

Books

Digital Computer Programming. By D. D. McCracken. 253 pp. John Wiley & Sons, Inc., New York, 1957. \$7.75. **Mathematics and Computers.** By George R. Stibitz and Jules A. Larrivee. 228 pp. McGraw-Hill Book Co., Inc., New York, 1957. \$5.00. *Reviewed by Philip M. Morse, Massachusetts Institute of Technology.*

Most of the books published on computers, to date, have been descriptions of how computers operate, rather than on how to use computers. They are analogous to descriptions of the mechanical construction of an automobile. Such descriptions are useful to a person who wishes to drive a car, or use a computer, but they leave many things out which are necessary for the driver to know. A person driving a car needs to know the traffic laws and something about the art of driving, as well as the dynamical properties of the 200-odd horses he is supposed to be controlling. Similarly, the person wishing to use a modern high-speed computer should know roughly how the machine works but, more important for him, he must know how to program his problem so it can be put on the machine, and what to expect in the way of results.

Unfortunately, computing machines are not so standardized, in regard to operation, as are automobiles. Even digital machines of different makes have important differences in programming procedures and in what they can and cannot do easily. Consequently, to use a given computer effectively one must learn its particular language of command and its peculiarities of behavior. In the past three years, however, the newer machines have become much more standardized, so that now a person knowing how to program for an IBM 704, for example, can learn to use another digital computer, such as a Univac, fairly quickly. In other words, it is now possible to issue "driver's manuals" for digital computers, which will explain the general methods of putting a problem on any machine in enough detail so that the prospective user can, in a short time, use any of the large machines now being produced. To change metaphors, a machine code is a rudimentary language; present machines use about the same grammar and syntax; differences in vocabulary can be quickly learned.

This book of McCracken's is the first such "driver's manual" to have come to the attention of this reviewer. It describes the procedures of programming, coding, and checkout, which must be gone through to translate the equations of numerical analysis, representing the problem to be solved, into the specific coded instructions

which tell the machine how to perform the numerical analysis. The various steps are illustrated, using a code for an imaginary machine, dubbed a TYDAC (Typical Digital Automatic Computer), which has "grammar and syntax" similar to most present computers, though it is, of course, not identical with any one of them. (It is this reviewer's impression that TYDAC is somewhat closer to the properties of the IBM 704 than to Univac, but the differences are not serious.)

The process of laying out the program, of the various coding procedures, the use of loops or cycles, of sub-routines, and of floating decimal point and the input-output methods are discussed and illustrated. The use of magnetic tape, methods of program checkout, and various specialized and generalized programming techniques are gone into.

Whether we like it or not, high-speed computers are now as necessary research tools for the theoretical physicist as are cyclotrons for the experimental physicist. Most of us should know enough about programming to ensure that our problems are solved effectively. With books like this one of McCracken's, it will not be difficult for us to do so. The learning of "computer language" is a much simpler task than the learning of German or Russian.

In contrast to *Digital Computer Programming*, reviewed above, *Mathematics and Computers* is a description of machines, their development and general properties, not a "driver's manual". It is written for the layman and not for the prospective user of a machine.

Within its self-imposed limits, the book is clearly and logically written. It begins with a well-written discussion of the difference between pure and applied mathematics, and what is meant by "solving a problem". It then goes on to a history of the development of analogue and digital computers, a very elementary discussion of the logical design of digital computers and of the various types of analogue machines, and finishes with chapters on Monte Carlo methods, computer errors, and special applications.

This is a useful book for the college freshman or for the nonprofessional who wishes to get a rough idea as to what computers do and how they came to be. It will not be of much help to physicists who want to learn how to put a problem on a computer. But then, it was intended for the former, not the latter.

Low Temperature Physics II. Vol. 15 of *Handbuch der Physik*. Edited by S. Flügge. 477 pp. Springer-Verlag, Berlin, Germany, 1956. DM 112.00 (if part of series DM 89.60). *Reviewed by Louis D. Roberts, Oak Ridge National Laboratory.*

In the past ten to fifteen years, the techniques of physical measurement in the temperature region 4.2 — 1°K and below have been much simplified, and correspondingly have been adopted in an increasing diversity of investigations. The growth is such that in another decade low-temperature physics may be so inclusive as