clear. The study of man differs from the study of physical phenomena in that the aim must not be manipulation but self-control. It is concerned not merely with knowledge, which is external, but with "understanding" as well. But is this altogether capable of being organized scientifically, indeed can it ever be so organized? Or, as a good many of the most able physical scientists today would probably surmise, are these areas of understanding and of self-control essentially areas of experience rather than of knowledge —that is, are they the domains of poet, artist, and saint rather than of researcher and professor? Matson does not raise these questions, but he makes it clear that these are the real issues and that so far no scientific approach has been found to the understanding and self-control of man, of his society, his behavior, and his values.

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## Crystallography

**Crystallography and Crystal Perfection.** Proceedings of a symposium held in Madras, 14–18 January 1963, and organized by the University of Madras. G. N. Ramachandran, Ed. Academic Press, New York, 1963. x + 374 pp. $12.

It is obvious that the editor must have been hard put to find a suitable title: a glance at this book will show the magnitude of his predicament. Thirty mostly unrelated papers, by 55 authors representing about 30 institutions, were presented at a symposium on crystallography. (Another symposium—on protein structure—held at the same time, is presented in a companion volume.) These activities testify to the vitality of Indian crystallographers: about one-third of the contributions come from Indian research centers. The list of authors contains many names famous among crystallographers. In Section 1, Phase Problem, are papers by M. J. Buerger (image functions), Dan McLachlan, Jr., (optical devices for phase determination), G. N. Ramachandran and R. Ramachandra Ayyar (Fourier series for isomorphous crystals and anomalous dispersion), I. Nitta *et al.* (sign determination by statistical method), W. Hoppe *et al.* (the "shift product method" and structure-factor signs by Sayre's relations), S. Raman and W. N. Lipscomb (the Patterson approach), R. Srinivasan *et al.* (tests for isomorphism), and W. Cochran *et al.* (EDSAC program).

Section 2, Crystal Perfection, contains papers by G. Borrmann, L. V. Azároff, S. Chandrasekhar, R. Parthasarathy *et al.*, M. Renninger, and N. Kato, who contributes a unified treatment entitled "Wave-optical theory of diffraction in single crystals." Section 3, Crystal Disorder, contains four papers: H. Jagodzinski (disorder phenomena), I. Waller (effect of impurities on neutron scattering), P. Krishna and A. R. Verma (silicon-carbon polytypes), J. I. Langford and A. J. C. Wilson (variance and line broadening). In section 4, Anomalous Dispersion, J. M. Bijvoet *et al.* take a second look at sodium chlorate and sodium bromate antipodes of the same sign and find that they have opposite configurations; D. Dale, D. C. Hodgkin, and K. Venkatesan report the structure of Factor V 1a, which is an aquocyanide of natural vitamin $B_{12}$ nucleus (containing Co); S. N. Vaidya and S. Ramaseshan comment on procedures used in the Bijvoet method. A paper on electron diffraction by S. Miyake *et al.* and two papers on neutron diffraction, by J. Shankar and V. M. Padmanabhan and by P. K. Iyengar (from the Atomic Energy Establishment at Trombay, India), constitute section 5.

The Wooster family describe their automatic x-ray diffractometer in section 6, Instrumentation; an integrating Weissenberg camera for low and high temperatures is also described, by A. K. Singh and S. Ramaseshan, in this section. Four miscellaneous papers are collected in a last section: elasticity of cubic crystals (by J. Laval); infrared and Raman spectra of glycine and its addition compounds (R. S. Krishnan and P. S. Narayanan); infrared absorption in ionic crystals (S. S. Mitra); antitensors of first and second kinds and their symmetries—ten groups for each kind (I. S. Zheludev). Each contribution is accompanied by a summary of the oral discussion that followed it. A 5-page index lists the names of over 400 authors whose works are cited. The volume is beautifully printed, illustrated, and bound. A crystallographer can hardly afford not to buy it.

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## Russian Translation

**The Theory of Mathematical Machines.** Yu. Ya. Bazilevskii, Ed. Translated from the Russian edition (Moscow, 1958) by C. A. Hoare. J. M. Jackson, Ed. Pergamon, London; Macmillan, New York, 1963. xii + 264 pp. Illus. $10.

This is a translation of a book published in Russia in 1958. It is comprised of a preface and eight papers. The principal contributors are the editor who wrote two papers and participated in one other, I. Ya. Akushskii who wrote two papers, and Yu. A. Schreider who wrote one paper and shared one with the editor. As is customary with symposia, the papers are to some extent expository. It is my impression that the last four papers are mainly of the expository category. The first four, however, have more claims to originality.

In the preface the editor presents an outline of the theory of mathematical machines. According to him this theory consists of three parts. The first part consists of the study of the logical structure of mathematical machines. The second is the theory of programming, and the third is the study of the means of physical implementation of a given logical structure. He says that "The first and second parts may be considered as a branch of cybernetics which deals with methods of implementing algorisms as distinct from such branches as, for instance, mathematical linguistics and biology, which are concerned with the creation or the discovery of algorisms. The content of the third part lies outside the framework of cybernetics." This statement, granted accurate translation, is rather stunning, but perhaps this is because I have been much more concerned with numerical methods than with logic. It seems to me that an almost automatic consequence of implementing algorisms is the creation of new ones. Moreover, in this we see that the interpretation given cybernetics in Russia is broader than that accorded it in the United States.

The distinctive features of the first paper, "The theory of sequential logical functions," by Bazilevskii, seem to be in the methods of introducing sequences (that is, time lags and feedback) and in the study of reductions of sequential logical functions through use of periodicities as well as other devices. Although I have not attempted to con-