ments, such as, for example, the recent work on singularities in virial expansions are therefore not discussed in the reviews. It is unfortunate that there is such a long gap between the completion of a manuscript and its appearance in print in this review series. I think, on the basis of personal experience, that this gap could be considerably shortened if authors, editor and publisher all would coöperate more closely on a stricter deadline basis.

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The reviewer is a senior research fellow at the National Bureau of Standards.

Do machines think?

GREAT IDEAS IN INFORMATION THEORY, LANGUAGE AND CYBERNETICS. By Jagjit Singh. 338 pp. Dover, New York, 1966. Paper $2.00

by Sanford E. Gerber

I find myself on that side of the fence where we believe that, if a machine exhibits some form of behavior that is also exhibited by human beings, this behavior should be called by the same name. That is to say, if an animal behaves in a certain way, such that I would conclude that he thinks, I would have to conclude that a machine that exhibits the same behavior also thinks. It seems to me unfair to say that, since a man can do more things than a machine, the machine does not think; whereas, if the machine can do some of the things which are within man's ability, it must perform some of the same processes. Furthermore, I find it clear that in order for a machine to do what a man does it is not necessary to do it the same way. I don't think Jagjit Singh would agree with my philosophy. He would prefer to consider such concepts as "will" and abstractions. I am tempted to agree that these concepts are uniquely human, but I am not willing to agree that a machine does not think. Anyway, this is a moot question that has been debated by people much brighter than me. I state it here only to indicate that Singh sits on the other side of the fence.

This is a most interesting book intended for the nonexpert, or even for the uninitiated. It contains chapters on such things as coding theory, information and entropy, neural networks, and artificial intelligence. What Singh knows about information theory and cybernetics is apparently greater than what he knows about language, for it is particularly in the area of natural language that the book exhibits its only true weakness. There is one chapter devoted to machine translation in which much of the recent meaningful work is not discussed. Other considerations of natural language processing, such as automatic speech recognition, are not even mentioned. With the exception of this sole weakness, the book does a very good job of describing, discussing and dissecting some very important research. I would recommend this book to the beginning student of information theory.

I have one bone to pick with the publisher. On the jacket of the book, the author is identified by name only. I have been unable to discover the identity of Jagjit Singh. Although he has written a worthwhile book, I cannot provide my reader with any information about his qualifications to have done so.

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Basic equations for the serious reader

X-RAY DETERMINATION OF ELECTRON DISTRIBUTIONS. By Richard J. Weiss. 196 pp. North-Holland, Amsterdam (Interscience, New York), 1966. $10.50

by Leonid V. Azároff

The development of the theory of x-ray diffraction by crystals was begun by C. G. Darwin concurrently with the discovery of the phenomenon by Max Laue. In 1914 it was expounded in two papers in the *Philosophical Magazine* and in 1922 a third paper by Darwin completed his contributions to this subject. About 50 years later, some of the leading present-day expositors met in Cambridge, Mass., to participate in a symposium commemorating B. E.

Warren's retirement from MIT. The papers read on this occasion made it clear that all basic features of the most modern versions of kinematical and dynamical theories had been included in the original Darwin treatment, so that all those who followed have primarily elaborated and expanded his classical work.

In 1944, the theory of x-ray diffraction was completely rederived by W. H. Zachariasen, and was published in book form: *Theory of X-Ray Diffraction in Crystals* (Wiley, New York, 1945). By the time this elegant treatise was allowed to go out of print, a renaissance of interest in the dynamical theory has made it popular to discuss x-ray diffraction theory using the notation and mathematical formulation developed by Zachariasen. The present book is no exception. It is a particularly welcome addition to the literature because it again makes available, in book form, a complete treatment of the basic equations describing the diffraction of x-rays by perfect and imperfect crystals. The presentation is terse and intended for the more serious reader rather than a neophyte. Since Richard J. Weiss has been primarily interested for many years in exploring electronic structure of atoms in crystals, his treatise emphasizes those aspects of the diffraction theory that must be fully appreciated before results having requisite physical validity can even be sought.

The book contains four chapters and five appendices that will prove to be extremely useful to anyone planning to carry out similar investigations. Chapter 1 discusses scattering by free atoms while chapter 2 considers what happens in perfect and imperfect single crystals as well as in polycrystalline aggregates. Chapter 3 then takes up the various experimental precautions that must be adhered to in order to obtain intensities accurate to 1%. This is probably the most important contribution of this book because it points out just how difficult it is to obtain quantitative information about the electron distribution from x-ray diffraction studies. Some of the more successful applications of these procedures are described in Chapter 4. Weiss refrains from commenting on numerous less carefully conducted investigations and suggests instead, in a concluding statement, that newcomers to this field should begin by repeating some of the more successful measurements of others to assess the reliability of their own procedures. Such newcomers will find this book an invaluable guide as will those who wish to discover what the limitations and potentialities of x-ray diffraction methods are for the determination of electron distributions in crystals.

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Leonid V. Azároff has written three books on x-ray diffraction and on the solid state. He received his PhD in 1954 from MIT, following an interdepartmental program emphasizing crystallography.

Photons and excitons

THE OPTICAL PROPERTIES OF SOLIDS. (Enrico Fermi School, Varenna, July, 1965) J. Tauc, ed. 434 pp. Academic Press, New York, 1966. $22.00

by Thomas A. Scott

This book comprises the proceedings of course 34 of the Enrico Fermi International School of Physics, held at Varenna under the sponsorship of the Italian Physical Society.

The course was devoted to the optical properties of solids and was designed to bring the participants into contact with current research in the field. 18 topics by 20 authors are listed in the table of contents. Some of the contributions consist of a single lecture on a specific problem, but most are derived from a series of formal lectures on broad aspects of the field. One of the best examples is an excellent review of magnetooptical effects in solids by G. Dresselhaus and M. S. Dresselhaus of the MIT Lincoln Laboratory.

Like most books of this nature, the coverage is not uniform. Some authors have exercised commendable care and effort in transforming their lectures to manuscript form, but other chapters read little better than lecture notes. Happily, the former are in the majority. One of the faults common with this kind of book is that there is inevitably some duplication of material, which at the price of books today is at least annoying. More serious still is the omission or too brief treatment of material, usually of an introductory