All Tangled up: Life in a Quantum World

"[I]nconceivable as it seems to ordinary reason, you–and all other conscious beings as such–are all in all. Hence this life of yours which you are living is not merely a piece of the entire existence, but is in a certain sense the *whole*; only this whole is not so constituted that it can be surveyed in one single glance."[1]
– Erwin Schrödinger, Nobel physicist

There are conversations one never forgets. One I'll always remember occurred around 10 years ago, in which a good friend of mine, who is a physicist, and I were discussing remote viewing. In one version of this procedure, an individual somehow conveys complex, detailed information to a distant person, even though the two have no sensory contact with each other.[2] My physicist friend is a leading researcher in this field and has published several experiments that demonstrate these phenomena beyond reasonable doubt. I asked him whether quantum-physical effects might be involved in these long-distance exchanges of information. I had in mind the 1964 theorem of CERN physicist John Stewart Bell and subsequent experiments showing that subatomic particles, once in contact, remain connected thereafter, no matter how far apart they are, so that a change in one is correlated with a change in its remote partner, instantly and to the same degree.[3,4] Such particles are said to be "entangled," a term introduced into physics in 1935 by Nobel physicist Erwin Schrödinger. Schrödinger said, "I would not call [entanglement] *one* but rather *the* characteristic trait of quantum mechanics, the one that forces its entire departure from classical lines of thought."[5] Might the nonlocal connectedness of distant subatomic particles underlie the linkage between humans who share thoughts remotely?

"Impossible!" my physicist friend said emphatically. Quantum effects, he maintained, are limited to the invisible, subatomic microworld; they do not matter in big objects such as brains and bodies. Quantum information, he insisted, would be quickly degraded in warm, wet brains in a process called decoherence; it would fizzle, get lost, vanish like a snowball in an oven. Besides, he added, distant, nonlocal connections cannot be used to send messages. Therefore, quantum phenomena in brains cannot conceivably underlie the connectedness of distant humans seen in remote viewing experiments.

"But there are respected physicists who see things a bit differently," I offered hesitantly. As a nonphysicist, I was trying to mind my manners. I cautiously mentioned physicist Nick Herbert, who said, in discussing distant, nonlocal connections in his 1987 book *Quantum Reality*, "Bell's theorem . . . takes non-locality out of the inaccessible microworld and situates it squarely in the familiar world of cats and bathtubs."[6] If cats and bathtubs, why not humans?

"Wishful thinking," my physicist friend said with unmistakable irritation. "Can't happen. Doesn't happen." Our conversation was over, and we moved on to less touchy talk.

LIVING IN A QUANTUM WORLD

My friend's view mirrored the message in standard physics textbooks. The mid-sized world of bricks, brains, and beasts, and the colossal world of planets, stars, and galaxies, the texts say, are the domains of classical physics and are described by Newton's laws and Einstein's theories of relativity. But as we descend in scale to subatomic particles and atoms, we cross an invisible boundary where classical physics no longer applies, and the strangeness of quantum behavior takes charge. The framework provided by quantum mechanics governs this microscopic, invisible level.

How things change! The June 2011 cover of the journal *Scientific American* displays a human head made of tiny particles and the caption "Living in a quantum world: small-scale physics has a 'spooky' power over the world at large." In his lead article, Oxford physicist Vlatko Vedral explains what this fuss is all about:

> Quantum mechanics is not just about teeny particles. It applies to things of all sizes: birds, plants, maybe even people . . . . Quantum mechanics is commonly said to be a theory of microscopic things: molecules, atoms, subatomic particles . . . . This convenient partitioning of the world is a myth . . . . It is but a useful approximation of a world that is quantum at all scales . . . . Over the past several years experimentalists have seen quantum effects in a growing number of macroscopic systems. The quintessential quantum effect, entangle-

> ment, can occur in large systems as well as warm ones–including living organisms–even though molecular jiggling might be expected to disrupt entanglement . . . . Until the past decade, experimentalists had not confirmed that quantum behavior persists on a macroscopic scale. Today, however, they routinely do. These effects are more pervasive than anyone ever suspected. They may operate in the cells of our body . . . . We can't simply write [quantum effects] off as mere details that matter only on the very smallest scales . . . . The entanglements are primary.[7]

There are apparently no limits to the extent of entanglement. As physicist N. David Mermin has shown, quantum entanglement grows exponentially with the number of particles involved in the original quantum state, and that there is no theoretical limit on the number of these entangled particles.[8] "If this is the case," say physicist Menas Kafatos and science historian Robert Nadeau in their book *The Conscious Universe: Parts and Wholes in Physical Reality*, "the universe on a very basic level could be a vast web of particles that remain in contact with one another over any distance in no time in the absence of the transfer of energy or information."[9]

When I saw this issue of *Scientific American* endorsing the macroscopic status of quantum effects, I had the urge to mail a copy to my physicist friend. But if he and I are entangled, as the article implies, I figured he might already be picking up on what I'm thinking. Save the postage.

