tion or discussion of those aspects of quantum theory that have led some physicists to find a warrant in quantum theory for at least a partial subjectivism (determination by the knower) with respect to detailed aspects of microlevel events.

The subsequent major theme of the dialogs is that of validation of ethical judgements. Relations between science and philosophy, meaning of "laws of nature," comparative roles of an alleged "spiritual element" and of biological instincts in ethical behavior, continuities between animal and human behavior, and death and the significance of an individual life are among the topics that are discussed as relevant issues. I would say that the view eventually favored by the two participants in the dialogs is, in general, one that would be agreeable to most physicists, although, of course, there would be many differences in detail.

But among Western readers there would probably be one important exception to a general agreement with Pfeiffer's views. His discussants readily agree on the ethical superiority of society over the interests of the individual, and they speak against an egoistic ethic, in which the object is above all else the development of one's own personality. There are also, it should be said, expressions of limitations on the dominance of society; thus the assertion is made that "Human progress would surely stop in its tracks if the individual were once more robbed of his freedom of choice of his general path, i.e., choice of profession, spouse and conviction." The question of how far the individual person may be encouraged to pursue his own fortune, independently of demands for wider public needs, is one that faces us in the West in the present period of disquiet. One can say much in support of the doctrine that man best serves his society by freely becoming his own best self; but how then should one bring social responsibility into the concept of "best self?"

Discussion of such questions, as well as of philosophical issues more immediately related to problems of physics, is very highly desirable today. I think we must, therefore, warmly commend Pfeiffer for his Socratic endeavor.

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The master in his metagalaxy

BEYOND THE OBSERVATORY. By Harlow Shapley. 222 pp. Scribner's, New York, 1967. $4.50

by MARTIN F. McCARTHY

Oh, what do the scientists do? Yes, what do the scientists do when they are outside their laboratories, away from lecture platforms, apart from computers, beyond the observatory? This is the question set for himself by Harlow Shapley, distinguished dean of American astronomers. His title as Professor Emeritus of Astronomy at Harvard after 30 years as director of the Harvard College Observatory means simply that Shapley, a very youthful and dynamic octogenarian, is now free to be teacher-at-large for us all. In this collection of essays Shapley shows those flashes of wit, insight and wisdom that have always marked his lectures, classes and colloquia and merited from a colleague an encomium we could all aspire to: "Shapley is incapable of giving a dull lecture."

But what does the scientist do beyond the observatory? Shapley's answer is clear. A scientist always keeps his eyes and mind open and searching as the magnificent panorama of cosmic evolution unfolds before him. He rejoices (and it is easy to see that Shapley has had a tremendous amount of fun preparing and delivering the essays in this little book) in sharing this broad and detailed view with his fellow men. A scientist knows his vocation is a fortunate and happy one: to explore a part of creation, to see how it fits into the whole pattern of things and to share the good news of all this with other people. An expert in his own branch of science, he makes himself alert to the progress and problems of other disciplines. Aware of his own limitations and his vast potentialities for error, he is not afraid of learning more and is tireless in communicating the fruits of his labors to others. He puts his knowledge and sense of research at the service of his fellow men.

Those who had the chance of hearing Shapley lecture on "Cosmography" to packed classes of Harvard and Radcliffe students will find many an echo in the topics treated here. I suggest that the reader, as a practicing scientist, may wish to look first at the index and then at the final essay, "The Scientist Outside the Laboratory." These final 20 pages illustrate the variety of subjects discussed and set forth the leitmotif of all the essays.

Harlow Shapley has never been afraid to step outside the range of his own vast expertise, "The Metagalaxy and all its parts." One notes the master's touch in all those portions of the book that deal expressly with matters astronomical, and one finds charming the original and articulate approach of the wise lover of learning to problems biological, exegetical and sociological. This is the example Shapley sets for us in this splendid set of essays: to be bright eyed, brave, inquiring and humble and always to think beyond one's self. The lesson of this book as well as Shapley's own code and the goal he sets for the

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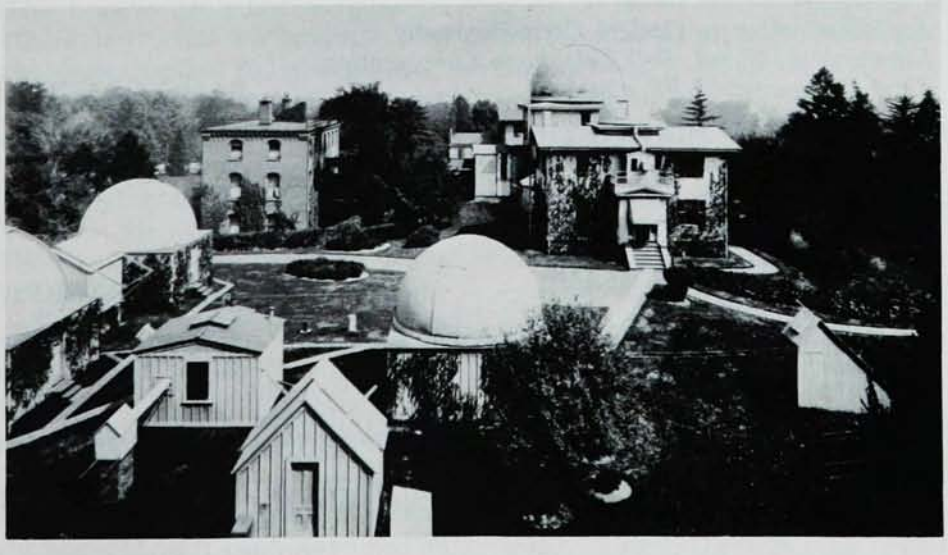

HARVARD COLLEGE OBSERVATORY as it appeared in the 1920's when Harlow Shapley became the director. Building at left housed the photographic plates.

young (of all ages) scientists can be summed up in this modification of Terence's dictum: "I am a man of science; consequently, I can deem nothing human as alien to me."

