadmium in paint or as an electro-plating, and the deposits from water or fuel in boilers. No information is given on the concentrations in the atmosphere of the various harmful contaminants which may occur during welding processes. These clearly depend upon the conditions of each operation and presumably on the methods of the individual workman.

The clinical section of the report begins with a critical review of the literature on health hazards of welding. In this investigation 249 men were examined from 16 firms where welding was done. Two hundred and forty-five were welders, two had previously been engaged in this trade, and two were foremen who had been exposed to the fumes in welding shops for many years. The firms were chosen so that a representative sample of welding processes and metals used would be included in the survey. Particular enquiry was made as to the type of welding upon which each man was engaged for most of the time, and each man was asked to comment upon the state of his health before he became a welder, and since taking up this occupation. He was asked also to give an opinion on the influence of the work upon his health. The average age of the group of welders examined was 34 years, the range being from 17 to 64. The average length of welding experience was 12.7 years, the longest experience being 37 years, and the shortest one year. The examination included a radiograph of the chest in 180 workmen, a controlled investigation into the effects upon the eyes in which a group of 50 shipyard welders was compared with one of 50 "shipyard non-welders" of the same age groups, and blood examinations in an unselected group of 100 welders.

The analysis of the results of the investigation is very detailed and the frequent interposition of tables and references to them in the text results in a somewhat disjointed description of the findings. These are more clearly presented in the summary.

The protection afforded by the usual clothing, gloves, and face-shield, reduces the risk of dermatitis from exposure to rays, dust, and oil, although multiple small burns result from sparks thrown off by the arc spluttering. The condition known as "arc-eyes" is common and most electric welders have experienced at least one attack. Gas welders do not suffer from this condition unless they have been exposed to unscreened rays from a neighbouring arc. The effects are temporary, but chronic conjunctivitis is found in welders more frequently than in men employed on other jobs. In the group examined no evidence of damage to the lens or deeper structures of the eye was detected. Their average age was 33.5 ± 4.9 years and their average welding experience was 10 ± 4.3 years. Cataract is seldom seen in glass workers when exposure to radiation has been for less than 17 years. No comment is made upon the nutritional state of the group of welders examined for specific lens changes. Minton (1949) states that "welders who may be suffering from some general disease, or those whose

state of nutrition is poor are liable to greater damage of the lens as a result of such physical factors as infra-red radiation".

The main positive finding was that approximately 60% of the welders examined had symptoms referable to disease of the respiratory system. Cough was the commonest complaint and abnormal physical signs were detected in about half the men who had symptoms. Of the 180 men radiographed, "definite inhalation changes" were found in 20 and "suspicious" changes in a further 12. The x-ray changes occur in direct proportion to the length of the employment and are more common and occur after a shorter time in electric welders. Symptoms were slightly more frequent and signs definitely more so in the group of welders showing x-ray changes. Two cases are described in which removal from exposure to fume resulted in retrogression of the shadows seen on x-ray examination. Several other welders had been found on examination 10 years previously to have x-ray changes which had not increased in intensity nor caused any diminution in working capacity. While this knowledge should lead to caution in assessing the significance as to prognosis of x-ray changes in the lungs of welders, it should not result in complacency towards the need for suppression of dust and fume especially when welding is done in confined spaces.

Doig concludes that the condition designated "welder's disease" by other observers is not a specific disease of welders due to their occupation. This, and the available evidence from statistics which suggests that there is no increased mortality or morbidity rate among welders, is reassuring. He recommends that more precise information of a statistical nature is required to ascertain that diseases such as pneumonia and gastro-intestinal disorders are no more frequent among welders than in the general population. The report concludes with a description of the regulations at present in force to protect welders from the effects of inhalation of dusts and fume, and the recommendations for the personal protection of the welder. Further recommendations designed to improve the ventilation in the vicinity of welding processes are made, and where fumes cannot be removed by exhaust ventilation the welders should be provided with breathing apparatus which ensures an adequate supply of air from an uncontaminated source. The variety of conditions which are encountered in different welding processes makes it necessary to consider each job as a separate problem if complete protection and maximum comfort is to be provided for the welder.

LESLEY BIDSTRUP

Minton, J. (1949). *Brit. med. J.*, 1, 392.

Health of Ferrous Foundrymen in Illinois. By the Division of Industrial Hygiene, U.S. Public Health Service and the Division of Industrial Hygiene, Illinois Dept. of Public Health. 1950. Public Health Service Publication No. 31. Washington, D.C.: Federal Security Agency. 24 text figures, numerous tables and diagrams. Pp. VII + 130. Price 75 cents.

It is well known that since many foundry workers are exposed to siliceous dusts they run a risk of silicosis and

considerable attention has been paid to the suppression of dust in foundries. Continuing claims for silicosis among workers in the ferrous foundry industry in three mid-western states led to a combined environmental and clinical survey.