ENTANGLEMENT AND NONLOCALITY

"Entanglement" and "nonlocality" are often used interchangeably, but they are not identical.

An object is said to be entangled if it cannot be fully described without considering one or more additional objects. It is as if the separate, distant entities comprise a single system. Entanglement has been experimentally verified many times over the past three decades and is accepted by the majority of physicists as a fundamental feature of nature.[4]

Nonlocality is widely considered to be a mechanism for the effects of entanglement. As Kafatos and Nadeau describe, "When particles originate under certain conditions, a measurement of one particle will correlate with the state of another particle even if the distance between the particles is millions of light-years. And . . . even though no signal can travel faster than light, the correlations will occur instantaneously, or in 'no time.'"[10] These instantaneous connections are said to be nonlocal, and particles displaying nonlocally correlated behavior are said to be entangled.

Three types of nonlocality have been described: spatial or type I nonlocality; temporal or type II nonlocality; and type III nonlocality, a combination of type I and type II, which takes in the unified whole of space and time.[11]

According to physicist Nick Herbert, "A non-local connection links up one location with another without crossing space, without decay, and without delay." These connections have three identifying characteristics, says Herbert. They are *unmediated* (no connecting signal is involved), *unmitigated* (the strength of the correlations do not fade with increasing distance), and *immediate* (they are instantaneous).[12]

In order for distant particles to demonstrate nonlocal connections, they must have once been in contact. According to the big bang theory, all the matter in the universe was originally in contact, concentrated in a "very hot dot" of matter-energy that exploded around 14 billion years ago, resulting in the universe we see.[13] So, if the big bang theory is valid, a requirement for nonlocal connections–original contact–was met early on.

A NEW WORLD

We are witnessing one of the most important transitions in the history of human thought: entanglement and nonlocality, once thought limited to the invisible, microscopic world, are now demonstrated to be a feature of the biology of living creatures, apparently including ourselves.[14,15] This realization will profoundly affect our concept of our place in the universe and what it means to be human.

There seems to be no going back to a divided world. "[F]ew physicists now think that classical physics will ever really make a comeback at any scale," Vedral says.[7] That does not mean classical physics is finished, headed for the junk heap of obsolete ideas. It remains an excellent approximation of how things work in the see-touch-feel world of visible, large-scale objects. Any scientific model that can put satellites into space and men on the moon can hardly be considered irrelevant.

The incursion of entanglement and nonlocality into the biological domain is not a fringe movement. Neither is it based on a mere handful of studies. A Google search for "biological nonlocality" yields over a million hits; a search for "biological entanglement" identifies nearly a million sites. The basic ideas have been around for some time. Nobel physicist Brian D. Josephson and physicist Fotini Pallikari-Viras saw where this field was headed two decades ago in their seminal paper "Biological Utilisation of Quantum Nonlocality," published in *Foundations of Physics* in 1991.[16] For a lay-oriented update on the robust research on entanglement in biological systems, see science journalist Mark Anderson's intriguing article "Is Quantum Mechanics Controlling Your Thoughts?" in *Discover,* where Anderson asserts, "Science's weirdest realm may be responsible for photosynthesis, our sense of smell, and even consciousness."[17]

Just how profoundly and in what ways we will be affected by these discoveries, no one knows for sure. It is early days, and physicists are still recovering from their astonishment. "The implications of macroscopic objects such as us being in quantum limbo is mind-blowing enough that we physicists are still in an entangled state of confusion and wonderment," Vedral acknowledges. "Even those of us who make a career of studying these effects have yet to assimilate what they are telling us about the workings of nature."[7]

Could these "mind-blowing" discoveries tell us something about distant communication between humans, which my physicist friend and I discussed? Dean Radin, coeditor-in-chief of *Explore,* thinks so. Radin has thoughtfully examined the implications of entanglement in his superb book *Entangled Minds: Extrasensory Experiences in a Quantum Reality*. He says:

> Some may regard all the excitement about entanglement a fad, or as mere hyperbole designed to annoy physicists and beguile new agers. But it goes deeper than that. Experiments have demonstrated that the worldview implied by classical physics is wrong. Not just slightly incorrect in minor ways, but fundamentally

wrong in just the right way to support the reality of psi.[18]

