
This must read book approaches the theory of atomic structure and the behavior of electrons from a relativistic and philosophical perspective. The application of relativity to quantum mechanics defines the nature of quantum field theory, which is the mathematical and philosophical approach to experimental research. In quantum mechanics position (of an electron, for example) is observable, which makes it, position, a preferential entity. In relativistic quantum field theory, time and position (space) operate in a space-time continuum and become inseparable in a reality called Hilbert space.

As soon as one begins discussion of a differential space or reality, numerous philosophical disagreements surface, which, when coupled with the mathematics of quantum field theory, conjure to the mind some hocus-pocus of nuclear physics research. That misunderstanding, often found in the phenomenological assertion (page 4) “that quantum objects have no definite property,” and the logical positivist “notion of reality as meaningless metaphysics,” is the very reason for Auyang’s text.

Auyang addresses the phenomenological and mathematical issues confronting our quest to peer into the unknown—an unknown far beyond the comfort of our senses and our comprehension of instrumentation, such as telescopes or microscopes or spectrosopes and spectrometers which permit us to “see” beyond the limits of human eyes. Kant sought to understand that objective reality that was beyond the empirical objects of our experience. Likewise, (page 62) Auyang seeks to explicate that “objective reality” beyond the physical theories and experimentation of relativistic quantum field theory.

After presenting an overview of what quantum field theory is, and explaining the problems, Auyang addresses the issues of objective reality, the nature of the object, space-time and events, and the relation between the observer and what is observed. While mathematical equations are limited, the mathematical concepts essential to the theory are included. The book approaches quantum theory cogently and with an order unlike any other primer on quantum theory, in order to discuss the metaphysical issues present. Additionally, while other introductory works typically limit themselves to classical quantum theory, Auyang presents the more comprehensive relativistic theory used in the laboratory.

Auyang’s thesis could be called a logical common-sensism, which explains why nuclear scientists find what they do in their experiments. “By common sense I mean the theoretical attitude of our everyday thinking, in which we step back from the tool context of our activities, abstract from the values we attach to the objects, and regard the objects as mere presence. . . . I concentrate on the theoretical attitude because it is the part of everyday thinking that the sciences develop and refine.” (Page 62) She disagrees with Bohr’s belief that (63): “Atomic systems should not even be thought of as possessing
definite properties in the absence of a specific experimental setup designed to measure these properties."

Her argument is that the experiment, the scientist, and the "real" world are a unitary whole. She writes (P. 100): "The physical object \( x \) is neither posited in advance nor constructed out of its representations afterwards. It is defined simultaneously and encoded in all its representations in the integral structure. Neither the representation-free \( x \) nor the representation \( \{x^n\}_a \) [the content of the experiment] alone is sufficient to characterize the primitive unit of empirical knowledge. Both and their interrelation are required." Just as the observer exists, so does the subatomic particle—both have a non-phenomenological reality.

Reality is an interrelatedness and the objects of reality are not things to be stumbled upon as given, but rather they are the parts of experiences to be interpreted. She concludes (pp. 194-5): "The interpretation of quantum field theory presented . . . implicitly contains a notion of the mind. The mind is understood not as an intelligent object but as the intelligibility of objects. . . . The mind is found in the general conceptual structures of experience, common sense, and scientific theories. . . . Once upon a time we listened to God speaking through burning bushes. We came to realize that even if a voice is heard, it is still up to us to decide whether it conveys the words of God. . . . Objectivity is not the state of givenness but a basic problem for theoretical reason. The unfamiliar topics of modern physics prompt us to take up the criticism anew."

The book is a text on the process of representation and interpretation of the atomic world. There is no division between the classical and the quantum worlds, but rather there is a need to reexamine our knowing of those worlds. Auyang's logical common-sensism appears similar to Peirce's common-sensism and her foray into representation and interpretation would find support in Peirce's formal semiotic—his logic (see NEM 4:20). Interestingly, Auyang only mentions Peirce in a cursory manner, in a note (p. 261) which addresses probability and propensity. The book plows fertile ground for a semiotic study of quantum field theory. Auyang is a research scientist and the book is a major contribution to both science and philosophy.

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The publication of Environmental Pragmatism is good news both for philosophical pragmatists and for environmental philosophers. Pragmatists will gain by seeing their broad ideas sharpened and modified as they are applied to pressing issues (e.g., wetlands protection and whale hunting). Environmental philosophers will gain by convenient access to a sophisticated body of ideas that is too often overlooked. The