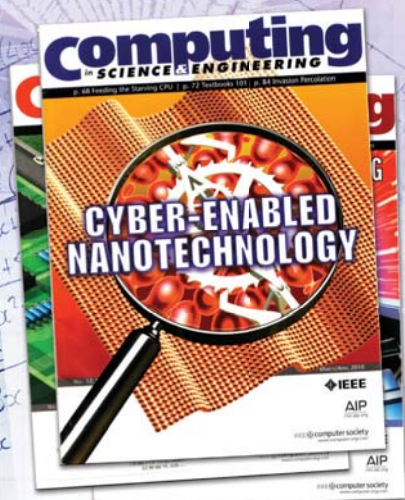


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adding, “although quantum cosmology can clarify questions about the universe in unprecedented ways, it does leave modest freedom for the myths.”

Bojowald’s honesty is to be commended. Of the many valuable lessons we learn in *Once Before Time*, a most relevant one is that physics is an empirical science. As Bojowald himself puts it, “It is important to remember what the aim of science is: to describe Nature; and Nature has her own sense of beauty.” In science so far removed from experimental guidance, it is wise to be humble.

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Dance of the Photons From Einstein to Quantum Teleportation

Anton Zeilinger

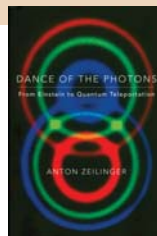
Farrar, Straus and Giroux, New York,
2010. \$26.00 (305 pp.).
ISBN 978-0-374-23966-4

Anton Zeilinger is an unequivocal expert in the field of experimental quantum information, which alone is reason enough for you to read *Dance of the Photons: From Einstein*

to *Quantum Teleportation*. Originally published in German in 2005, *Dance of the Photons* is written from the perspective of an omniscient third party who details the adventures of archetypes Alice and Bob as they explore the fascinating world of entangled quantum particles. Although the book covers many topics, the story of Alice and Bob is a step-by-step description of one of the more important ongoing experiments of our time—testing the violation of Bell’s inequality.

Although a popularization, the storyline in *Dance of the Photons*, which is based on experimental quantum physics, won’t excite you the way a thriller or romance novel would. The difference, of course, is that this story is based in reality and the others in fantasy. Quantum physics is a factual description of the microscopic world. Or is it? To determine whether a particular view of the world accurately describes reality, one criterion could be to require positive verification based on what can be known to the senses (that is, “measured”). That is what Zeilinger presents in *Dance of the Photons*.

Zeilinger shies away from conflating interpretation and observation, basing



the story of Alice and Bob on their measurements of entangled photons. In so doing, he fulfills half of the believability criterion. The other half is a bit more subtle and involves the violation of Bell’s inequality.

On a high level, Bell’s inequality is the foundation for a test to verify a key component of quantum mechanics, entanglement. If you really want to understand Bell’s inequality, you should study quantum physics for a few years and then pour over a measurement chart created by an experimentalist you trust. The second best way is to read Zeilinger’s description of entanglement in the appendix, in which he gives a clear description of the key idea without resorting to formal mathematics. Indeed, that section is a must read for everyone studying quantum physics, regardless of their formal training.

The possibility of the conveyance of keen insights into the quantum world is most assuredly facilitated by *Dance of the Photons*. That makes it a force to be reckoned with among quantum physics texts, even if some readers may need to supplement their knowledge to fully appreciate what is contained therein. But for his part, Zeilinger has clearly presented the thought process and pedagogy needed to shift one’s perspective from local realism to a more valid way of viewing the world.

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Complex Webs Anticipating the Improbable

Bruce J. West and Paolo Grigolini
Cambridge U. Press, New York, 2011.
\$75.00 (375 pp.).
ISBN 978-0-521-11366-3

From taking an airplane to how much we earn, many aspects of our daily lives are connected to webs and networks. That idea is stressed by Bruce West and Paolo Grigolini in their eminently readable inquiry, *Complex Webs: Anticipating the Improbable*, in which they note the global pursuit by scientists and engineers to develop the field of network science. Past attempts have met with limited and often disappointing results; those attempts include generalized systems theory, complexity theory, catastrophe theory, and the theory of complex adaptive systems. The present search for

