peculiar assertion can turn out to be absolutely true.

The relation between quantum theory and the physical world was seen as follows: Quantum theory tells what future scenarios are consistent with some initial information, and what the relative probability of each scenario is. Quantum theory cannot tell more than that, but neither can any other theory.

My pragmatic approach may not satisfy everyone's philosophical needs. But the aim of an applied quantum course is to see how to use the theory and to introduce the many approximations that have made the theory accessible to physicists and engineers. If some basic consequences are difficult to accept, the problem must lie with the initial assertion from which the consequences follow.

Reference

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ENIAC or ABC?

The review by J. Ross Macdonald and Harvey G. Cragon (Physics Today, July 2000, page 58) of *ENIAC: The Triumphs and Tragedies of the World's First Computer* seems to be an able assessment of the book and its content. However, perhaps due to misstatements in the book, the review fails to reflect adequately the place of the Atanasoff–Berry Computer (ABC) relative to the Eckert–Mauchly ENIAC in the lineage of the electronic digital computer. (See Alfred E. Brenner's article, "The Computing Revolution and the Physics Community," Physics Today, October 1996, page 24.)

Work on the ABC design by John V. Atanasoff (a University of Wisconsin PhD physics graduate whose adviser was John Van Vleck) began in 1937 at Iowa State University (ISU). It is well established that a breadboard mock-up was completed in 1939 and that a full-scale prototype was being tested by early 1942. The review correctly indicates that, years later, Honeywell initiated a lawsuit claiming that ENIAC patents applied for by Presper Eckert and John Mauchly in 1947, though not issued until 1964 to Sperry Rand, were invalid.

On 19 October 1973, the trial judge entered his opinion, stating that "Eckert and Mauchly did not themselves invent the automatic digital computer, but instead derived that subject matter from one Dr. John Vincent Atanasoff."[1] Behind that terse statement is a trial record that exhaustively examines the "prior art" embodied in the ABC and the adoption in either ENIAC or the later EDVAC of many concepts first introduced in the ABC, such as regenerative memory, base-2 calculating, modular construction, and fully electronic computation.[2,3] (See also Alan R. Mackintosh's article "The First Electronic Computer," Physics Today, March 1987, page 25.)

Evidence introduced at the trial showed that, starting in December 1940, Atanasoff met with Mauchly, briefed him on the ABC design, invited him to Iowa to see the full scale machine under construction (he stayed at Atanasoff's home) and provided him with free and open access to detailed design features that later appeared in the ENIAC or the EDVAC. Nevertheless, many supporters of ENIAC's historical primacy still claimed that the court decision was flawed, that the ABC could never operate, and that the ENIAC did not, in fact, depend on the ABC design.

After 1973, Atanasoff began receiving widespread recognition for his accomplishment, including major awards from the Institute of Electrical and Electronics Engineers (IEEE) and the Navy, several honorary doctorates, and, in 1990, the National Medal of Technology presented by President George H. W. Bush.

In 1994, senior engineers at the Department of Energy's Ames Laboratory put forward the idea that the availability of ABC documentation and old parts could make it possible for them to build a full-scale replica of the ABC that might refute the charge that the ABC could never have operated successfully. A small group of ISU officials, of which I was one, then took on the challenges of project oversight and fundraising.

In late November 1996, the completed (but not yet operational) replica was unveiled in Pittsburgh, Pennsylvania, at "Supercomputing '96," an annual joint meeting of the IEEE and the Association for Computing Machinery. The ABC anchored an extensive display of historic supercomputer artifacts in celebration of 50 years of computer development.

By October 1997, all systems were fully operating and the machine was brought to Washington, DC. At the National Press Club, the ABC carried out its first public calculations before computer experts, ISU alumni, and the press. For the next eight months, the ABC toured Iowa, promoting ISU eminence in developing advanced technology. Along the way, some computing runs were videotaped, preserving a visible place in history for Atanasoff's dream. Ironically, the unattributed adoption of some of the ABC's concepts apparently provided the only means by which they were incorporated into the mainstream of computer development.

References

1. Section 3 of Judge Earl R. Larson's opinion in *Honeywell Inc. vs. Sperry Rand Corp. et. al.*, 19 October 1973.
2. C. R. Mollenhoff, *Atanasoff: Forgotten Father of the Computer*, Iowa State U. Press, Ames (1988).
3. For an informative technical discussion of the ABC and the trial, see A. R. Burks and A. W. Burks, *The First Electronic Computer: The Atanasoff Story*, U. of Michigan Press, Ann Arbor (1989).

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In SOA, S Is for Semiconductor

I read with great interest the article on optical communications by Gordon A. Thomas, David A. Ackerman, Paul R. Prucnal, and S. Lance Cooper (Physics Today, September 2000, page 30). A good portion of the text describes the nonlinear optical loop mirror (TOAD) device, a critical component for very high bit-rate modulation. The nonlinear element in the optical loop is a semiconductor optical amplifier (SOA). However, throughout the article and the figure captions, the authors refer to the SOA as a "silicon optical amplifier." This error is not just a matter of words. SOAs, for fundamental physical considerations based on conservation of energy and momentum, cannot be made from silicon. Furthermore, even if silicon could be used to make an SOA, it would operate in a wavelength range of little interest for optical communications.

Semiconductor optical amplifiers for optical fiber communications are made from gallium indium arsenide phosphide. This material is chosen