Some physicists sense the momentous nature of nonlocality and entanglement. Among them are University of California-Berkeley theoretical physicist Henry P. Stapp, who says that nonlocality could be the "most profound discovery in all of science."[19] Columbia University physicist Brian Greene echoes the sentiment, saying, " There can be strange, weird, and 'spooky' quantum connections between things over here and things over there[20] . . . This is an earth-shattering result. This is the kind of result that should take your breath away."[21] And as Kafatos and Nadeau assert in their book *The Non-Local Universe*, the implications are "quite staggering." They see "a new view of the relationship between mind and world" coming into view, in which "mind, or human consciousness . . . is seamlessly interconnected [with the] whole called the cosmos."[22]

Consciousness loose in the world? The idea evokes snickers from materialists who are convinced the brain somehow makes consciousness, like the liver makes bile, and that consciousness is confined to the brain and body. Other scientists disagree. Among them is anesthesiologist Stuart Hameroff, who started the Center for Consciousness Studies at the University of Arizona in 1998. The center sponsors biannual conferences titled "Toward a Science of Consciousness." For years Hameroff has collaborated with Oxford mathematical physicist Roger Penrose in rethinking the origin and nature of consciousness. In summing up his view, Hameroff states, "Most people think that consciousness emerged over eons as a by-product of random mutations and the inherent complexity of natural selection, but I look at it the other way around. I think a fundamental field of protoconscious experience has been embedded all along–since the big bang . . . and that biology evolved and adapted in order to access it and to maximize the qualities and potentials implicit in it."[23] Penrose is also dubious of the conventional brain-makes-consciousness view, saying, "My position [on consciousness] demands a major revolution in physics . . . . I've come to believe that there is something very fundamental missing from current science . . . Our understanding at this time is not adequate and we're going to have to move to new regions of science . . ."[24]

But what is consciousness? Although fully adequate definitions do not exist, I follow the definition offered by Robert G. Jahn and Brenda J. Dunne, who for three decades researched the nonlocal manifestations of consciousness at PEAR, the Princeton Engineering Anomalies Research lab: "[Consciousness is] the capacity to react to, attend to, and be aware of self and other. Consciousness subsumes all categories of experience, including perception, cognition, intuition, instinct, will and emotion, at all levels, including those commonly termed 'conscious,' 'subconscious,' 'superconscious,' or 'unconscious,' 'intention,' and 'attention,' without presumption of specific psychological or physiological mechanisms. Neither consciousness nor its environment exists in isolation; they can be represented only in interaction and exchange of information."[25]

ENTANGLED BEHAVIOR IN ANIMALS

If, as Hameroff and others suggest, consciousness has been embedded in the world from the beginning, and biological systems evolved to adapt and take advantage of it, and if consciousness is nonlocal, entangling the creatures who possess it, how would it manifest? What would it look like? Where would we look for evidence?

We would naturally look at the behaviors and experiences of humans, of course. Abundant evidence strongly suggests that human consciousness is nonlocal, unconfined to specific points in space, such as brains and bodies, or in time, such as the present. This evidence affirms, compellingly in my view, the validity of what psychologist and psi research Charles Tart calls the Big Five: telepathy, clairvoyance, psychokinesis, precognition, and remote healing.[26] I've reviewed this evidence often in this column.[27-29] Those wanting a comprehensive review of this field may also consult Dean Radin's groundbreaking books *The Conscious Universe*[30] and *Entangled Minds*,[18] as mentioned, the authoritative book *Consciousness and the Source of Reality* by Princeton researchers Robert G. Jahn and Brenda J. Dunne.[2] or the landmark book Irreducible Mind by University of Virginia psychologist Edward F. Kelly and colleagues.[31]

But what about nonhumans? Could other creatures possess a form of proto- or precursor consciousness that is not as highly evolved as in humans, but which might qualify as rudimentary consciousness nonetheless? If so, might it behave nonlocally, and might it entangle the creatures who possess it? I suggest the answer is yes, and that the evidence may be all around us in the natural world. Let's consider a tantalizing example, the magnificent American bison or buffalo. In the following, I'll provide examples of their behavior that suggest that individual animals are perhaps entangled and united as a larger organism.

Every spring and fall they were on the move, vast herds of them stretching as far as the eye could see. No one really knew how many there were, for they were countless and uncountable. Estimates ranged from fifty to one hundred fifty million. Their running created a faint vibration and a deep rumble in the earth that announced their coming to any living thing in their path. They would stop to rest and feed periodically and bed down at night. Then they were up at dawn to renew their journey toward the horizon and to destinations that had beckoned them for millennia. On cold mornings their breath formed a giant frosty cloud that hung like a halo over the mammoth herd, a sign sought by every hunter.