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The reviewer, an astrophysicist and Jesuit, is with the Vatican Observatory in Rome.

A collection of nuclear reviews

ADVANCES IN NUCLEAR PHYSICS, VOL. 1. Michel Baranger, Erich Vogt, eds. Plenum Press, New York, 1968. $18.50

by EVANS HAYWARD

This volume is the first of a new series of books dedicated to the publication of review papers in nuclear physics. I believe that there is a real need for such a series. Students, teachers and researchers need competent review articles on all aspects of physics written by specialists.

Good review papers written by knowledgeable research workers are not generated by spontaneous combustion. They are solicited by aggressive editors who find out who can write a particular article on a specific subject and convince the prospective author of his unique abilities to do the job. No busy scientist is going to volunteer to write a review paper; it's just too much work. And anyway he's too busy filling up the pages of *The Physical Review* with the reports of truly original work. Michel Baranger and Erich Vogt, the editors of this new series, have enough good judgment, world-wide acquaintances and power of persuasion to succeed at the task they have undertaken.

In their preface the editors say that they are going to use the "stream" method for the selection of papers. They will solicit a considerable number of articles, and then when a sufficient number of papers are available the book will be published. This procedure negates the main objection to the review book as a means of publication, namely, that all too often review papers become obsolete while they await the completion of their companions. This more flexible approach is most promising.

The present volume contains a heavy dose of theoretical nuclear physics, but a greater emphasis on experimental topics is promised for the second volume. The first paper, by Jorrit de Boer and Jörg Eichler, is a very thorough treatment of the theory of the reörientaton effect and its connection with the experiments that have been performed. This article is followed by the descriptions of two different methods of describing light nuclei, "The Nuclear SU_3 Model" by Malcolm Harvey and "The Hartree–Fock Theory of Deformed Light Nuclei" by Georges Ripka. The paper by Vogt on the statistical theory is an updating of earlier reviews on the same subject with some interesting topical applications. The final paper on three-particle scattering by Ian Duck includes a discussion of the Fadeev equations and n–d scattering and points out a series of still open questions. These papers have an average length of 80 pages so that each one represents a treatment in depth.

Finally, is this book for you? If you are a nuclear theorist, it has to be available to you. Ask your librarian to get it. If you find yourself orbiting the 2s–1d shell, it has to be on your desk: Go out and buy it.

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History of quanta

WAVE MECHANICS. By Gunther Ludwig. 230 pp. Pergamon Press, Oxford, 1968. Cloth $5.50, paper $4.00

by GARRISON SPOSITO

This book is not a text on quantum theory, but in fact is a contribution to the series entitled *Selected Readings in Physics*, published under the general editorship of Dirk ter Haar. The author's purpose, as he puts it, is to furnish counterpoint to those many volumes whose aim is to represent theory more or less as dogma in the context of what has been most aptly called "normal science." This is indeed a good idea; Ludwig's argument, that developmental studies of old theories can be inimical to prejudicial receptions of new ones, is the best one to support his idea.

Wave Mechanics begins with about 70 pages of what must be termed an excursion (not really a business trip, but then, not really a visit either) into the physical, mathematical and logical aspects of quantum mechanics. Ostensibly these opening comments are meant to place the reprinted papers that follow into the milieu of current thought; but, marching as they do so rapidly through Hamilton–Jacobi theory, the notions of Hilbert space and the calculus of propositions, the comments give the impression of a thumbnail sketch for the expert rather than a critical introduction for the novice. What is more serious, perhaps, is the minute amount of attention (two pages) paid to the tantalizing philosophical heresies subscribed to by the founders of wave quantum mechanics. One would suppose that this point would command more space in a work whose objective is at odds with pure didactics.

The eight papers reprinted in the second part of the book are partial translations into English of Louis de Broglie's doctoral dissertation; three of Erwin Schrödinger's four communications on quantization as an eigenvalue problem and his paper on the connection between the Schrödinger and Heisenberg pictures; Werner Heisenberg's first paper on matrix quantum mechanics; Max Born and Pascual Jordan's more rigorous version of Heisenberg's work, and, finally, Born's paper on scattering processes wherein the probabilistic view of quantum theory is put forth. Evidently Ludwig has done the translations himself—although he does not tell us this—and presumably he had definite reasons for allowing only portions of these fundamental papers to appear. In the absence of prefatory remarks, however, one can only speculate, or, what is a little better, compare the abridged papers with the originals, in the hope of deducing the antecedent logic. If one does trouble himself to compare, he finds that, although much of what is omitted has to do with commonplace applications of quantum mechanics, some of the missing passages are notable. For example, lost from the translation of Schrödinger's first communication is his acknowledgement of de Broglie's influence upon his work. A severed final paragraph in the fourth communication describes his uneasiness over the requirement that the wave function be complex valued and does not quite live up to his expectations for a field scalar. Lastly, because the *entire* third communication has been deleted, we are deprived of Schröding-