Book Reviews

Automation in Business and Industry. Eugene M. Grabbe. Wiley, New York; Chapman & Hall, London, 1957. 611 pp. Illus. $10.

In the spring of 1955, an engineering extension course on automation was held by the University of California. This consisted of a series of lectures by eminent scientists, engineers, and industrialists. It proved to be a success, and consequently the lectures, some 70 in all, have now appeared in book form.

The book has all the advantages and disadvantages of its origin. Many of the individual contributions are fresh and informative—each facet of the subject is treated with authority by an acknowledged expert. On the other hand, they are uneven in length, depth, comprehensibility, and importance; there is much repetition. In spite of, and partly because of, the lack of coherence inherent in such a compilation, an excellent impression is given of the complexity and rapid growth of the subject.

The term *automation* is not one which marks precisely the limits of a particular field of development. This can be seen from the attempts of quite a number of the authors of the essays which comprise the book to define it in accordance with their own conceptual needs. In the present instance the bias is toward computer and feedback control, but there is very little left in the book of the original "Detroit" automation concept, based essentially on the transfer machine.

The term *automation* has now been accepted internationally, even if grudgingly. In Europe, where the subject is at present fashionable, there is hardly a speaker on the subject who does not begin his lecture by deploring the word, both for its linguistic impurity and for its lack of precise meaning; yet no alternative has been seriously proposed.

There are many, too, particularly among the engineers, who dismiss automation as being overdramatized and not new. This may be so, but there is a really substantial rate of development and there is great industrial interest in each of the three main groups of technical advance which loosely comprise automation—refined mechanization, automatic control, and the use of electronic computers; what is not yet clear is how quickly it will be possible to integrate these three streams of progress to provide a fully automatic production system.

The present book, while it pays lip service to the fuller concept of automation, naturally—since it is the work of specialists—concentrates on the component advances and does so clearly and well. For example, there is an excellent summary by John L. Bower of the development of digital control of machine tools, while Dean E. Wooldridge, in discussing the "future of automation," points out the lessons to be learned from military electronics and weapons-system experience. There are excellent descriptions, too, of analog and digital computer developments, of data processing, and of instrumentation, process, and industrial control. The sections on the petroleum and chemical industries, by C. G. Laspe, describe clearly how significant the application of these methods has already become. He goes a little too far, perhaps, in his introduction, where he states that "automation has been the key to the rapid growth of the present-day process industries." Surely this is more true in reverse; it has been the high state of science and technology in the chemical and petroleum industries and the development of continuous processes and of long runs of production which have favored development of advanced instrumentation and feedback control, much to the benefit of industry as a whole.

It is becoming increasingly clear that we are now at a stage in technological advance at which fundamental scientific knowledge and the existence of techniques in electronics and other fields should make great and dramatic advance possible in the near future. As Simon Ramo says in the first chapter of the book: "There are scores of aids to business and industry and transportation that present technological art is capable of providing, without a single new discovery in basic science. It would be possible today on the basis of known pure science to design devices that could displace a very large fraction of the white-collar workers." Again, at the end of his essay, he writes, "Perhaps the most glaring shortcoming of today's art is our lack of quantitative understanding of human beings as part of a complete system which includes both the machine and the human being."

Herein lies the real problem of automation. The basic science exists in sufficient degree to produce completely new patterns of industry; engineering skills are available (although scarce) to exploit the new possibilities, but men are not yet sufficiently aware of the nature of the changes and of the adjustments which will have to be made. The real problem of automation is this individual and social comprehension. The increasing complexity of automation is, in particular, a challenge to management, from whom is demanded a knowledge of, or at least a familiarity with, problems of vastly differing nature—economic, engineering, and human. We know far too little about the changes that automation will bring to the industrial and social structure, but they will certainly be profound, and evidently rapid and healthy progress can be made only if technical, economic, social, and educational facets are dealt with as a whole. Automation is thus an excellent pilot example of the rapid technical change which is characteristic of our age. The problems it brings will, to a large extent, be common to other types of advanced technical innovation, including atomic energy. It is important, therefore, that they should be studied.

The present book recognizes these wider problems but devotes little attention to them. As an account of the individual techniques which are creating true automation, it is, however, excellent and is to be widely recommended.

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Isotopic Tracers in Biology. An introduction to tracer methodology. Martin D. Kamen. Academic Press, New York, ed. 3, 1957. xii + 474 pp. Illus. $9.50.

This is the third edition of a work which was first published in 1947 under the title *Radioactive Tracers in Biology*. In the intervening 10 years the use of tracers has become commonplace, and the literature, even in a specific field such as biology, has become so voluminous that the author has made no attempt to produce an exhaustive survey of the field. In selecting more recent work, Kamen judged the pedagogic value of the study, rather than its novelty, as a criterion for inclusion in the text.

Among the significant changes in the new edition are the inclusion of chapters on stable isotope tracers and a revision of the early sections dealing with the physics of the nucleus and the chemistry of radioactive ions. Specific parts of this

volume dealing with biochemical applications have been greatly extended. The third edition also contains a series of very useful appendixes, the one on chromatography being particularly noteworthy in its detailed description of the use of autoradiographic techniques as a means of augmenting the information that can be obtained from the original paper chromatogram.

