made for the Copenhagen theory were too sweeping, and that alternative possibilities have been cut off before they were sufficiently developed. Attempts to develop alternatives which "supply the missing parts" are a legitimate, and potentially very important, part of theoretical physics.

Persons who dislike these attempts and do everything in their power to discourage them should recall the principle that Bohr used to defend the Copenhagen theory against its early attackers: *the test of any theory is not whether it contradicts preconceived philosophical notions, but only whether it contradicts experimental facts.* It was only on this basis that the Copenhagen interpretation could survive the Einstein-Podolsky-Rosen paradox. Today, the shoe is on the other foot; the Copenhagen interpretation has become the "preconceived philosophical notion," and persons who seek to modify it are entitled to demand that their efforts be judged according to the same rules of evidence that Bohr demanded for his.

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**An Introduction to Fourier Analysis.** R. D. Stuart. Pp. 126, John Wiley & Sons, Inc., New York, 1961. Price $3.00.

Fourier analysis occupies a near-central position in many physico-mathematical inquiries in the sense that, if one carries his purely mathematical analysis far enough, he becomes involved with abstract harmonic theory, and, if one investigates linear mechanics at all thoroughly, he will come to use Fourier methods.

This brief, but not too short, monograph provides another well-written heuristic introduction to Fourier techniques as written for the practicing applied physicist or engineer. Since nothing more powerful than Riemannian integration is used, the book is most definitely not a mathematical treatise. Indeed, emphasis is placed upon physical theory and its practical applications.

The first chapter treats the elementary mathematical theory of Fourier series. It develops, e.g., the formulas for the coefficients of a Fourier series—including the complex case. Then it considers the expansion of even and odd periodic functions, matters of convergence, Parseval's theorem, and, finally, the application of that theorem to the determination of the power in a complex waveform. Chapter 2 systematically analyzes various periodic waveforms, e.g., square waves, triangular waves, and saw-tooth waves. In addition, it provides a brief discussion of Gibbs' phenomenon. The next chapter presents the Fourier integral as the limiting case (infinite period) of the Fourier series (finite period). Then various theorems analogous to the ones for Fourier series are given, e.g., the shift theorem, the superposition theorem, and Parseval's theorem. The fourth chapter applies the results of Chapter 3 to the analysis of transients in linear systems. The Fourier integrals of certain waves are developed, e.g., the rectangular pulse, the unit step, the unit impulse, and finite trains of simple pulses. Although the author considers rectangular frequency distributions, he does not develop Shannon's sampling theorem. Chapter 5 utilizes the results of the first four chapters to analyze various linear circuits, e.g., distortionless lines, ideal filters, and RC filters. The Laplace transformation is mentioned but not used. The last chapter discusses various kinds of wave motions, e.g., diffraction, amplitude modulation, phase modulation, pulse-amplitude modulation, pulse-phase modulation, and pulse-width modulation.

Since the work lacks home problems of any kind, it would be unsuitable by itself as a text for students. However, the book does provide a sort of convenient condensation of more extensive books written on the same subject [see, e.g., S. Goldman, *Frequency Analysis, Modulation and Noise* (McGraw-Hill Book Company, Inc., New York, 1948)].

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**Physics for the Inquiring Mind.** Eric M. Rogers. Pp. 778, Princeton University Press, Princeton, New Jersey, 1960. Price $8.50.

There are a great many difficulties in writing a reasonably brief review of Professor Rogers' book *Physics for the Inquiring Mind.* One of the most painful arises from the past abuse of the appropriate adjectives. As e. e. cummings points out, "certain ideas gestures ryhmes, like Gillette Razor Blades having been used and reused to the mystical moment of dullness emphatically are Not To Be Resharpened." In particular, to use the word "stimulating" of a physics book runs the risk of being an insult. But if you will pause for a moment and give back the full meaning to that adjective, it does mark one of the most important characteristics of Professor Rogers' work. Rather than being only a clear and logically constructed skeleton of physics, into which the teacher must breathe life and inspiration, this book contains so much vivid analogy, so many good stories, and so many intriguing questions that it is in itself a major stimulus to the student. Its success demonstrates to my mind that these are not irrelevent and misleading trimmings often suspect of being inconsistent with sound scientific thinking, but are in fact a valuable part of good teaching. I can assert on the basis of actual trial that many parts of this book can be read with pleasure by young teenagers. At the same time, the writing is accurate and the discussion goes deeper than many a college text.

In one sense it would require a staff of experts to review *Physics for the Inquiring Mind*; its scope is wide, encompassing classical physics, relativity, and atomic structure; it makes use of both detailed episodes and sweeping developments taken from the history of science; it raises questions in the domain of the philisophy of science, both as to the methods by which science evolves and as to the structure and meaning of scientific knowledge. Certainly experts will find much to debate; nevertheless, this is not primarily a book for experts. It is a goad and a guide for beginning students of physics. These are its real functions; and it performs them wonderfully well.

