

siderations of the orchid family, orchids and their collectors, and acknowledgments. This is followed by the systematic section of the volume, which takes up all but 18 pages of the total.

The systematic section is excellent. The treatment of both the genera and the species is conservative. The account of a given genus includes a description of the genus; a key to the included species, if more than one; the accepted specific name, and synonyms for a much greater area than that covered by the volume; a specific description; flowering times; range of the species (Mexico is sometimes included in the term "Middle America," but more often given separately). The exsiccatae for Trinidad and Tobago are cited.

The illustrations are mostly excellent and very much more numerous than the "List of plates" would indicate—there are 97 plates although only 21 are mentioned. One photograph, by oversight, is used to illustrate species in different genera (opposite pages 70 and 78, where the illustrations belong with the *Pleurothallis*).

The volume can be recommended not only as a source of information on the flora of Trinidad and Tobago but also for the large number of plates illustrating plants of a much wider range. The volume is well and attractively printed on paper that appears to be of excellent quality. The price is rather high even considering the number of plates.

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Language's Role in Behavior

Language and the Discovery of Reality. A developmental psychology of cognition. Joseph Church. Random House, New York, 1961. xviii + 245 pp. Illus. \$4.

Whatever their current research activities might suggest, many psychologists would profess their ultimate goal to be that of arriving at a satisfactory scientific account of such "higher mental processes" as classifying, thinking, and problem solving. There is today renewed interest in what has been called "cognitive psychology" and in speech, language, and communication. To mention some of the more prominent approaches within psychology, we have B. F. Skinner's uncompromising

attempt to describe verbal behavior in terms of the principles of reinforcement, G. A. Miller's treatment of language in terms of information theory, and C. E. Osgood's use of a "mediation hypothesis" to explain the acquisition of meaning. From the fields of linguistics and cultural anthropology we have had a description of language as a formal system of meaningful sounds and the hypothesis—most closely associated with the name of B. L. Whorf—that the particular language one is brought up to speak conditions one's perception of objective reality and perhaps also one's modes of thinking.

Church's important contribution in this book is his clear formulation of a self-consistent, no-nonsense point of view concerning the role of language in behavior, derived largely from an analysis of the development of the child's use of language in relation to his perceptual and cognitive experiences. Arguing from a phenomenological base, Church states his opposition to what he regards as the gratuitous constructions of Skinner and also to the mystique of Whorf's linguistic relativity. He believes that the influence of language categories upon the child's awareness of reality is only indirect, but still traceable.

A substantial portion of the book is devoted to issues which are not immediately related to the theme advertised in the title but which are valuable and interesting as rightful subject-matter in cognitive psychology: the preverbal experience of the child, the "thematization" of experience, "upward" and "downward" logical classifications, varieties of thinking, tests of verbal functioning, and the nature of personal styles of thinking and acting.

The book is well organized and gracefully written. Church keeps much of his documentation and evidence behind the scenes; in his allusions to observations made of children, for example, he fails to identify the observers, the conditions of observation, the status of the children, and so forth. The reader has little opportunity to question the interpretations offered by Church. This is nonetheless a significant and provocative book, containing much insight and wisdom for psychology as a whole and many suggestions not only for research but also for the conduct of education.

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Carus Mathematical Series

Statistical Independence in Probability, Analysis and Number Theory (Carus Mathematical Monographs, No. 12). Mark Kac. Wiley, New York, 1959. xiv + 93 pp. \$3.

This book is an outgrowth of three lectures delivered by Mark Kac at the summer meeting (1955) of the Mathematical Association of America; the general topic was "Familiar things from an unfamiliar point of view." Subsequently Kac was invited to prepare an expanded version for publication in the Association's Carus Mathematical Monograph Series, the aim of which is "to contribute to the dissemination of mathematical knowledge by making accessible . . . expository presentations of the best thoughts and keenest researches in pure and applied mathematics . . . set forth in a manner comprehensible not only to teachers and students specializing in mathematics, but also to scientific workers in other fields. . . ." Kac has made a signal contribution in this direction.