The animals moved as a single being and with a unified will that caused many to die, because there could be no careful testing of danger or weighing of risk by single individuals when the group mind took charge. When they approached a river, the leading animals would venture hesitantly into the water, probing for deep unseen holes and quicksand. But the herd behind them kept coming, pushing, and shoving the leaders into drowning places and quicksand bogs. Thousands might be killed as a result, a sacrifice to the unbending single-mindedness of the colossal herd. Native Americans were bison mind readers. They understood the instincts that molded the masses into a single organism, and they used this knowledge to drive the bison off precipices such as Wyoming's Chugwater bluffs and Montana's Palisades cliffs.[32]

Encounters with their sheer numbers and unified behavior left men speechless. In May 1871, Colonel R. I. Dodge drove a

wagon from Fort Zarah to Fort Larned on the Arkansas River in southwestern Kansas. He bumped into one of the greatest gathering of large animals on earth–the great southern bison herd, migrating north from the Texas panhandle for the summer grass. Of the 34 miles between the forts, 25 were through "an immense dark blanket of buffaloes," writes author Mari Sandoz in her classic book *The Buffalo Hunters*. From atop Pawnee Rock, Dodge could see up to 10 miles in most directions a solid, moving mass of animals. Others who saw this herd said it was 25 miles wide, probably 50 miles deep, and took five days to pass a given point. Estimates were from four to 12 million animals in this particular herd alone.[33]

The herd was moving leisurely on this occasion. Two months earlier, however, Colonel Dodge's buffalo encounter had been different and it almost cost him his life. In cold blustery weather, Dodge's party made camp in the bend of a creek, crowding the tents and wagons close together. When the campfires died out and everyone except the sentinel was asleep, Dodge heard a faint but deep roaring sound. He soon realized its source–a gigantic buffalo herd bearing down fast on the camp. He knew the herd must be split or the camp would be overrun and they would all be trampled into the earth. He summoned the sentinel and three more men, and they stationed themselves between the charging bison and the camp. When the animals were about 30 yards out, they starting firing their rifles as fast as possible and yelling. One animal fell dead, but the others kept coming. The men could feel the earth trembling beneath their feet. More animals fell to their gunfire. When it appeared there was no hope, the stampeding mass parted slightly, then more, then swerved to avoid the men. They passed within 30 feet of one flank of the camp and 75 feet from the other. The sleeping men awoke to the thunder of the stampeding animals and the gunfire and were paralyzed with fear, certain they were doomed.

Native Americans considered massed buffalo on the run as one of the true perils of the plains. They always had scouts far out from their villages, whether camped or moving. These individuals could ascertain the distance and direction of a stampeding herd by listening intently with an ear to the ground.

As the railroads went west, railroad men learned the danger of the bison's single-minded herd behavior the hard way. Rampaging herds would charge anything in their way, including locomotives and cars. The leading animals would plunge head-on into them, pushed from behind, and although many would be killed the train would suffer as well. After trains were derailed twice in one week by charging bison, the trainmen learned to stop at a safe distance and let the animals pass.[34]

The herd behavior of bison is not an isolated pattern. Highly coordinated movements occur also in the famous wildebeest migrations in Africa, in the caribou herds of Alaska and the Canadian Yukon, and in other animals as well. Nor are these patterns limited to large mammals.

Early White settlers in America reported highly organized group behavior in passenger pigeons. Before the immense flocks were exterminated from wanton slaughter during the 1800s, it was said that their passage would block the sun for days at a time. Like the bison, they were so numerous that no one could imagine they *could* be exterminated.

One of the birds most adept at group behavior is the starling, whose acrobatic movements in huge flocks are a kind of aerial ballet. In England during the winter months, thousands of starlings return in the evening from foraging to Ot Moor, a 400-acre grassy wetland in southeast England. Small flocks merge into larger flocks, at which point they begin to wheel and gyre in arrays that are among the most elegant in nature. For a visual treat, see the spectacular video "Starlings at Ot Moor" by video journalist Dylan Winter, at http://www.youtube.com/watch?v=XH-groCeKbE.[35]

Enormous schools of fish such as herring and sardines demonstrate similar group behavior, wheeling in breathtaking unison. An awe-inspiring example is available at http://www.youtube.com/watch?v=cIgHEhziUxU&feature=related.[36]

When creatures demonstrate group behavior, are they acting unthinkingly and blindly, or is something else involved? Might we be glimpsing mass entanglement of thousands or millions of creatures acting as a single unit as a consequence of nonlocally distributed protoconsciousness?

