ment and control of process variables; to provide a reference book for those who are searching for an instrument that fills their specific needs; to give the man who develops new instruments an opportunity to compare some of the approaches used by his colleagues in the solution of problems common to the instrument industry." The title of this book might better have included the word *industrial*. The book is well illustrated by schematics as well as by cutaway drawings of many instruments, which adds greatly to ready understanding.

The outline of contents is conventional—chapters on instruments for temperature (60 pp.), humidity and moisture, pressure (14 pp.), flow, liquid level, density, viscosity, speed, and analysis (30 pp.) cover the measurement section. Five chapters (127 pp.) relate to the control area—automatic controller action; electric controllers; self-operated, pneumatic, and hydraulic controllers; time function controllers; and final control elements.

The organization is somewhat confusing, showing lack of a coherent classification of the various functions of instrument systems. For instance, recording devices are useful for recording any signal that results from any type of measurement, but nowhere in this book are recorders treated as recorders per se; rather, they are referred to in passing in several connections, first in the temperature chapter under the heading "Millivoltmeters as recorders." Little attention has been paid to the careful use of terms. Definitions are sometimes only implied or are given in terms of operations. The treatment does not include any discussion of performance and limiting accuracy of the instruments.

The short chapter on controller action is simplified but straightforward. Although this is in no sense a textbook, anyone with a modicum of technical background can follow the descriptive treatment of control in these chapters.

Unfortunately the book contains no references. A short glossary covers only some of the terms used specifically in the control chapters.

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Frontiers of Astronomy. Fred Hoyle. Harper, New York, 1955. xvi + 360 pp. Illus. $5.

Fred Hoyle's interests range over the entire field of astronomy. In this book he discusses what is literally at the frontiers of the science. The coverage of astronomy is extensive. Although it is in no sense a textbook, the sequence of topics is almost that of a traditional textbook, with the first chapter on the earth, and the last on the universe as a whole.

The book is not mere reportage. In every chapter Hoyle's own ideas and often his own researches are presented in a very readable way. His enthusiastic personality comes right out of the printed pages.

The level is popular. There are no equations or mathematical proofs; in spite of this not many matters are left out because they are too technical. The book could be read with interest by those with no background in astronomy, but it is my impression that it will be enjoyed most by those with some prior acquaintance with astronomy or physics. Anyone whose knoweldge of astronomy is defined by the content of a typical introductory textbook will be fascinated by the recent progress in observation and theory presented here.

Hoyle has set out to prove the thesis that the characteristics of the universe as we find it are not due to chance but to law. He feels that no aspect of the universe—for example, the densities and masses of the planets—need be attributed to arbitrary starting conditions. All follow from equilibrium conditions that would obtain regardless of the starting conditions. If all the theories he presents can be substantiated, this very attractive view will be established.

In many cases, however, observation is not yet at the stage where the choice of theory is clear-cut. Although Hoyle has taken pains to point out alternatives, his preference for the theories that bear out the thesis is difficult to suppress. The reader might obtain a false impression of the weight of the arguments on the other side or, conversely, wonder whether all the conflicting observations have been given. But this comment is a bit beside the point; the book will be read precisely for Hoyle's ideas, and we must look to those who disagree with him to present their side of the story themselves.

The question of emotional preference for a theory is faced squarely in the epilogue, following remarks about the steady-state theory of the universe and the continuous creation of hydrogen that it implies. Hoyle says, "It is not a point in support of this theory that it contains conclusions for which we might happen to have an emotional preference." He agrees to the correctness of the remarks in this connection expressed by Herbert Dingle in his presidential address (1953) to the Royal Astronomical Society. But, Hoyle says, "it is not an emotional preference to attempt to establish a theory that would place us in a position to obtain a complete understanding of the Universe." This is true as long as the proponent of the theory stands ready to abandon it if observation goes against it and does not support it by incomplete observations or with too many assumptions. I feel that Hoyle has improved in this respect over some of his earlier expressions, and that he has indicated correctly at what points his present views must be provisional.