The concept of *statistical independence* stems from the commonplace notion of two or more things (events, propositions, and the like) being independent if they have "absolutely no connection with each other whatsoever." The concept of *probability* itself was long surrounded "with vagueness which bred suspicion as to its being a bona fide mathematical notion." Today both *probability* and *statistical independence* are precisely defined but in very general and abstract terms. The price of such generality and abstraction is "not only to submerge the simplicity of the underlying idea but also to obscure the possibility of applying probabilistic ideas and results outside of the field of probability theory."

The author's principal aim in the original lectures and in this enlarged version was to show that "(a) extremely simple observations are often the starting point of rich and fruitful theories, and (b) many seemingly unrelated developments are in reality variations on the same theme." In view of the aim stated in (a) perhaps one should not be surprised to find that the book starts with the formula

$$\sin x = 2 \sin \frac{x}{2} \cos \frac{x}{2}$$

The chapters "The normal law in number theory" and "From kinetic theory

to continued fractions" fulfill objective (b). Over and over again Kac exemplifies the old Italian saying: "A mathematician is like a lover—grant a mathematician the least concession and he will draw from it a consequence, and from that consequence another!"

A truly delightful book!

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Forerunner of Audubon

Mark Catesby. George Frick and Raymond Phineas Stearns. University of Illinois Press, Urbana, 1961. x + 137 pp. Illus. \$5.

If Audubon—Bartram—Catesby are the ABC's of American natural history, Catesby is certainly least known to Americans. This attractive book will help remedy that situation, but we shall not know Catesby well until his great work, *Natural History of Carolina, Florida, and the Bahama Islands*, is re-issued.

Eighteenth-century Catesby, subsidized by Sloane, Sherard, and others who had been eager for the contributions of John Banister, and by Governor Nicholson, displayed none of Audubon's showmanship as man or artist. Catesby illustrated North American birds in habitat backgrounds, a method brought to its fullest flowering by Audubon in the next century. Contrary to the authors, these backgrounds were not initiated by Catesby. Maria Sibylle Merian published her first work in 1679, and another on insects of Surinam in 1705, wherein plants fairly compete with insects in disciplined beauty.

We know little of Catesby's exact routes in Virginia and Carolina. He reached Fort Moore on the Savannah River some 300 miles from Charleston. There may be notes as to where the sketches were made on the original Catesby drawings in the Royal Library at Windsor. Catesby drew from the living plant, but faced with engraving costs, he took lessons from the French artist, Joseph Goupy, and engraved the plates himself. That Goupy's friend, the Duke of Chandos, was also Catesby's patron seems to have been overlooked. Although the text of his *Natural History* was published in parallel English and French columns, we do not know who prepared the French

version, but the Franco-Philadelphia naturalist Du Simitiere left a 16-page manuscript subject "Catalogue" to Catesby's work, though there is no clear evidence he was in touch with Catesby.

Frick and Stearns' volume is an excellent chronicle of man and naturalist, and happily the price is most attractive! It must be said, however, that this is historians' and not naturalists' commentary. The naturalists' edition, which should be published, will embrace not only bird commentary but also notes on Catesby's mollusks (by Wilkins) and on his plants (by Dandy); it will align these subjects with the state of our knowledge rather more intimately.

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New Books

Mathematics, Physical Sciences, and Engineering

The Abundance of the Elements. Lawrence H. Aller. Interscience, New York, 1961. 294 pp. Illus. \$10.

Algebra. With applications to business and economics. Paul H. Daus and William Whyburn. Addison-Wesley, Reading, Mass., 1961. 365 pp. Illus. \$6.75.

Elementary Particles. Enrico Fermi. Yale Univ. Press, New Haven, Conn., 1961. 120 pp. Illus. \$1.45.

Elements of Statistics. Elmer B. Mode. Prentice-Hall, New York, ed. 3, 1961. 334 pp. Illus. Text edition, \$7.25; trade edition, \$9.65.

Engineering Castings. How to use, make, design and buy them. Glenn J. Cook. McGraw-Hill, New York, 1961. 266 pp. Illus. \$8.50.

Fast Reactors. R. G. Palmer and A. Platt. Temple Press, London, 1961 (order from Simmons-Boardman, New York). 93 pp. Illus. \$2.95.

Flow of Fluids through Porous Materials. Royal Eugene Collins. Reinhold, New York, 1961. 280 pp. Illus. \$12.50.

