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The Enigma of Time

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BOOK REVIEWS

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Quantum Questions: Mystical Writings of the World's Great Physicists. Edited by Ken Wilber. 208 pp. Shambhala, Boulder, CO, 1984. Price $8.95 (paper). (Reviewed by Fredrick M. Stein.)

It should come as no surprise to established scientists—the intended audience of this purposeful book—that many of the founders of modern physics also wrote extensively on philosophy, religion, and metaphysics. According to this latest book by Ken Wilber (author of *The Holographic Paradigm*), Einstein and many of the great theorists of this century held a mystical–spiritual world view even though they rejected—as does Wilber—the in-vogue notion that the success of modern physics offers positive support for some particular mystical–spiritual world view. This rejection is given by Wilber as his theme, but, in fact, it is not the focus of Wilber's earnest and well-organized efforts in presenting excerpts from the writings of Heisenberg, Schrödinger, Einstein, de Broglie, Jeans, Planck, Pauli, and Eddington.

The abovementioned excerpts are excellent, and I would expect those interested in physics to find them illuminating and provocative. What concerns the reviewer, however, is the way in which the excerpts are used by Wilber in presenting his personal philosophical position. His views are spelled out in the introductory portion of the book, but there are also invasions of Wilber's thought interspersed in several of the excerpts.

Wilber begins on a firm heuristic basis when he defines science in terms of an epistemology (method) and ontology (domain). His normative methodology includes the ways and means of gathering information and of making knowledge claims which are open to public and repetitive experimental validation or refutation. Wilber's definition of domain, however, becomes most obscure. He presents the Great Chain of Being with its spirit/Spirit dichotomy as if it is part of the received view of reality rather than a speculation. Since Wilber's "working ontology" is based on the views of philosophers who are largely outside the mainstream of western philosophy (such as Arthur Lovejoy and Huston Smith), the ensuing discussion of the relationship between science and religion is relevant only to those who accept his definitions of spirit/Spirit and his construal of Buddhist ontology.

In his Introduction, Wilber asked, "...why did *all* of these great physicists embrace mysticism of one sort or another?" His answer, I believe, is the focus of this book. Wilber claims that these prominent theorists were led to their mystical views of the world by the *failure* of quantum mechanics to provide them with anything other than a symbolic reality. He finds validation for this position and for his personal views on mysticism in some of the writings—especially in the ontological and epistemological theories of Sir Arthur Eddington (whom he describes as an eloquent writer, a penetrating mystic, and one of our most accomplished philosophers). Eddington combines a form of idealism (his "mind stuff") with a selective subjectivism (his "fishnet" theory), which he called *structuralism*. On this view, scientific laws and theories are conventions (à la Poincaré) which depend, more or less, upon our free choice from among alternative ways of describing the natural world. The enterprise of physics, then, reduced to investigations into the nature of sensation and measurement, can express nothing more than the regular relations among phenomena. This Machian view of science is "good news" for Wilber; for, in his construal of Eddington's somewhat naive and overextended analogies, Wilber finds the message that, "...there is no longer any major physical–theoretical objection to spiritual realities." This claim, he further stresses, is now "...'officially' advanced by theoretical science itself." This overblown statement tends to call into question Wilber's stated intentions.

At first glance, this book appears to be an excellent and delightful collection of philosophical essays written by the most revered theorists of our modern age. Those who enjoy the readings and find (as I did) that some are too short, are encouraged to obtain the originals for which references are provided. However, with a careful reading of the Introduction (and the over-the-shoulder-comments interspersed in the essays), one may develop the suspicion that while avoiding the tired "physics-supports-mysticism" syndrome, the selection process for the excerpts is based on the premise that "[certain] physicists—support—[Wilber's] mysticism."

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The Enigma of Time. Edited by P. T. Landsberg. 248 pp. Hilger Ltd, Bristol (distributed by Heyden, Philadelphia), 1982. Price: $28.00. (Reviewed by Eric J. Chaisson.)

Time. Who among us physicists has not occasionally given the concept of time some deep and measured thought? The symbol, t, inundates the scientific literature as well as our daily mathematical manipulations, for few things of natural interest are immutable. Even philosophers and theologians, alas sociologists too, are now considering anew the role of time in our world views. To be sure, the physical scientist's struggle to understand the nature of time has been a long and interesting one, though not necessarily one that has produced meaningful appreciation much more significant than some of the time-honored ideas of antiquity. Clearly, no one has offered a scientific "solu-

tion" to the problem of time.

The present volume is a collection of (mostly) reprints published during the last half-century. Using stated criteria such as short, expository, and not easily available, the editor, P. T. Landsberg of Southampton, has compiled 14 papers that address the subject of time according to four major categories: Irreversibility; Cosmology and Electrodynamics; Quantum Mechanics including Black Holes; and Time in the Arts. I have found the selection of included papers, the editing, and the quality of the printing to be disappointing.