Proto- or precursor consciousness seems especially plausible in instances in which animal behavior resembles that of humans. When an elephant dies, for example, the herd often gathers around the dead animal and may linger for days, as if they are experiencing genuine grief and mourning. They have been known to bury the dead animal before moving on, and may revisit the death site at later dates and fondle the bones. Chimpanzees in a zoo have been observed to stand silently in a circle and cry as a deceased friend was carried past them.[37] Behaviors have also been observed in dogs, horses, and gorillas that impress ethologists as authentic mourning, described by David Alderton in his book *Animal Grief: How Animals Mourn for Each Other*.[38]

In one report of a "magpie funeral," a flock of around 40 of the birds gathered around a magpie that had been killed on a road. When the auto that had killed the bird returned, the magpies swarmed it and almost forced it off the road.[39]

In a similar instance, a man shot a crow that had been stealing eggs. Within hours his house was under siege by around 30 crows that circled it for days. The man gave up hunting permanently.[40]

Scientific tradition says we should not attribute human-like emotions to animals. This hideous transgression is called anthropomorphism. As ethologist Frans de Wall points out, it was the ancient Greeks who gave this practice a bad reputation. The above examples, and hundreds like them, suggest that the ban has been overdone, resulting in what de Waal calls anthropodenial.[41] Anthropodenial is the stubborn refusal to admit the obvious: that humans are not the sole repository of consciousness.

SWARM THEORY

Currently ethologists are not into entanglement, nonlocality, or protoconsciousness as explanations of these behaviors. When animals, birds, and fish manage to act in concerted, coordinated ways, the concept of "swarm intelligence" or "swarm theory" is generally invoked as an explanation. Swarm theory was introduced in the 1980s by researchers in artificial intelligence and robotics. According to this view, the individuals in a group interact locally with one another and with their environment via ordinary sensory

means. Although there is no centralized controlling influence dictating how the individuals should behave, the local and often random interactions between the individuals somehow lead to the emergence of intelligent group behavior. In other words, the individual is not particularly clever, but the group is. Swarm theory has been applied to naturally occurring phenomena such as animal herding, bird flocking, fish schooling, ant and termite colonies, beehives, and bacterial growth.[42] Swarm theory has practical applications. It has been used to determine how best to ticket and board passengers onto commercial aircraft, assign aircraft arrivals to airport gates, and route trucks in the most efficient way possible. Scientists have developed software for groups or "swarms" of robots, using simple rules that mimic the behavior of insect swarms. The goal is to use robots to intelligently perform dangerous minesweeping and search-and-rescue operations that would place human first responders at risk. Some day, scientists predict, robotic swarms might explore the surface of Mars.[43]

When animals, birds, fish, or insects swarm, how do they do it? If none of the herring in the school grasps the big picture, how do they change direction in a flash, like a single entity? One key, say swarm theorists, is that no one is in charge. There is no "general" giving orders, which would take time to disseminate information throughout the herd, flock, school, or hive. Instead of orders from the top, complex, unified behavior originates with the individual.

In 1986, Craig Reynolds,[44] a computer graphics researcher, created a simple program he called "boids" in order to explore what these rules might be in flocking behavior. In his simulation, generic bird-like objects, the boids, were each given three instructions: (1) don't crowd nearby boids, (2) fly in the average direction of nearby boids, and (3) stay close to nearby boids. When he set the program in motion on a computer screen, there was a striking simulation of the unpredictable and lifelike movements seen in flocking.

But why do creatures follow these rules, and why do they form immense herds, flocks, or schools in the first place? A standard answer from biology is that there is a survival advantage in doing so. A big group of animals, birds, or fish has more eyes with which to spot predators. When attacked, they can confuse a predator by coordinated mass movements. A mass of individuals has an advantage in locating a mate, finding food, or following a migration route. As a group member, each individual is more likely to stay alive and reproduce than if isolated and alone.

If it were all so simple. Swarm intelligence "seem[s] miraculous even to the biologists who know them best," says National Geographic writer Peter Miller.[45] Some biologists who live in the wild for long periods and observe creatures up close have a gnawing suspicion that the neat formulations of swarm theory leave something out.

