Illustrations and diagrams are well presented, and in spite of the comparatively high price, the nature of the subject matter will ensure a demand for it. Anyone concerned with nuclear energy topics should find this a valuable source of information, additional to, and in a more manageable size, than the proceedings of the Geneva conferences. C. R. TOTTLE

INSTRUMENTATION, DATA PROCESSING AND AUTOMATIC CONTROL

Progress in Automation

Vol. 1. Edited by Dr. Andrew D. Booth. Pp. viii+231. (London: Butterworths Scientific Publications, 1960.) 42*s*.

THE editor of this volume defines automation as that field of endeavour which "seeks to duplicate the activities of living creatures, including humans, by non-living but energy consuming means". He goes on to give an excellent historical survey, beginning with the water clock of Vitruvius in 245 B.C. and including many examples of early applications of automatic control. This broad definition is inevitably followed by a wide selection of topics, and the title of the volume is singularly uninformative about their content. In fact, the ten contributors to the volume cover some aspects of British progress in instrumentation, data processing and automatic control.

Articles on instrumentation are contributed by T. B. Rowley and A. E. M. Hodgson. Both are devoted to nucleonic measurement techniques using radioactive isotopes. The first deals with thickness and level measurements and the second with fluid-density measurements, and the combination gives a clear account of these important methods.

Data reduction gives rise to the need for converters to transform the varying analogue quantities in the plant or process into digital form for use by the logger or computer. An excellent contribution by G. J. Herring reviews current practice in analogue to digital conversion and considers in detail a converter designed for use in high-speed data reduction.

The contribution on steel strip mills by G. Syke is a general review of the problems of instrumentation and control in the production of continuous strip. For the chemical industry, J. M. Keating discusses the automatic control of chemical plants and indicates the necessary properties for a digital computer used as a master controller for such a plant. The problems of data processing in an oil refinery are also considered and future developments indicated.

Automatic inspection techniques are discussed by J. A. Sargrove, who considers the possibility of performing statistical analysis on the samples tested and automatically feeding back information to the production line to correct unwanted trends and faults.

There are four articles on machine tool control which form a useful record and are in many ways complementary. K. J. Coppin describes a simple method of machine tool control designed for existing machines. The desired work dimensions are set in by an operator at the start of each traverse and positional measurement is from potentiometers geared to the lead screw. Two fully automatic numerical control systems are described in articles by D. T. N. Williamson, of Ferranti, Ltd., and F. W. Hartley, of E.M.I., Ltd. The Ferranti system uses optical diffraction gratings with moiré fringe counting to achieve positional measurement and is non-interpolating. The E.M.I. system, on the other hand, uses a continuous analogue measure of tool position and interpolates parabolically between points in the stored programme of successive tool positions. Hartley's paper also contains a comparison of several British and American systems and discusses the economics of numerical machine tool control.

H. J. Finden considers in his paper a numerical control system for a machine tool in which a linear inductosyn gives a precise analogue position measurement independent of the lead screw.

The articles are well written and authoritative, and the choice of topics gives a fair cross-section of British efforts in this vast field.

The volume fills a gap in existing literature between the specialist papers in professional journals and the more popular articles on automation. In this respect it will be of value to many engineers, research workers and administrators who require a sound account of progress in a given topic without searching the literature. It is very well produced, but further volumes may be better matched to their purpose as progress reviews if made in a less costly form.

P. H. HAMMOND

SIGNALS AND STATISTICS

Statistical Theory of Signal Detection

By Dr. Carl W. Helstrom. (International Series of Monographs on Electronics and Instrumentation, Vol. 9.) Pp. viii+364. (London and New York: Pergamon Press, 1960.) 63*s*. net.

DR. HELSTROM is primarily interested in the reception of radar signals. He formulates his problems explicitly as problems in statistical inference: to detect a signal in the presence of noise (that is, to decide whether a signal of known form, or perhaps only of known statistical properties, is present or not), to estimate parameters of the signal, such as arrival time and carrier frequency, and to resolve signals, that is, to decide which of a number of known signals are present simultaneously.

After some general material on signals, filters and noise, the author gives a clear description of the Bayes, minimax and Neyman-Pearson decision criteria. Later in the book he describes the use of ratios of maximized likelihoods, and some of the properties of Bayes and maximum likelihood estimates.

The rest of the work consists largely of a detailed application of these methods to the decision problems mentioned above, for situations of varying degrees of complexity: for example, detection when one has nuisance parameters such as signal amplitude, phase and arrival time, or when repeated observations are made on the signal. An aspect of the problem novel to many statisticians is that observations are taken in continuous time, so that the idea of 'sample size' is to some extent replaced by that of 'signal to noise ratio', and the data must be transformed canonically if one is to have an enumerable set of variates.