must accept the word of the experimenter that such and such a chemical is responsible for the change. When the film is concluded, the viewer can really say no more than that drugs change the behavior of people and animals, a rather obvious conclusion after such an elaborate treatment. In this case, it seems that much more would have been gained by limiting concern to one kind or sort of question, by following the problems and techniques of research in more detail, and perhaps even by relating the question to the "chemistry" as well as the "behavior."

*The Brain and Behavior,* the third program, has a fascinating succession of film and also raises a very significant question: "Is all science appropriate for showing in the home to laymen?" The film includes a great deal of footage of "the cat in the hat," a cat with a cumbersome instrument on the top of its head, which connects to electrodes inserted into specific areas of the brain. And one watches such examples as a hungry cat, stimulated in the area that controls sleep, abandoning its activity and curling up to sleep.

As fascinating as the implications of such research are, I feel that, in this instance, where film so powerfully depicts reality, certain aspects of experimentation should be played down if not omitted. I am not raising the question of whether animals should be used in experimentation. That must be clearly separated from what I am questioning—how and in what detail should animal experimentation be filmed for general viewing in the home by all of the family.

Some people may take exception to the subtitle of the series, "The science of psychology," and to such references in various programs as "the science of learning." In fact, one program (*No Two Alike*) uses the word *science* six times in relation to some aspect of psychology. The process, activities, and contributions to the understanding of behavior guarantee to psychology its place as a science, and the films reveal this with insight and skill. Hence it is redundant to speak of the science of psychology just as it would be redundant, if not pompous, for physics to keep referring to itself as "the science of physics" or for chemistry to speak of "the science of chemistry" or of "the science of free radicals."

Regardless of my criticisms of individual films, the series represents a major step forward in the presentation of science. *Focus on Behavior* has managed to combine the tremendous appeal existent in the fact that psychology is about ourselves, our children, and animals, with techniques of presentation that are far better than those generally seen on television.

It would be convenient if one could credit a single individual with the authorship. However, as is usual in television, the responsibility for the success of the series is distributed among a wide number of people. These include the American Psychological Association (the Board of Scientific Affairs, the Board of Directors, and a special advisory committee for the program), Mayer-Sklar Inc., which produced the series (credits include almost 20 producers, writers, and directors), and last but not least, the large number of psychologists who participated in the programs (more than 25 are named in the series summary).

The individual titles and the areas covered by the ten films are: *The Conscience of a Child* (growth and development), *A World to Perceive* (perception), *The Brain and Behavior* (brain and the nervous system), *The Chemistry of Behavior* (psychopharmacology), *Learning about Learning* (learning research), *No Two Alike* (individual differences and psychological testing), *The Social Animal* (social psychology), *The Need to Achieve* (motivation and personality), *Of Men and Machines* (engineering psychology), and *Computers and Human Behavior* (computers and human mental processes). These films are available for purchase or rental through the Audio-Visual Center (Indiana University, Bloomington. $150 each). A descriptive folder and study guides for the series are available from National Educational Television (10 Columbus Circle, New York, N.Y. 10019).

A final note on reviewing film is appropriate at this point. This is the second time that an educational TV series has been reviewed in *Science* [see Garrett Hardin's review of *Virus,* in *Science* **134**, 548 (25 Aug. 1961)]. Although many would probably agree that more such series should be reviewed, the difficulty of the undertaking must not be underestimated. Reviewing films requires equipment for projection, time for securing and returning films, and time to set up the film, view it, and rewind it. Each film should be viewed at least twice, and a number of films must be checked later to ascertain the accuracy of comments one wishes to make about them. This particular series of ten 30-minute films required a great deal of time for viewing, plus several additional hours for checking. And all of this was preliminary to the actual time required to write the review.

Thus it can be seen that we ask a great deal of film reviewers. Yet we must keep in mind the impact that these films and others like them can have. They will be shown on more than 80 educational TV stations in the United States, probably in many cases more than once. In addition, they will be distributed to schools and colleges where they will probably reach an audience at least as large as the TV audience.

In his review Garrett Hardin commented on the need for laboratory workers to get out of their labs and tell the rest of the world what they have been doing. As this is increasingly done through the medium of television, we concurrently need reviewers to comment on how well and how accurately the story is being told.

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## X-Rays: A Scientific Tool

**X-Ray Studies of Materials.** A. Guinier and D. L. Dexter. Interscience (Wiley), New York, 1963. x + 156 pp. Illus. $6.95.

*X-Ray Studies of Materials,* by Guinier and Dexter, is the 20th volume in that excellent series, the Interscience Tracts on Physics and Astronomy, edited by R. E. Marshak. The present volume is a survey of the uses of x-rays as a scientific tool. Medical applications and industrial radiography are omitted.

The first five chapters review the fundamentals of x-ray production and detection and the standard theory of diffraction by perfect and mosaic crystals. The level of treatment is appropriate for a beginning physics graduate student, the detail and emphasis for the interested nonspecialist.

Chapter 6, on the determination of atomic arrangements, does not quite do justice to the achievements of modern crystallography. No mention is made of the spectacular work on myoglobin and hemoglobin, nor is there sufficient emphasis of the revolution that high-speed computers have brought about.