For five months in 2003, wildlife biologists Karsten Heuer and his wife Leanne Allison trailed the Porcupine caribou herd of 123,000 animals for more than a thousand miles in their migration from their winter range in Canada's northern Yukon Territory to calving grounds in Alaska's National Wildlife Refuge.[46] "It's difficult to describe in words, but when the herd was on the move it looked very much like a cloud shadow passing over the landscape, or a mass of dominoes toppling over at the same time and changing directions," Heuer said. One domino hitting the next in line, a succession of falling dominos one after the other. Classical cause and effect? Not exactly. Heuer elaborates, "It was as though every animal knew what its neighbor was going to do, and the neighbor beside that and beside that. There was no anticipation or reaction. No cause and effect. It just was."[47]

No cause and effect? This sort of talk makes paid-up biologists crazy. There is no room in modern biology for "it just was" that bypasses cause and effect. The closest biologists come to "just is" is the concept of instincts, the inherent inclinations of a living organism toward a particular behavior. These fixed action patterns are not based on learning but are inherited, say biologists, by the passage of DNA from parent to offspring. DNA is the cause, instinctual behavior is the effect. Yet other kinds of knowing keep cropping up in animals that suggest entanglement and the nonlocal acquisition of information.

ANIMAL-HUMAN ENTANGLEMENT?

During the 1920s, a two-year-old dog named Bobbie, mostly collie with a bit of English sheep dog, became a national sensation. His owners, Mr. and Mrs. Frank Brazier, restaurant owners in Silverton, Oregon, were vacationing in Indiana when Bobbie got lost. Despite intense efforts to locate the dog, the Braziers finally despaired of finding him. Brokenhearted, they resumed their trip westward, never expecting to see him again. Six months later Bobbie showed up, emaciated, at the family restaurant in Oregon. He ran up stairs to the second-floor living quarters and jumped on the bed, awakening Frank Brazier by licking his face.

No one could believe it. But when the Silverton *Appeal* published the story, it quickly spread to newspapers across the country, and hundreds of people sent letters to the Braziers claiming they had seen Bobbie and were able to confirm his identity by several distinguishing marks. Still dubious, the Oregon Humane Society launched an investigation into the Braziers' claims. By interviewing people who claimed to have seen him, they reconstructed the route home, which they estimated was around 2800 miles, much of which took place in the dead of winter. Bobbie did not follow his owners' route back to Oregon, but traveled an indirect course over land he had never seen nor could have been familiar with. This was no lookalike dog; his owners were able to identify him not only because of his loving behavior, but also by several unique marks and scars.

Celebrity followed. Bobbie received medals, keys to cities, and a jewel-studded harness and collar. Author Charles Alexander wrote a book about him, *Bobbie, A Great Collie,* published in 1926. Bobbie played himself in a silent movie, "The Call of the West," a reel of which is in the archives of the Oregon Historical Society Research Library. When Bobbie died in 1927, he was buried with honors at the Oregon Humane Society. Portland's mayor gave the eulogy. A week later, Rin Tin Tin, the media-famous German Shepherd, laid a wreath at his grave, dog to dog. Each year Bobbie's legend is celebrated in Silverton's annual children's pet parade. This annual event was started several years after Bobbie's death and was led by Pal, Bobbie's son.[48-53]

I have had the opportunity to discuss distant, nonlocal knowing with many audiences over the years, and I often use re-

turning animals as examples. I find that the most frequent explanation that critics offer for Bobbie and similar instances is a highly developed sense of smell. This cropped up in a lecture I gave at the Smithsonian Institution in Washington, DC. I was interrupted by a man in the audience who confidently announced, "Pheromones! The dog sensed pheromones coming from his owners in Oregon. The prevailing winds blow west to east. The dog followed this chemical signal all the way to Oregon." Pheromones are chemicals produced by mammals and insects and are released in minute concentrations into the environment. They play a role in sexual attraction. "Nearly 3000 miles," I said, "and between members of different species? Creatures sense pheromones from their own kind. In any case, these chemicals would get pretty diluted over 3000 miles, don't you think?" Another man in the audience chimed in with another explanation. "Pure chance! The dog found the home in Oregon by dumb luck." "There are a lot of houses to the west of Indiana," I offered. "The odds against finding the right house by chance are pretty high." Both men were supremely confident and were unmoved by my comments. It was a reminder that, for many individuals, any explanation is preferable to one involving some sort of nonlocal communication.

Cynics still suggest that the entire Bobbie episode was a gigantic hoax or an exercise in massive self-delusion. Perhaps. But the evolving evidence for entanglement between biological systems, and for nonlocal operations of consciousness, suggest the possibility of cognitive entanglement between pets and their owners. If the owner possesses specific information–in this case, knowledge of the location of the home in Oregon–it might be available to the pet as well, because of the nonlocal linkages in consciousness bonding two living creatures.