In the choice of papers, the editor demonstrates his nationalism, for most of the authors are British. Perhaps our British colleagues have given the concept of time more thought than the rest of us, or maybe they publish largely in obscure journals (neither of which I regard as the case), but the editor's peculiar criteria and personal subjectivity have severely biased this collection. As such, the volume has only limited usefulness, for it does not present a representative selection of the best papers on the subject, nor is it likely to be helpful to those (even among physicists) who are novices on the subject of time. I would suggest that if the reader is already intrigued by the subject and has perhaps read some of the better (less obscure) papers concerning time, then it is not inconceivable that something could be gained by perusing this volume; if not, this work is hardly the place to begin. The editor has apparently tried to address this issue by providing a glossary of terms, but, like much of what we write in the sciences, their definitions seem useless to both experts (who already know the terms) and to neophytes (who will not find this glossary helpful); for example (p. 234 ff), consider a few entries; "*H-function.* The function for which one seeks to prove the *H*-theorem"; "*Gnomic.* Of the nature of maxims or aphorisms"; "*Onsager relations.* Assert a symmetry between the coefficients which couple the flow of irreversible currents to the forces which act... ." Nor did I find Landsberg's introduction terribly penetrating, for it is more a summary of the odd set of papers to come rather than a cogent overture to the fascinating subject of time.

Not surprisingly, the best papers are those that were originally published in hardly obscure journals, namely contributions by Lewis (published in *Science*), Davies (in the *Monthly Notices*), and Penrose (in one of the widely available Einstein centennial volumes). To find an inverse correlation between the obscurity and the usefulness of published papers is nothing new in physics.

Perhaps my biggest gripe concerning selection is not only that the editor has taken the liberty of sandwiching two of his own unpublished papers amidst the other published entries, but also that these two "personal contributions" are largely dated, uninsightful, and overabundant in reference to other of Landsberg's unpublished works and "inaugural lectures," none of which the reader can easily consult for further information. (Now I know why the journal *Nature* prohibits the use of references to unpublished papers; when overdone, it can be very annoying.)

Other authors who make an appearance in this volume include Hoyle who makes his usual plug for the creation of matter from nothing, Dirac who in two pages and without any references proposes two new metrics in place of Einstein's—a paper reproduced here as though it were photo offset from a poor xerox, but in any case later eclipsed by another of his own contributions which is not included here—Sir Ernst Gombrich with a paper on "moment and movement in art," whose relevance to this volume escapes me, and A. J. Leggett whose self-proclaimed (p. 155) "vague speculations...[bordering] on the point of irreponsibility" are reprinted from *The Encyclopedia of Ignorance.*

Enough. At a time when new books are appearing on our library bookshelves at an ever-increasing rate, publishers need to become more discriminating, and referees more critical, in their choice of which works to publish. I suggest, not only because of the above criticism but also in view of the hefty price for such a slim book that doubtless required negligible amounts of copy and production editing as well as little typesetting, that this is perhaps a good example of one volume that never should have seen the light of day.

Eric J. Chaisson received his doctorate in 1972 from Harvard, where he remained on the faculty until recently, assuming his current position as Professor of Astronomy and of Physics at Haverford College. He is the author of Cosmic Dawn *as well as the recently released* The Invisible Universe *(co-authored with George B. Field).*

Frozen Star. George Greenstein. 274 pp. Freundlich Books, New York, 1984. Price $16.95 (hard cover). (Reviewed by Martin Harwit.)

George Greenstein is a theoretical astrophysicist, much of whose work has dealt with the structure of neutron stars. He writes on pulsars and black holes with the authority of a man who has spent a great deal of time thinking about these strange objects. His book will be appreciated by young physicists wishing to know about exciting new areas of astronomy, by high school students looking forward to a career in science, and by many others who enjoy science vicariously.

Three quite different aims appear to permeate the writing. More than anything, Greenstein seems concerned with showing the reader how scientists work, to dispel some of the stylized, sterile descriptions of scientific work that younger people are often given to hear. Woven into this theme is the zigzag course of discovery and understanding that has marked progress in the study of highly compact stars and black holes. This is marked by many anecdotes, some personal, others gleaned from interviews with prominent astrophysicists. Finally, also, Greenstein attempts to make the physics of white dwarfs, neutron stars, and black holes comprehensible to readers with no mathematical training. Not a single formula or equation disturbs the uninitiated reader.

The explanations of physical processes are often clear and simple. Concise figures help to draw attention to essential points. Vivid scenes are painted, often with a good dose