

## **Preface to the Twentieth Anniversary Edition**

Twenty years after the publication of *Fire in the Mind*, the stone camel still stares across the highway that leads from Santa Fe to the center of the universe—a mythical spot where, in the cosmology of the Tewa Indians, creation began. Across the road the Tesuque bingo hall, where I went one night long ago to ponder the nature of randomness, is now a full-fledged casino—one of five, all operated by the pueblos, that form a scenic, stretched-out version of the Las Vegas Strip. The glitz is barely noticeable—another of the strange juxtapositions that make northern New Mexico the magical place it is. The beauty of the land endures, along with the mysteries I explore in this book.

Our brains evolved to seek order in the world. And when we can't find it, we invent it. Pueblo mythology cannot compete with astrophysics and molecular biology in attempting to explain the origins of our astonishing existence. But there is not always such a crisp divide between the systems we discover and those we imagine to be true.

Since this book was written, physicists have finally caught a glimpse, within a blizzard of particle accelerator tracks, of what they think is the Higgs boson, the long-missing keystone in a theory that seeks to make sense of the subatomic world. But how do they know the discovery is real? With so many particle collisions to sort through, the same patterns that resemble a Higgs can also pop up randomly in the data, like a visage of Jesus appearing on a burnt tortilla. The hardest part of the Higgs experiment was ensuring that the feeble signals the instruments detected were probably genuine, and not another delusion.

Searching in another direction, cosmologists have become persuaded that the universe has not been simply expanding since the primordial explosion but has been doing so at an accelerating pace. This has required another revision to the big bang theory, adding a hypothetical ingredient called “dark energy” to an esoteric mix that already included dark matter and cosmological inflation. But are these discoveries or inventions—order that is in the world

or is put there by our minds?

At the same time, superstring theory, which proposes that we live in a universe of ten dimensions, has gotten even weirder. In the most recent versions, ours is one of a vast array of universes, each inaccessible to the other and each ruled by different laws of physics. The same question that seemed so puzzling twenty years ago remains: Is physics poised on the verge of a breakthrough or has it bumped up against the limits of what it is possible for our species to understand?

As I write this, I can see out my window to the piñon-covered foothills where the Santa Fe Institute continues to explore the science of complex systems—those in which many small parts interact with one another, giving rise to a rich, new level of behavior. The players might be cells in an organism or creatures in an ecosystem. They might be people bartering and selling and unwittingly generating the meteorological gyrations of the economy. They might be the neurons inside the head of every one of us—collectively, and still mysteriously, giving rise to human consciousness and its beautiful obsession to find an anchor in the cosmic swirl.

George Johnson

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