

There is no lack of published material about Bohr. The edition of his collected papers also contains many biographical details, letters and so on, and there have been numerous obituaries and at least two commemorative volumes. In this book, a translation and slight revision of the Danish edition of 1985, Blaedel has addressed himself to the task of writing a full-length biography that covers all facets of his subject and that emphasizes that they form part of one harmonious unity. I think that on the whole he has succeeded remarkably well. He gives an accurate picture of the man theorists of my generation both admired and loved. And not only of the physicist: Bohr's relations with his family and in particular with his wife, an admirable woman, are drawn with sympathy and understanding.

Blaedel's sketch of the atmosphere at Bohr's institute in Copenhagen, where work was combined with — often somewhat childish — playfulness, especially in the late 1920s and early 1930s, is true to life; it will raise nostalgic memories among those who, like myself, experienced it. I am not so sure about the physics, however. The essential subjects are included and I have not spotted obvious errors, but I wonder whether Blaedel's account of the discussions between Bohr and Einstein — to give one example — will be comprehensible to non-physicists. Here, though, is a book to be read as a biography and not as an introduction to modern physics.

The translation from the Danish is in general satisfactory, although I noticed one or two slips. A few errors in the original have been corrected, and here and there short explanations have been added to help readers who are unfamiliar with Danish geography and Danish history and literature. The book is richly illustrated; although the quality of reproduction is not as high as that of the rather sumptuous original (which also contains a few colour plates), it is perfectly adequate.

Some readers may regret that the book is more a eulogy than a critical appraisal — that Blaedel does not mention any scientific shortcomings or any less desirable human traits. So be it. Personally I think he has produced a fitting tribute to a great scientist and a noble man. □

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#### New in Britain

Just published by Unwin Hyman, price £11.95, is "What Do You Care What Other People Think" by Richard Feynman as told to Ralph Leighton. The book, which was published last autumn in the United States by W.W. Norton and reviewed in *Nature* on 3 November, tells largely of Feynman's productively unconventional work on the inquiry into the failure of the Challenger space shuttle.

## Wholesome ideals

P. W. Atkins

**Science, Order and Creativity.** By David Bohm and F. David Peat. *Routledge: 1988. Pp.280. Pbk £5.95.*

THE world will be much nicer once 'creativity' has been liberated from its present tomb, the walls of which are built from the attitudes of conventional science. This is the message that David Bohm and F. David Peat urge on us in this somewhat bizarre and certainly uneven book that has grown out of conversations that the two have had together over the years. I began to read with high hopes. But although some of the early passages show interesting insights, in general my dislike grew with the page numbers.

The book is pervaded on the one hand by a schoolboy naïveté ("How does science intend to end the danger of mutual annihilation that exists in the world?") and on the other by a pessimism about the potential of and the attitudes currently struck by conventional science. Before considering purchasing it, those who are sensitive to these things will want to know that both Sir Fred Hoyle and Rupert Sheldrake are mentioned without disapproval.

To be fair, I must allow the authors to speak for themselves, for I fear I may be one of those at whom is directed the accusation of being a prisoner of conventional science, and therefore may be over-tender to its message. The argument begins with an attempt to disarm criticism of what is to come by considering the role of communication in creative perception, and by identifying how communication may break down at the dawn of revolutions in science and at what the authors so fervently long for, the sunrise of a new paradigm. Quantum theory is in this context a paradigm of paradigms, and something of the wars of interpretation is presented here. Rather inappropriately, though, Bohm takes the opportunity to present a moderately lengthy account of his 'causal interpretation', for which he needs the burden of a new potential (the quantum potential, essentially  $\nabla^2\psi^2/\psi^2$ ). The advantage of his formalism appears to be that it does not require a break with classically established concepts; here, however, the authors have tripped over their own feet, for a more relaxed view of quantum theory would lead us to believe that we must unburden ourselves of the expectation of the farmyard and not cling to classical concepts.

Built on these foundations, such as they are, is an account of what is meant by order, its classification and (an essential feature of what is to come) its unfolding.

The authors deal properly with the change in our perception of the concept that has been stimulated by developments in fractals and determinate chaos. To do so, they distinguish between 'constitutive order' (the actual order expressed in the physical constitution of the entity, as in the material hexagons of a beehive) and 'descriptive order' (the order that stems from an abstraction, as in the motion of an object through a field of coordinates). They argue that actual order (whatever that is) lies between these two extremes, and thus alight on what is for them the comforting view that order is a cycle of activity that involves both. It is in this chapter that the generally 'Eastern' flavour of the book begins to be explicit for the first time.

The authors are desperate to eliminate the fragmentation of conventional science and thus to impress upon us the essential 'wholeness' that is crucial to comprehension and human progress. Hence order, of various degrees, kinds and hierarchies, is essential to their argument. Thus they go on to distinguish 'generative order' from 'implicate order'. The former is an "inward order out of which the manifest form of things can emerge creatively". The rule for generating fractals would be an example. The latter is a particular kind of generative order that, I must confess, leaves me confused, for to comprehend it we must somehow understand that "the basic movement of enfoldment and unfoldment is thus a dual one in which there is ultimately no separation between enfoldment and the unfoldment". There is, of course, a superimplicate order too.

In the tacit infrastructure of consciousness, the authors claim, there are rigid ideas that restrict creativity. (I suspect, on the contrary, that they constitute a ladder to comprehension.) These ideas operate close to the source of the generative order and, as well as restricting creativity, imply "the presence of an energy that is directed toward general destructiveness". Whatever that means, I feel that it is the manifestation of the authors' pessimism, and more truly the spur of their writings than the overt joy of enlarged comprehension that they claim to be the book's impetus.

Bohm and Peat urge on us the "key importance of liberating creativity" if human life is to have a worthwhile kind of survival. And how do we escape from our prison? We need to de-fragment science, attain wholeness, comprehend levels of order, give up the hope of true and total comprehension, and, perhaps most important of all, "clear up" the sociocultural dimension. It really is as easy as that. □

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