

# ENTANGLED

**Entanglement:** The quantum theory that, under certain circumstances, particles that appear to be isolated are actually instantaneously connected through space and time.

*In the future, it [will be] deemed a great oddity that 20th-century scientists had discovered elementary physical particles but had failed even to consider the possibility of elementary psychic factors.*

— KURT GÖDEL

## MINDS

A restlessness is brewing in science. Unexpected discoveries in many scientific disciplines are shaking previously held assumptions. One commonality among these discoveries is that observations once believed to be meaningless, or mere anomalies, are being reconsidered. In the process, new revelations are surfacing about the nature of reality. A few examples will serve to illustrate the rising tension:

- Cosmologists have learned that we might have accidentally overlooked 96% of the universe. The missing preponderance of the universe is dubbed “dark” matter and energy, and we know next to nothing about it.
- Neuroscience dogma used to assert that neurons in the brain do not regenerate, and that mental functioning inevitably deteriorates when there is a brain injury or as neurons die in the course of aging. Now, new data are revealing that brain neurons do, in fact, regenerate. The brain is much more plastic than previously imagined.
- In the borderlands between physics and chemistry, researchers are re-examining claims of cold fusion after 15 years in the deep freeze. Successful replications from laboratories around the world continue to suggest that unexpected effects, possibly nuclear fusion, really do occur in supposedly impossible ways. Have the prejudices of hot fusion researchers, who have spent billions of dollars in a still-vain attempt to build controllable fusion reactors, deflected attention from this anomaly?

- In physics, the idea of *entanglement*—the quantum theory prediction that under certain circumstances particles that appear to be isolated are actually instantaneously connected through space and time—is not only known to be demonstrably real, but is far more pervasive and robust than anyone had imagined even a few years ago. Devising new forms of entanglement has become a central focus in the accelerating race towards developing practical quantum computers.

When science begins to churn with unexpected developments and tolerance for new ideas, breakthroughs are often lurking over the horizon. The consequences of such revolutions are not fully appreciated until long after they’ve occurred, but one thing is certain: Just as modern science propelled the world into the nuclear, information, and genetic engineering ages, the pregnant postmodern era is likely to introduce radical changes in everything—from our daily lives to the dynamics of global society. One topic likely to change is science and society’s view of the paranormal, that uncertain realm just beyond the reach of science but perpetually alive within our experience.

One element of the paranormal—which I will refer to as *entangled minds*—is, I believe, on the threshold of transforming from paranormal to normal. I envision that the process may go something like this:

The growing pressure to develop workable quantum computers is rapidly expanding our ability to create ever more robust forms of entanglement in increasingly complex systems, for longer lifetimes, and at room temperature. Existing techniques like “entanglement purification” and “coherence repeaters” will be further enhanced, and our understanding of what entanglement means and how to use it will advance rapidly.



# Someone will ask, “I wonder what it would feel like when my brain is entangled with the outside world? Are **mind fields** bioentangled with the rest of the universe?”

First, pairs of photons, and then photon-atom pairs, and then atoms will be successfully entangled in the lab. And then triplets, quartets, and ensembles of atoms. And then macroscopic systems. Pairs of entangled photons will be shot through metal sheets and remain entangled after they punch through to the other side. Photons will remain entangled after being transmitted through miles of open atmosphere. New forms of entanglement and robust, long-lived quantum coherence will be discovered. And then it will be proposed, and confirmed, that certain forms of entanglement extend to virtually everything in the universe, since, as far as we know, everything emerged entangled out of a single, primordial Big Bang. This grand entanglement is nonlocal, extending throughout time and space, suggesting that, despite everyday appearances, we live in a deeply holistic reality.

Researchers will discover that under certain conditions, living cells also exhibit properties associated with quantum entanglement. Then the idea of *bioentanglement* will emerge, a concept that is more general than today’s special cases of entanglement involving inanimate particles and photons.

After scientists become used to the remarkably coordinated dances observed among entangled biomolecules and living cells, someone will get a bright idea and ask, “I wonder what would happen if two *brains* were entangled? Would they show correlated behavior at a distance, just like other forms of bioentanglement? And is it possible that minds and brains are complementary, like particles and waves, and that there are interpenetrating *mind fields*?”

An enterprising investigator will take up the challenge and conduct an experiment to see if stimulating the brain/mind of an identical twin results in a corresponding response in the electroencephalograph (EEG) of a distant twin’s brain/mind. The postulated “EEG correlation” experiment will work, and it will be widely hailed as a scientific breakthrough.

Then someone will ask, “I wonder what it would *feel like* when my brain is entangled with the outside world? Are mind fields bioentangled with the rest of the universe?” The answer will be yes, and at this point telepathy, clairvoyance, and the entire panoply of psi phenomena will be rediscovered for the umpteenth time. But this time, and for the first time, it will be accompanied by a widely accepted theoretical foundation.