Chapters 7 and 8 are the best, and

they are very good indeed. In chapter 7 the authors discuss polycrystalline arrays, crystallite size and orientation, crystalline texture, precision measurement of lattice parameters, and internal stress determinations. In chapter 8 they treat the imperfect crystal, the small crystallite, and some of the methods and results of small angle x-ray scattering.

In general, the purposes of this volume, and of the series, have been well achieved. The reader will find a clear and always authoritative discussion of most of the areas in which x-rays are a useful tool for structural studies. Applications to physics and physical metallurgy have perhaps been emphasized a little compared to chemistry and biology. A minor annoyance is the too skimpy list of references. Frequently a new method or development is described, but without reference to the original, or even to a review article, where more complete details might be found.

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## Inorganic Chemistry

**Anorganische Chemie.** vols. 2 and 3. István Náray-Szabó. Translated into German by András Beliczay. Akademiai Kiado, Budapest; Akademie Verlag, Berlin, 1963. vol. 2, 813 pp.; vol. 3, 669 pp. Illus.

In the second volume of this series [volume 1 was reviewed in *Science* **131**, 1214 (1960)] the author describes elements and compounds of the alkalies, alkaline earths, and aluminum and the transition metals of groups III through VII; actinides and lanthanides are also included.

The salts described include hydrides; halides; polyhalides; oxides, peroxides, and hydroxides; oxyhalides; sulfides and sulfur oxyacid salts; selenides and tellurides and the corresponding oxyacids; phosphides, arsenides, and their oxyacids; carbides, acetylides, carbonates, and combinations of carbon, nitrogen, and oxygen; compounds with silicon, germanium, lead, tin, and boron, with and without oxygen; and double and complex salts.

In the third volume information is given about copper, silver, gold, zinc, cadmium, mercury, gallium, indium, thallium, Group VIII, and the inert gases. The salts and compounds are treated in the same order as in the previous volumes. A review of the chemical properties of the elements and a short chapter on geochemistry and cosmochemistry conclude the volume.

Each group is introduced by a presentation of the electronic structure of the respective elements and their ionization and excitation potentials. This is followed by a concise discussion of valency, crystalline structure, melting points, ionic radii, the most characteristic chemical compounds, and the abundances of the elements.

In describing individual elements the author gives a short historical introduction followed by sections on the occurrence, nomenclature, and abundance of minerals, preparation of the element (on a laboratory and on a commercial scale), and their physical properties (with a tabulation of constants), chemical properties, and compounds. Application, world production, physiological activity, and analysis are also considered. This is followed by a description of chemical compounds for each group of elements, with a tabulation of physical constants.

The books represent a substantial amount of information presented in a manner that is clear, systematic, and uniform; thus they fulfill the purpose stated by the author. That the data are reasonably up to date is illustrated by the inclusion of information on krypton tetrafluoride, which was published in 1963.

Scientists and students who require a simple, concise reference source on inorganic substances should find these volumes particularly useful.

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## Mathematical Physics

**Mathematical Models in Physical Sciences.** Proceedings of the conference held at Notre Dame, Indiana, April 1962. Stefan Drobot and Paul A. Viebrock, Eds. Prentice-Hall, Englewood Cliffs, N.J., 1963. x + 193 pp. Illus. $5.

In contrast with the atmosphere encountered at an increasing number of conferences, the atmosphere that held sway at the conference which gave birth to this slender volume must have been almost Victorian in its leisureliness. A small but generally distinguished group of speakers addressed a somewhat larger but almost equally distinguished audience on a remarkably broad range of subjects in mathematical physics; the speakers emphasized problems in classical physics and the mathematics of the models rather than their physical utility. Thus, there were two talks on the problem of the liquid-gas phase transition (by G. E. Uhlenbeck and Mark Kac; unfortunately the two addresses are represented only by abstracts in the volume); a short account by Harold Grad of his work on the mathematical foundations of the description of transport phenomena; and a very informative presentation by Norman J. Zabusky of his work on a model for the oscillations of a nonlinear string. The latter article is one of the few in the volume which is relatively self-contained. Zabusky gives an account of the previous (numerical) study of the model and of his own effort to understand analytically the basic phenomena yielded by the machine calculations.

Less readily placed in a category are papers by Martin D. Kruskal, Stan M. Ulam, and Jerzy Neyman. In a unique paper entitled "Asymptotology," Kruskal tries to summarize, in the form of principles, the techniques for obtaining the limiting behavior of systems of equations as some parameters decrease. Ulam summarizes all too briefly some computing machine investigations of nonlinear algebraic transformations and of nonlinear partial differential equations. Neyman recounts (in what is for this volume a relatively long article) his study, by means of the theory of probability, of the data produced by astronomers on the distribution of galaxies.

Of 11 technical presentations, only two were concerned with the quantum theory. F. J. Dyson summarized some of his own work and some of that carried out by others on a new version of statistical mechanics, which has important application to atomic and nuclear spectroscopy. My personal favorite is a beautiful article by Rudolf Haag on the mathematical foundations of the Barden-Cooper-Schrieffer model of superconductivity. The report concludes with an article on constraints in classical fields, written by the organizer of the conference, Stefan Drobot.

The volume contains a complete list of the conference participants, drawn from as wide a variety of fields as the speakers themselves. It is an amusing exercise for the reader to gauge the