Bobbie's case is not unique. Instances abound that suggest the existence a human-animal bond that operates nonlocally across space and time, a connection that can be difficult to break, even when people try. For example, consider a man who wanted to get rid of his dog and released him in a dense part of the city of Durham, North Carolina, five miles from his residence. When he returned home the dog was waiting for him, frisky and happy to be united with his master. The man's conscience was pricked, and he decided not to abandon his pet after all.[54]

Extreme examples exist. In a Bobbie-like case, Minosch, a German cat, reportedly traveled 1500 miles in 61 days to return home after being separated from its vacationing family.[55]

Thousands of similar cases have been reported. No doubt some can be dismissed as involving look-alike animals, but not all; often the returning animal has its original collar and nametag, and can be further identified by distinguishing marks and scars.

Particularly fascinating are those cases in which the returning animal appears to be responding to the physical and emotional needs of some remote person. An example is that of an Irish soldier in World War I, whose wife and small dog, Prince, took up residence in 1914 in Hammersmith, London, while he was sent with one of the earliest contingents to the battlefields of France. After a period of service he was granted leave to visit his family, but when he returned to battle Prince was utterly disconsolate and refused all food. Then the dog disappeared. For 10 days the wife tried desperately to trace him, to no avail. Finally she decided to break the news in a letter to her husband. She was astonished when she heard from him that the dog had joined him in the trenches at Armentières, under heavy bombardment. Somehow Prince had made his way through the streets of London, 70 miles of English countryside, hitched a ride across the English Channel, traveled over 60 miles of French soil, and then "smelt his master out amongst an army of half a million Englishmen and this despite the fact that the last mile or so of intervening ground was reeking with bursting shells, many of them charged with tear-gas."[56]

One of the most thorough investigators in this field is British biologist Rupert Sheldrake, who has done pioneering work with dogs who know when their owners are returning. Even when the experimenter tries to fake out the dogs by varying the time the owner returns, or varying the means of transportation, the dogs still seem to go on the alert by standing at a door or window minutes before the owner shows up. This occurs even when no one at home knows the time of the owner's return. Sheldrake's work is detailed in his fascinating book *Dogs That Know When Their Owners Are Coming Home*.[57]

LIMBIC SCIENCE

Swarm intelligence and instinctual behaviors make sense until you start examining the niggling little exceptions that do not fit in. But the exceptions are crucial. William James,[58] the father of American psychology, was a champion of misfit observations. As he put it, "When was not the science of the future stirred to its conquering activities by the rebellious little exceptions to the science of the present?" And, "Any one will renovate his science who will steadily look after the irregular phenomena. And when the science is renewed, its formulations often have more of the voice of the exceptions in them than of what were supposed to be the rules."[59] I suggest that when biologists bump up against observations that evoke reactions such as the above comment, "No cause and effect. It just was," they are sensing James's "rebellious little exceptions." They are entering a domain we might call "limbic science"–from *limbus*, the Latin word for "edge." Limbic science is science that is on the edge, on the borderline. It is science that is forward leaning, a probe into future, a search for hypotheses and concepts that are better able to explain nature's mysteries than do our current ideas. It is science that points toward biological nonlocality and entanglement.

BEYOND "QUANTUM"

There has been runaway enthusiasm in lay circles to give everything over to quantum physics, and to enshrine it as a kind of über religion at whose altar everyone should worship. This is unwise, because there are mysteries of consciousness that appear to be completely untouched by quantum physics.

One of them has to do with the communication of individuals at a distance, the topic of my conversation with my physicist friend. According to most physicists in the field of nonlocal quantum effects, nonlocal connections cannot be used to send intelligible messages from one object to another. As physicist Nick Herbert[60] says, these connections, while real, involve "consciousness *without content*." He states, "It is difficult to see what

use we could make of such nonlocal connections. On the other hand, perhaps these connections are not there for us to 'use.'"

But this cannot be the whole story, because hundreds of studies show that humans can and do use these connections to share intelligible information remotely with others, as in telepathy, precognition, and remote viewing.[18,30,61,62] Moreover, emotional closeness is a major factor facilitating nonlocal communication between distant individuals, and emotional factors are completely missing in the equations of physics. Therefore, events involving distant communication between humans await a deeper explanatory model than that which is available in quantum physics, as currently understood.

The traditional response of many scientists has been to deny the existence of intelligible, information-packed, nonlocal exchanges, because they are not permitted in classical physics. A wiser approach is to not sacrifice empirical data in order to protect one's pet theory, but to revise current models or search for better ones that might explain the facts.