Students will benefit from the breadth of interests, the rich variety of questions that connect the physics with all intellectual puzzles, while at the same time they disentangle the details of concrete physics problems with the aid of carefully plotted exercises. Science is not merely discussed; the students learn specific pieces of science, and, in addition, they are encouraged to think generally about it.

Perhaps the eager student who wants to know the answers, to swallow up all of physics as fast as possible, will get a bit impatient at times. But let him try to explain his knowledge to a friend; he'll soon see the point of the slow developments, the carefully labeled rough analogies, and the illuminating problems.

The problems are indeed one of the essential elements through which the student learns, and the discussion of the text often assumes that the students have worked them over carefully. There is a liberal supply of them, some designed to clear up well-known confusions; others giving practice in the analysis of data and the formation of reasonable conjectures; some bearing directly on the subjects immediately on hand; a few introducing new subjects; and finally a large set of general problems which can be used to look over material "from several chapters, or even the whole book."

Even those problems which seem to be most specific often start us on long paths. For example: Problem 20 on page 24 explicitly raises the question of whether a projectile is accelerating at the point between the rising and falling portions of its path. Problem 21 is specifically designed to help a student see that, at the instantaneous rest position (unlike any rest position of finite duration), the projectile is accelerated. In particular, the student shows that the apparent top of the path is different in different frames of reference, and he starts to develop his insight into the relation of frames of reference moving at constant relative velocity. Later in the book similar problems, including accelerated frames of reference, carry the student to the threshold of Einstein's general theory of relativity. It is no accident that, in the long run, an apparently trivial problem helps us to go a long way.

In addition to the carefully chosen problems and stimulating reading, Professor Rogers' course relies on two other major elements: excellent illustrations, which eat up a lot of space and are worth it, and laboratory work. Here and there through the book are laboratory chapters. A first glance at them can be very misleading. They may appear to be very elementary and strangely out of place; the experiments occasionally draw on ideas that may not be developed for several chapters to come. The answer is that they are not to be read as ordinary chapters; they are to be worked through in a real laboratory at the appropriate time, and no matter what impression they create when looked at on paper, when they are actually put into operation (as they have been, for example, at Princeton and at Haverford), these laboratories do a good job. I have taken the time to visit and observe the laboratory. The students I saw often came closer with their elementary questions and naive apparatus to doing real investigation than students in many fancier laboratories.

There is a very important question raised by Professor Rogers' book. Because it performs many of the functions that have been left traditionally to a lecturer, it forces us to re-examine the possible roles of lecturers and of textbooks in teaching physics. It is possible that when the book provides more enrichment and more stimulus the teacher must take more of his time nailing down the rigorous arguments. He may feel that some of his fun has been stolen, and that he has been left with the scut work. I don't believe that this conclusion is necessary. As far as I can tell, students who have been started with the more stimulating questions are more willing to do the necessary labor than are those who are laboring for no good reason. In addition, the teacher has two essential functions which he can perform better when the students start with the kind of background that Professor Roger's book supplies. It is indeed the teacher's role to unscramble puzzles, and straighten out logic in discussion. If he must spend most of his time laying out the materials and making them interesting, he never gets time for this important second round. Starting with Professor Rogers' book, he almost automatically starts with the second round. Almost the same remarks apply to the teacher's second major function, that of relating the details of his subject to either the larger philosophical ideas, or the technical applications. Starting with most textbooks, we occasionally get to those problems; starting with *Physics for the Inquiring Mind*, we should have a chance to deal with them more often.

Whether or not you decide to use this book as a text, you should certainly find it invaluable as a source of ideas and of detailed teaching. At the very least, many copies should be available for students to read.

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**Radar Observes the Weather.** Louis J. Battan. Pp. 158, Science Study Series, Doubleday and Company, Inc., Garden City, 1962. Price $0.95.

We have all heard of radar, when it emerged from its hush-hush wrappings after World War Two, and we may have wondered what the "weather man" may have been able to do with it over the years. Our tv programs are making us weather conscious. Dr. Battan has done a service to both the interested layman and to the physicist alike in bringing together in such short compass the latest facts on the subject.

With a minimum of technical description and almost no mathematics, the author describes how radar works in principle and what modifications have had to be made in the operation when the "pips" are to detect a cumulus cloud in a young thunderstorm instead of an enemy plane coming over the horizon. Precipitation in its various forms—hail, snow, rain showers, steady rain—as well as tongues of cold air, are as amenable to radar investigation as planes. Yes, the author tells how lightning can give