As an exposition of the areas of astronomy where current interest is high, *Frontiers of Astronomy* is to be recommended heartily. A more readable account would be hard to come by. It will be assigned as collateral reading in my course in astronomy.

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Proceedings of the International Conference of Theoretical Physics, Kyoto and Tokyo, September 1953. Science Council of Japan, Ueno Park, Tokyo, 1954. xxviii + 942 pp. Illus. $10.

This volume contains a record of the lectures and discussions of the main sessions and some of the informal meetings of the International Conference of Theoretical Physics, Kyoto and Tokyo, September 1953. The conference was attended by 55 physicists from 13 countries and approximately 600 Japanese physicists.

The texts of both the lectures and discussions are based on tape recordings taken during the actual sessions. The contents are divided into five sections: field theory and elementary particles; nuclear physics; statistical mechanics; molecules and solids; and liquid helium and superconductivity. There is a name index.

The Convolution Transform. I. I. Hirschman and D. V. Widder. Princeton University Press, Princeton, N.J., 1955. x + 268 pp. $5.50.

The title of this book brings to mind general researches on groups, function-spaces, Laurent Schwartz distributions, and, of course, it includes after suitable changes of variables, the Laplace transform, to which one of the authors has already devoted a well-known and much prized treatise. However, it is said that the author of an equally prized book on the good city of Boston—a city for which I have a special affection—once collaborated on a further volume dealing with the United States, and that his friends were relieved to find that this further and somewhat shorter volume limited itself to those parts of the United States that could be reached in an hour or so from Boston on foot.

The heart of the present book is again the Laplace transform, for it turns convolutions into ordinary products, and many readers will indeed be relieved to find that the book limits itself to material accessible, from fundamentals exposed in the earlier treatise, by pedestrian methods of real and complex variable theory available in Titschmarsh.

The limitations that the authors impose on the notion of convolution are drastic. They restrict themselves to the Lebesgue convolution $K*f$ and the Stieltjes convolution $K\#f$ of a pair of functions K, f on the additive group consisting of the real line—that is, to integrals $\int K(x-t)f(t)\,dt$ and $\int K(x-t)\,df(t)$—where the function K, termed *kernel*, is variation-diminishing, which means that $K*f$ has no more changes of sign than f.

As a result of researches of Laguerre, Pólja, and Schoenberg, these kernels, or rather their Laplace transforms $1/E(s)$, are characterized in several ways in the first few chapters: the corresponding $E(s)$ turn out to be the entire functions, equal to unity at the origin, which are expressible as uniform limits of polynomials in s with real roots, or, what amounts to the same, the products of the type:

(1) $\exp(-cs^2+bs)\ \Pi\ (1-s/a_k)\exp(s/a_k)$ where $c \geqq o$, b, a_k $(k=1, 2, \ldots)$ are real and $\Sigma a_k^{-2} < \infty$. However, the authors develop the theory of convolution transforms only in the case $E(s) = \exp(-cs^2)$ (Chapter VIII) and in the case where $E(s)$ is given by (1) with $c=o$ (Chapters VI, VII), or in a still more restricted case in complex form (Chapter IX).

In spite of these drastic limitations, no doubt due to the author's desire to spare the reader, the book is undoubtedly an excellent complement to the earlier one on the Laplace Transform, and, as the authors state, some of the earlier results can now be better understood as special cases of the newer developments.

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New Books

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Fluid Flow in Practice. J. R. Caddell, Ed. Reinhold, New York; Chapman & Hall, London, 1956. $3.

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Introductory Quantitative Chemistry. Axel R. Olson, Charles W. Koch, and George C. Pimentel. Freeman, San Francisco, 1956. 470 pp. $5.

Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, *but to the publisher or agency sponsoring the publication.)*

Identification and Geographical Variation of the Cyprinodont Fishes Fundulus olivaceus (Storer) and Fundulus notatus (Rafinesque). Studies in Zoology, vol. 3, No. 7. Jerram L. Brown. Tulane University, New Orleans, La., 1956. 16 pp. $0.50.

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