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which the reader will have no trouble in correcting. Like its predecessors the book is written in a style that commends it to the general reader as well as to the specialist.

On Human Communication: A Review, Survey, and Criticism. By Colin Cherry. 333 pp. The Technology Press of Mass. Inst. of Technology & John Wiley & Sons, Inc., New York, 1957. \$6.75. *Reviewed by P. J. Davis, National Bureau of Standards.*

This is the introductory volume to a series *Studies in Communication* which the Technology Press intends to publish over the next few years. Written for the general reader, this book is a survey of the newly evolved combined field of cybernetics information theory (linguistics-mathematics-phonetics-psychology-semantics). What an assemblage of fact and speculation! What a wealth of bibliographical material: 367 references ranging from Helmholtz on tones to Lewin on topological psychology to Whittaker on interpolatory function theory to Wittgenstein on logic; from Shannon on communication to Zipf on behavior and least effort to Toynbee on history to Jakobson on phonemics. There is a constant tug-of-war between presenting the logical product of these fields and presenting their logical sum. There is the feeling of vast numbers of ideas thrown together between one set of covers with the author hoping that contiguity will force many of them to mate and produce offspring. Indeed, this reviewer hopes that they will, and that what results will be something more than a machine which can take Russian spoken in the presence of background noise and convert it into flowing, type-written English. Withal, a fascinating and stimulating book.

Elements of Partial Differential Equations. By Ian N. Sneddon. 327 pp. McGraw-Hill Book Co., Inc., New York, 1957. \$7.50. *Reviewed by J. C. Polkinghorne, University of Edinburgh.*

All physicists and engineers need to know something about partial differential equations and this is an excellent book from which to learn. After an introductory chapter on ordinary differential equations in several variables, the author has two chapters relating to partial differential equations of the first and second orders respectively. Naturally he does not discuss the pure mathematical complexities of the proofs of existence and uniqueness theorems, but he is careful to state enough of these theorems to indicate their character and importance. Cauchy's problem is stated and discussed, and the closing three chapters of the book deal with Laplace's equation, the wave equation, and the diffusion equation: that is to say, with examples of the elliptic, hyperbolic, and parabolic types of equation. It seems a pity that when Professor Sneddon discusses the Green's functions for the wave equation he does not show how simple they look in a relativistic form.

The author is careful to show how the equations he



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discusses arise from the natural world. He draws his illustrations from a wide range of physics and from biology (life and death processes of bacteria). The general discussion of the text is exemplified by many worked examples and there are many more examples awaiting the efforts of the reader. A feature is that answers are given, but only for the odd numbered examples. This happily combines the possibility of the student, working on his own, being able to correct his own work with the possibility of the teacher using the book as a source of examples whose answers are not known to his class.

General Relativity and Cosmology. Vol. 4 of The International Astrophysics Series. By. G. C. McVittie. 198 pp. John Wiley & Sons, Inc., New York, 1956. \$9.00. Reviewed by R. B. Lindsay, Brown University.

This is Volume Four of the new *International Astrophysics Series*, whose purpose is to expound in authoritative fashion the latest developments in astrophysics and radio astronomy. The author of this book has sought to continue in the tradition of R. C. Tolman's famous work on *Relativity, Thermodynamics and Cosmology*, though in a somewhat more concise fashion.

General relativity is a subject which physicists by and large have tended to shun during the past twenty-five years, no doubt considering it of greater significance to the astronomers than to anybody else. This in spite of the valiant efforts of Einstein and others to develop a unified field theory that would bring electromagnetism into the framework, efforts which unfortunately have not had conspicuous success. It is all the more attractive therefore that Mr. McVittie has been able to uncover an interesting and notable physical application of general relativity, namely to Newtonian gas dynamics. The book is a self-contained whole, beginning with an introductory statement of the author's views on physical methodology and continuing with a very clear, but mercifully brief, presentation of tensor calculus and special relativity. This is followed by two chapters summarizing the principles of general relativity and their application to the three famous deductions which have been subjected to observational test, viz., the motion of the perihelion of Mercury, the bending of light rays observed at a total solar eclipse, and the gravitational red shift in the spectra of the sun and other stars. The author reviews the latest data and concludes that the agreement in the case of the first two effects is definitely in favor of the theory as expressed in terms of the Schwarzschild space-time. The presently available observational values of the red shift are so complicated by the existence of various Doppler effects that any definite conclusions as to agreement of theory and observation must await further careful study.

Physicists will undoubtedly find greatest interest in the two chapters on gas dynamics. By writing the general relativity equations for a continuous medium and proceeding to the limiting approximation which effectively makes the velocity of light in free space infinite