Environmental studies were made at 18 foundries and medical studies in 16. A well illustrated account of foundry processes is first presented, followed by the environmental studies which were concentrated on the dust problems. Dust counts were made by the standard impinger apparatus. Samples for chemical analyses were collected by a vacuum cleaner on filter paper, samples being subsequently size-separated by liquid elutriation in such a way that 99% of the particles in the smaller size fraction were less than 10 microns in diameter. Free silica was determined by x-ray diffraction technique. The silica content of the airborne dust in the fine fraction ranged from 12 to 21%, the differences between dusts produced by different operations being relatively small. Dust concentrations were found to be considerably lower than in former investigations. The mean concentration only exceeded 10 million particles per cubic foot (approximately 300 particles/cc.) in sand-slinger moulding and in the mechanical shakeout department. Studies of other atmospheric contaminants showed low concentrations of aldehydes and low concentrations of carbon monoxide except on occasions during pouring operations in the winter months. The lighting was unsatisfactory in several plants. Sanitary facilities were, in general, good.

For purposes of correlation with the medical studies, occupational weighted dust exposures were calculated for various occupations by giving appropriate weight to the mean dust concentrations observed at the various tasks carried out in each occupation, according to the time spent in each separate task.

The medical examinations were carried out on a voluntary basis, but over 90% of the employees were examined. They consisted of a full clinical and industrial history and detailed dental examination, blood studies, a vital capacity estimation, and a full size x-ray film.

Details of the age distribution and marital status, personal habits, and hours of work of the men are given. For purposes of correlation of the occupation with the medical finding, the occupations were classified as principal occupation and present occupation. It was found that in over 80% of instances the present and principal occupations was identical. The various jobs were grouped together to form groups with similar dust exposure large enough in size to be related to the medical findings. Full details are given of the frequency of various abnormalities on clinical examination. There was no association between hypertension and occupation, but there was a positive association between hypertension and increasing degrees of pulmonary fibrosis as seen in the radiograph.

The largest part of the medical study was devoted to the relation of the x-ray finding to occupation and other abnormalities. Technical difficulties were experienced owing to variations in mains supply, and about 5% of the films taken were rejected as being technically unsatis-

factory. Films were read independently by two doctors, and the films on which opinions differed were subjected to consultative opinion. The medical records of the cases were consulted when considered necessary for the proper interpretation of obscure cases. The classification adopted was that used previously by the U.S. Public Health Service, which is fully illustrated with figures and diagrams. The lower limit of definite abnormality was taken at "ground glass 2 stage" and at this level, 9.2% of the foundrymen had evidence of pulmonary fibrosis; 7.7% of the films showed ground glass 2 stage, and only 1.5% were nodular in type. Comparing this prevalence with similar studies in coal mines and metal mines in Utah, the incidence of early fibrosis was greater in the foundrymen but there was considerably less nodular fibrosis. The possibility that iron deposition in the lung may have been responsible for the radiographic abnormalities is considered, but the question is left open. The authors only point out that there was no apparent difference in the radiographic appearances in the occupations with greater exposure to iron dust than those with less exposure. No case of nodular fibrosis was found in men with less than 10 years' industrial exposure. In contrast with most previous studies, no difference was found between the frequency of nodular fibrosis in the iron and steel foundrymen. In no instance was fibrosis disabling and the vital capacity was the same in those with nodular fibrosis as in the rest of the group. When the prevalence of radiographic abnormality was compared with the weighted dust exposures, it was found to increase, as would be expected, with increase in dust exposure. There was very little difference between the different occupations, except that there was a higher incidence of fibrosis among the moulders than among the cleaners and finishers. There was no association between degree of pulmonary fibrosis and anaemia or leukocytosis but there was a slight association between pulmonary fibrosis and raised sedimentation rate. The meaning of these findings is difficult to assess because no statistical tests of significance were made.

The dental status of the workers was found to be similar to that of other industrial workers previously studied, but a curious abrasion of the surfaces of the teeth was observed which predominantly affected occupations with a higher dust exposure, and was attributed to attrition by abrasive dust in the atmosphere.

A series of recommendations for reducing dust concentrations is given, particularly to improving exhaust ventilation, to good housekeeping, and to avoiding the use of high silica parting compounds.

This volume makes little contribution to knowledge of the aetiology of silicosis. It was not conducted with this end in view. It was intended to encourage industrial hygiene and to see how serious the problem of silicosis was in the foundries studied. The volume represents a sound and unpretentious piece of work, which will be of considerable practical value to those concerned with the management of the foundry industry. There are also numerous tables showing the frequency of occurrence of different levels of blood pressure, blood counts, sedimentation rates, vital capacities, and dental abnorm-

alities in what may be regarded as a reasonably healthy industrial population.