Heterocyclic Compounds. Polycyclic compounds containing two hetero atoms in different rings. Five- and six-membered heterocycles containing three hetero atoms and their benzo derivatives. vol. 7. Robert C. Elderfield, Ed. Wiley, New York, 1961. 885 pp. Illus. \$37.50.

The Impact of the New Physics. Frank Hinman. Philosophical Library, New York, 1961. 174 pp. Illus. \$4.50.

Instrumentation for High-Energy Physics. Proceedings of an international conference. Lawrence Radiation Laboratory, University of California, Berkeley. Interscience, New York, 1961. 338 pp. Illus. \$10.

Introduction to Engineering Mechanics. John V. Huddleston. Addison-Wesley, Reading, Mass., 1961. 500 pp. Illus. \$9.75.

Introduction to Geometry. H. S. M. Coxeter. Wiley, New York, 1961. 458 pp. Illus. \$9.95.

Modern Computing Methods. Philosophical Library, New York, ed. 2, 1961. 176 pp. Illus. \$6.

Nuclear Sizes. L. R. B. Elton. Oxford Univ. Press, London, 1961. 114 pp. Illus. \$2.40.

Operational Electricity. Theory, characteristics, applications, and mode of operation of circuits and machines. Charles I. Hubert. Wiley, New York. 540 pp. Illus. \$8.50.

Physical Chemistry. Gordon M. Barrow. McGraw-Hill, New York, 1961. 707 pp. Illus. \$8.95.

Plasmas and Controlled Fusion. David J. Rose and Melville Clark, Jr. M.I.T. Press and Wiley, New York, 1961. 507 pp. Illus. \$10.75.

Plastics in Nuclear Engineering. James O. Turner. Reinhold, New York; Chapman and Hall, London, 1961. 149 pp. Illus. \$5.50.

Pleistocene Geology of the Randall Region, Central Minnesota. Allan F. Schneider. Univ. of Minnesota Press, Minneapolis, 1961. 166 pp. Illus. \$4.25.

Probability. A first course. Frederick Mosteller, Robert E. K. Rourke, and George B. Thomas, Jr. Addison-Wesley, Reading, Mass., 1961. 334 pp. Illus. \$5.

Probability with Statistical Applications. Frederick Mosteller, Robert E. K. Rourke, and George B. Thomas, Jr. Addison-Wesley, Reading, Mass., 1961. 493 pp. Illus. + plates. \$6.50.

Progress in Solid Mechanics. vol. 2. I. N. Sneddon and R. Hill, Eds. North-Holland, Amsterdam, Netherlands; Interscience, New York, 1961. 342 pp. Illus. \$11.75.

Quantum Theory. D. R. Bates, Ed. Academic Press, New York, 1961. 462 pp. Illus. \$10.

Radioactive Wastes. Their treatment and disposal. J. C. Collins, Ed. Wiley, New York, 1960. 260 pp. Illus. + plates. \$8.

The Science of Adhesive Joints. J. J. Bikerman. Academic Press, New York, 1961. 266 pp. Illus. \$8.

A Synopsis of Physics. C. C. N. Vass, Ed. Williams and Wilkins, Baltimore, Md., ed. 5, 1961. 348 pp. Illus. \$8.

The Theory of Crystal Structure Analysis. A. I. Kitaigorodskii. Translated from the Russian by David and Katherine Harker. Consultants Bureau, New York, 1961. 286 pp. Illus. \$12.50.

The Theory of Subsonic Plane Flow. L. C. Woods. Cambridge Univ. Press, New York, 1961. 616 pp. Illus. \$22.50.

Thermoelectricity. Science and engineering. Robert R. Heikes and Roland W. Ure, Jr. Interscience, New York, 1961. 587 pp. Illus. \$18.50.

Trace Elements in Plants. Walter Stiles. Cambridge Univ. Press, New York, ed. 3, 1961. 264 pp. \$7.50.

Transistors and Active Circuits. John G. Linvill and James F. Gibbons. McGraw-Hill, New York, 1961. 530 pp. Illus. \$14.50.

Water Treatment. For industrial and other uses. Eskel Nordell. Reinhold, New York; Chapman and Hall, London, ed. 2, 1961. 607 pp. Illus. \$12.