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Report of the Conference on Recent Developments in Cloud-Chamber and Associated Techniques. Comprising collected papers of the conference held under the joint auspices of the Physical Society of London and University College, London, March 1955. N. Morris and M. J. B. Duff, Eds. University College, London, 1956. 227 pp. Illus. 30s.

This volume is composed of the papers presented at the Conference on Recent Developments in Cloud-Chamber and Associated Techniques, held in London in 1955. There are 46 papers, plus reports of six discussion sessions. The reports cover the following variations of cloud chambers: diffusion, multiple plate, high pressure, fast cycling, and pure vapor. Problems of measurement and interpretation of tracks and apparatus for reprojection and measurement were discussed in one of the sessions (five papers). Circuits, counters and apparatus used for counter-controlled operation, and other peripheral matters are taken up in a number of papers. The bubble chamber, which was quite new on the scene at the time the conference was organized, was accorded a short presentation. However, because of the rapidity with which the development of this device has proceeded in the last few years, the material given in the report can now be considered to be only an introduction to the subject. Most of the authors are from laboratories in England, but there is a good representation from the United States and other countries.

It would be pretentious to try to rate the contents of the volume—its contributors constitute a large fraction of all the practicing experts in the cloud-chamber business, and it is therefore authoritative by definition. As in any report of a conference, the value of the written version depends on the care with which the manuscripts were prepared and assembled—the standard set by the editors. In the preparation of this volume, the editors are to be commended. They have been thorough in gathering the pertinent written material, references, and discussion. What is even more commendable in a work of this kind, they have made sure that the graphs and pictures are accompanied by full captions.

In the volume at hand we have without doubt the most complete statement existing on the art of cloud chambers. It is so complete, in fact, that one cannot help wondering, with a little nostalgia, if this will be the treatise to end treatises on the subject. In the past decade or more we have seen large sections of the area of usefulness of the cloud chamber taken over by the counter, the photographic emulsion, and the bubble chamber. It is easy to extrapolate and think that possibly before very long the displacement will be complete. There are, however, at least two areas which come to mind in which the cloud chamber still holds its position: (i) counter-controlled operation (preexpansion tracks), especially as applied to the study of cosmic rays, and (ii) the study of low-energy particles, particularly where it is desired that the tracks be long enough so that their curvatures in a magnetic field can be measured. Bubble chambers at present cannot be counter-controlled because no way has been found to produce expansion within the lifetime of the activation produced by the moving particle, and they are not suited to the study of low-energy particles because of the high stopping power of the liquid. Photographic emulsions obviously cannot be counter-controlled, and they have limitations similar to those of the bubble chamber where low-energy particles are concerned. These examples are enough to show that, in spite of a narrowing of the field, there do remain applications for the cloud chamber which are not challenged by the other techniques. Perhaps, therefore, the present excellent volume of reports does not have to be considered a swan song.

Everyone working with cloud chambers or concerned with the interpretation of cloud-chamber results will find the volume very interesting and valuable.

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Psychological Aspects of Aging. Proceedings of a Conference on Planning Research, Bethesda, Md., April 24–27, 1955. John E. Anderson, Ed. American Psychological Association, Washington, D.C., 1956. 323 pp. $2.

This is a significant book which can be read with profit not only by those specifically interested in problems of aging but also by graduate students and others entering research in any field of scientific psychology or the social sciences. The conference which it reports was held under the auspices of the American Psychological Association and was financed by the National Institute of Mental Health. Its purpose was to survey the field of possible research on aging that might be made by different branches of psychology.

The book begins with the text of the opening address by J. H. Sheldon, who was at the time president of the International Congress of Gerontology and to whose untiring efforts to foster international cooperation in this field, the invitation to give this address was a fitting tribute. The papers which follow are divided into five sections. The first deals with personality changes during the adult years and their relation to social adjustment. The second considers the nature of, and means of assessing, age changes, mainly from a psychophysiological standpoint. The third section outlines the more strictly psychological studies of changing ability, measured in the main by so-called "mental" tests. The fourth section discusses problems of training and education in the light of changes, with age, in the capacity to learn and of shifts in the pattern of motives brought by older people to their tasks. The fifth section is a consideration of age changes as they affect employability. There follows a masterly summary and ordering, by the editor, of proposals for future research raised by the other contributors.

As is evident from the scope of the various sections, the papers are representative of many different branches of psychology, and their scientific quality varies with that of the branch from which they have come. Almost all are, however, of high standard within their own fields.

The book as a whole would seem to be important for four reasons. First, it makes clear that psychological studies of aging during the adult years are now developed to a point at which they merit serious attention, both from psychology generally and from other branches of science.

Second, the papers as a whole provide an accurate view in research terms, without sentimental distortions, of the field as it must be considered by psychologists intending to enter it. Anyone who has attempted the difficult task of doing research on aging will know that a man often takes 2 or 3 years to become oriented and to begin making his own contribution. The present book should enable him to form a quick appraisal of the kind of work that has been done and of the areas in which contributions are now required, and thus it should give him a flying start and a better perspective than his predecessors have enjoyed.

Third, there is a repeated insistence on the need to view aging as a continuous process over the whole life-span. Most discussion in the past has been con-