C. M. FLETCHER

Psychology and the Industrial Worker. By E. G. Chambers. 1951. Cambridge University Press. Pp. 192. Price 10s. 6d.

This book is difficult to assess. If one accepts the author's declared intention to draw illustrations "wherever possible . . . from British sources", then it is no use complaining that 96 references from a total of 119 are British. If it is necessary that two-thirds of these British references should be to reports of the Industrial Health Research Board, then one takes leave to wonder if it was altogether wise to confine attention so narrowly to British work. We often castigate our American colleagues for their apparent inability to "read British", but at least their all-American bibliographies are evidence of widespread sponsorship of industrial psychology.

The author devotes 27 pages to "Vocational Guidance" and 12 pages to "Vocational Selection", but to the latter should be added an 18-page chapter on "Psychological Tests", so the apparent emphasis is probably not measurable in pages. What is evident, however, is that the author's healthy scepticism about tests sometimes tends to negativism. He is undoubtedly at his best when explaining the uses, importance, and drawbacks of statistical methods, a subject in which he rightly enjoys a high reputation. Many little gems of wisdom are to be found, and do much to excuse what may appear to some readers a lack of balanced judgment in parts of this book. For example, no reference to factor analysis appears in the fairly full "Index of Subjects", but on p. 149 there is an incorrect statement that psychological tests "are the sole material of the factor analyst". Apart from the fact that nothing in the book provides the lay reader with a clue to what a "factor analyst" may be, it looks as though the author either has never read the work of Burt and Cattell, or regards personality trait ratings as included in the word "test".

It seems a pity that in a book published in 1951 there is not even a footnote to correct the statement on p. 41 that "there has yet been no attempt to validate" the War Office Selection Board procedure. Even when Mr. Chambers' preface was written in December, 1949, it was possible to check progress in this matter; and in April, 1950, Vernon's article "The Validation of Civil Service Selection Board Procedures" appeared in *Occupational Psychology*, a journal which must obviously be high on the author's reading list. In this paper, Professor Vernon quoted very full details of the procedure and validation, with validity coefficients of 0.5 to 0.6.

The last point which the reviewer is obliged to mention (with surprise) is the author's unfortunate inability to prevent his political views from intruding in a book of this kind. In chapter IX, which opens with the altogether praiseworthy statement that "it is possible for a psychologist to make some comments of a non-political nature, and in what follows the writer hopes that he has

escaped as far as possible from the bias of party politics". Despite his awareness of the danger, Mr. Chambers in his discussion of trade unionism and nationalized industry leaves little doubt as to which party he supports. This is a pity, especially if the book is widely read by industrial workers, for they may be inclined to distrust psychology more than they do already if the author's political views are identified with the use of psychology by management.

In summary, this book provides a useful compendium, not elsewhere available, of I.H.R.B. Reports; a great deal of statistical and methodological sense; and a rather lop-sided estimate of industrial psychology, its achievements and possibilities.

ALASTAIR HERON

The Health of Executives : Mental Stress and Break-down. I.W.S. Pamphlets. 1951. The Industrial Welfare Society, Inc., 48, Bryanston Square, London, W.1. Price 1s.

This pamphlet is a discussion of the stresses and breakdowns arising in people who exercise high mental skills and responsibilities by Dr. Cecil Roberts, Deputy Treasury Medical Adviser. After a brief survey of the nature of mental skill, Dr. Roberts considers the meaning of responsibility and concludes that it is the same as answerability. He further concludes that the crux of the stress situation is the interplay between responsibility and self-esteem. This pamphlet is of particular interest to industrial medical officers for its analysis of the early signs of breakdown and the sequence of events which occurs; only psychological breakdowns leading to anxiety, apathy, and depression are considered, and these mainly from the angle of self-imposed stresses. Dr. Roberts gives a number of useful and practical suggestions for the avoidance of stress or at least of minimizing stress when it is inevitable. This little pamphlet contains much useful, concentrated wisdom in dealing with the affairs of a busy life; the executive does not exist who would not derive some benefit from a study of it.

L. G. NORMAN

Human Kinetics and Analysing Body Movements. By T. McClurg Anderson. 1951. London: Wm. Heinemann Ltd. 245 text figures. Price 30s.

There is a growing belief that students of anatomy are being assigned too much time to the study of the cadaver. The author demonstrates in this book the possibility of teaching this factual subject in a more functional manner. Even in the introductory section, which deals with the anatomy of the body structures concerned with movement, the activities of certain muscles are illustrated by sprinting, tennis service, or golf swing, and references to sport or industrial tasks are frequent throughout the entire book. Part II deals at first with the fundamental actions performed by the limbs against external forces, and the use of gravity, elastic recoil of the tissues, and momentum as aids to maximum effort. A very good chapter follows on "Kinetic Analysis" describing "lock", "check" and "balancing" actions and their effects, usually beneficial,