spatial orientation, that is, in the discrimination of distances and directions.

R. H. J. Watson (London) read a paper on "Stereotype Behaviour in the Rat". Such behaviour is one of many kinds often called abnormal which are conveniently studied in the rat. Mr. Watson considered in detail the difficulties encountered in arriving at criteria for normality and abnormality of behaviour. He considered in particular the suggestion made by Maier that behaviour should be considered normal if it were predictable from learning theory, abnormal otherwise. Using this criterion, Maier claimed that stereotype behaviour was abnormal, instigated by frustration resulting from presenting the rats with an insoluble problem. Mr. Watson reported experiments in which a more complex insoluble problem was used and in which a more complex stereotyping resulted. The analysis of the results indicates that, both in the insoluble problem and in a subsequent soluble problem, the behaviour conformed on a number of criteria to that which would be predicted from conventional learning theory. The results also suggested that such stereotypes would be self-perpetuating.

H. B. M. Hurwitz (London) read a paper, "Response Patterns in the Rat", which was also concerned with the predictive value of learning theory. In learning theories, it is commonly assumed that the strength of a response is a function of habit strength together with drive strength. The favourite experimental device for investigating the roles of these two factors is the Skinner box, in which rats learn to depress a lever to obtain delivery of food in a food trough. When the habit has been learnt, food is withheld and a count made of the number of lever-pressings produced before the habit is extinguished. Data obtained in this way are of basic importance to the theories of Hull and Skinner, for example. Mr. Hurwitz reported experiments using a modified Skinner box (which he demonstrated) with which the temporal and serial patterning of responses (both at the food trough and the lever) could be observed. Analysis of results suggested that the postulation of a secondary drive, frustration, could best explain the behaviour of the rat during extinction of the habit. Evidence for this would not have been forthcoming if conventional methods of analysing responses had been used.

General discussions on the papers were introduced by Profs. R. W. Russell (London) and W. S. Verplanck (Harvard). There were detailed discussions on methodology of the individual researches reported; more general topics covered included behavioural differences between various strains of rats, the use of the concept 'abnormal', and the predictive value of learning theories.

B. M. Foss

CAREERS IN CHEMICAL ENGINEERING

AN unexpected occurrence during the past few years has been the large decline in the numbers of men seeking admission to the universities for training as engineers, a decline noted not only in Britain but also to an even greater extent in the United States. Simultaneously, committee after committee has urged the need for more engineers in general, and chemical engineers in particular. Extensive training schemes will obviously be of little value unless the numbers of those willing to be

trained can be greatly increased, and thus the issue by the Institution of Chemical Engineers of a small brochure entitled "Careers in Chemical Engineering" is most opportune (pp. 12+4 plates. Inst. Chem. Eng., 56 Victoria Street, London, S.W.1, 1953; 2s.). This explains clearly, in the simplest language, what chemical engineering is, how it developed, what a chemical engineer does, his opportunities, and how he can be trained; and it supplements its descriptions with admirable illustrations of plant of diverse nature, designed and constructed by chemical engineers. It is to be hoped that means will be found of bringing this pamphlet to the notice of every school-boy leaving school, every schoolmaster, and every man at present engaged on National Service.

Modesty, unfortunately, seems to have compelled the authors to refrain from mentioning, except in the vaguest terms, the remuneration a chemical engineer may expect; in this materialistic age, one of the first questions asked by a young man selecting a career is: "What salary shall I get and what are the prospects?" This aspect might well be amplified in a future edition. A further line of thought is aroused by the almost parenthetical mention of teaching as an outlet for chemical engineers. Every academic member of the profession knows only too well the extreme scarcity of good teachers, and this fact must be regarded at the moment as the bottleneck in any scheme for the large expansion of chemical engineering training in Britain. Until steps are taken to induce a far larger proportion of chemical engineers than at present to go in for teaching, any increase in the numbers seeking training, or in funds for laboratory extensions, will be rendered of little avail.

H. E. WATSON

WOOL INDUSTRIES RESEARCH ASSOCIATION

REPORT FOR 1952-53

THE report for 1952-53 of the director of research of the Wool Industries Research Association* records that the opening of new research laboratories at the Leeds headquarters of the Association has greatly increased the research potential. Three new blocks of laboratory buildings, erected since the end of the Second World War, were officially opened by Lord Swinton in October last year. With a staff now totalling 203, a very considerable variety of research topics has been and is being examined, ranging from *ad hoc* investigations of a purely consultative type, designed to assist industrialists in solving the day-to-day problems of a highly technical industry, to almost purely mathematical analyses of the system of forces acting upon fibre arrays during roller drafting, and of the corresponding and resulting fibre displacements.

Among the many research activities mentioned in the director's report, several are noteworthy for the ingenuity and modernity of the techniques employed. For example, in order to test the theory of carding which has been developed at the Association, an electrical counterpart or analogue of the three-part scribbler has been built. This shows in electrical terms what happens to a discontinuous feed, such as is obtained from the hopper of a card, as it passes

* Wool Industries Research Association. Report of the Director of Research for 1952-53 (Publication No. 196). Pp. 27. (From the Association, Leeds, 1953.)