## A Fantastic Scenario

How long might we have to wait before this fanciful “bioentangled brains” experiment is conducted? *The answer is no time at all.* The proposed studies have been performed at least a dozen times over the past 40 years. And they work.

One of the first such experiments linking psi with entanglement was published in 1965 in *Science*. That study reported that the EEGs of pairs of separated identical twins (two such pairs out of 15 tested) showed striking correspondences. When one twin was instructed to close his or her eyes, causing the brain’s alpha rhythms to increase, the distant twin’s alpha rhythms were also found to increase.



# SHIFTING OPINIONS

## Are there any indications that

the concept of “entangled minds” is preparing to escape the purgatory of the paranormal? Given that scientific advancements depend not only on scientists’ interests, but on how sociologically acceptable a given topic is, one affirmative sign is what editors consider to be newsworthy in leading journals and newspapers. Consider this news item published on January 22, 2004, in *Nature*, one of the premier voices of mainstream science and an interminable critic of all things paranormal. The article was entitled, “Telepathy debate hits London: Audience charmed by the paranormal.” It began,

Scientists tend to steer clear of public debates with advocates of the paranormal. And judging from the response of a London audience to a rare example of such a head-to-head conflict last week, they are wise to do so.

The debate was between Professor Lewis Wolpert, a developmental biologist at University College London, who argued against the existence of telepathy, and biologist Dr Rupert Sheldrake, well-known for his theory of morphogenetic fields (see page 27). Sheldrake argued the case for telepathy. The *Nature* news article reported that most of the 200-strong audience agreed that Sheldrake won the debate:

[Sheldrake] presented the results of tests of extrasensory perception, together with his own research on whether people know who is going to phone or e-mail them, on whether dogs know when their owners are coming home, and on the allegedly telepathic bond between a New York

woman and her parrot. “Billions of perfectly rational people believe that they have had these experiences,” he said . . . Wolpert countered that telepathy was “pathological science,” based on tiny, unrepeatable effects backed up by fantastic theories and an ad hoc response to criticism. “The blunt fact is that there’s no persuasive evidence for it,” he said.


Wolpert then provided the rationale for why he feels justified in rejecting any positive evidence for telepathy, by stating, “An open mind is a very bad thing—everything falls out.” This may be an acceptable strategy for maintaining one’s religious faith, but such prejudice seems anathema to science.

The audience saw through Wolpert, accusing him of “not knowing the evidence” and being “unscientific.” In essence, Wolpert was attempting to argue his case through intimidation and repetition, rather than reason. Such strong opinions are not uncommon within the scientific community, and sometimes prejudices are based upon a kernel of truth. There is little doubt that many claims of miraculous health cures, flawless psychic predictions, and extra-terrestrials living among us are naïve or motivated nonsense. But this does not mean that all unexpected phenomena, especially those reported for millennia by sober, thoughtful observers, are equally false.

Many similar snippets are starting to appear in academic journals and popular magazines, suggesting that the entangled minds scenario I’ve proposed is already proceeding. In due time, the zeitgeist will become emboldened as theory and experiments continue to converge. Then one day a sociological phase shift will occur and past prejudices will dissolve, seemingly overnight (but only in hindsight). On that day, a new understanding of who and what we are may dawn.

Today, nearly four decades later, positive results continue to be reported, and the use of identical twins is not necessary. In 2004, a review of this class of experiments was published in *Mind and Matter*, a new scholarly journal devoted to interdisciplinary research on the mind-matter interaction problem. Psychophysicologist Jirí Wackermann concluded that “the present state of research [is] prosaically demure. There are undoubtedly particular indications of progress.” In less restrained terms, Wackermann was saying that even with increasingly sophisticated experimental methods and designs, EEG correlations reminiscent of bioentanglement continue to be observed in laboratories around the world (including in the IONS laboratory in 2003).

After all the excitement over bioentangled minds settles down, scientists will rediscover that those quantum neuroscience-oriented experiments were the tip of the evidential iceberg. Literally thousands of other laboratory experiments exploring various aspects of mind fields have been published for over a century; they’ve just been languishing in the scientific outback along with other paranormal beasts, patiently waiting for science to catch up with the phenomenology.

Much more scientific work remains, but I believe that a rational framework for psi may be taking shape. At least, the needle on our explanatory compass has stopped spinning wildly and is now pointing in a promising direction. After the initial experimental verifications of quantum nonlocality in the 1980s, there was no longer any question that the fabric of physical reality supported the time-space anomalies presented by psi. Coming to grips with the idea that we live within a profoundly holistic reality still remains a challenge given that our daily experience more often reinforces a sense of isolation than a sense of unity. But as more people are exposed to these concepts, I expect that common sense may evolve into a new, uncommon sensibility in which psi is regarded as boringly normal. 



**DEAN RADIN** has a PhD in psychology and an MS degree in electrical engineering. He is the author of *The Conscious Universe*, and the forthcoming book, *Entangled Minds*. Dr Radin is currently the president-elect of the AAAS-affiliated Parapsychological Association, and is Senior Scientist at IONS.

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