Physics may need to take a few lessons from biology. Although physicists maintain that entangled states between distant particles cannot be used to send meaningful information, evidence now suggests that separated individual human neurons in vitro are nonlocally linked.[63] If individual neurons can be nonlocally entangled, could bunches of them–whole brains–be nonlocally entangled as well? Several experiments using functional magnetic resonance imaging (fMRI) and EEG-based protocols suggest this is the case. In these experiments, the stimulation of one individual's brain appears to be registered simultaneously in a distant individual's brain, as demonstrated by fMRI or EEG.[64-66] These experiments suggest that the idea of united, linked minds is more than philosophical speculation.

THE GHASTLY SILENCE

Although some people have achieved a sense of unity with the cosmos based only on a scientific and intellectual worldview–Einstein is perhaps the great example–intellectual formulations are not enough for most individuals, because too much of the juice of life gets omitted. This deficiency in a purely scientific approach has long been noted by some of the greatest individuals in the history of science. Among them was Gottfried Wilhelm Leibniz (1646-1716), the German philosopher and mathematician. Leibniz, who invented the infinitesimal calculus independently of Isaac Newton, was considered one of the greatest minds of the 18th century. He refined the binary number system, which underlies virtually all digital computers, and invented mechanical calculators that were a marvel for their time. His intellectual reach touched all the major domains of learning. Even so, Leibniz could not find within science the satisfaction he was looking for. In a letter two years before his death, he wrote:

> But when I looked for the ultimate reasons for mechanism, and even for the laws of motion, I was greatly surprised to see that they could not be found in mathematics but that I should have to return to metaphysics.[67]

Three centuries later, Nobel physicist Erwin Schrödinger would come to the same conclusion:

> The scientific picture of the real world around me is very deficient. It gives a lot of factual information, puts all our experience in a magnificently consistent order, but it is ghastly silent about all and sundry that is really near to our heart, that really matters to us. It cannot tell us a word about red and blue, bitter and sweet, physical pain and physical delight; it knows nothing of beautiful and ugly, good or bad, God and eternity. Science sometimes pretends to answer questions in these domains, but the answers are very often so silly that we are not inclined to take them seriously.[68]

The great Darwin also encountered the effects of the ghastly silence Schrödinger spoke of. Late in life he lamented, "My mind seems to have become a machine for grinding general laws out of large collections of facts.. . . The loss of [the emotional] tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature.. . . The loss of these tastes is a loss of happiness." His solution: "[I]f I had to live my life again, I would have made a rule to read some poetry and listen to some music at least once every week. . .."[69]

Something more is needed–something that can marshal not only an intellectual appreciation of the wholeness implied in biological entanglement and nonlocality, but also something that can quicken the pulse and stir an ethic toward the earth that can counter the unbridled greed and plunder that threaten us.

Currently there are excellent exemplars of this awakening, including numerous scientists. But many scientists, it must be said, are reluctant to speak out in favor of wholeness, unity, and oneness because they fear being labeled as having "gone mystic." It is as if there are hooded inquisitors lurking within science who are keeping score, and who are continually oiling the rack and heating the pincers, just waiting for a scientist to step out of line.

Fear has never silenced great poets and artists, however. Poets have been yammering away about wholeness for centuries. As author Philip Goldberg points out in his important book *American Veda*,[70] there are superb examples among the Romantic poets, particularly William Blake, Percy Bysshe Shelley, William Wordsworth, and Samuel Taylor Coleridge. These poets sensed the interconnectedness and unity that are a feature of an entangled, nonlocal world. Thus Blake, in "Augeries of Innocence": "To see a world in a grain of sand / And a heaven in a wild flower, / Hold infinity in the palm of your hand / And eternity in an hour."[71] Shelley, in "Adonais": "The One remains, the many change and pass . . ."[72] Wordsworth, in "Tintern Abbey": "A motion and a spirit, that impels / All thinking things, all objects of all thought, / And rolls through all things."[73] And Coleridge, who wrote of "the translucence of the eternal through and in the temporal."[74]

In his book *Opening to the Infinite, Explore* columnist Stephan A. Schwartz describes how the personal experience of a nonlocal event can carry the emotional wallop of an epiphany. Schwartz, who practically invented the science of remote viewing, has taught thousands of individuals in workshops to have these experiences. He concludes that nonlocal experiences, of which remote viewing is only one example, bestow an "ineffable sense of connection" and a "sense of empowerment" that is so

profound it can permanently and radically alter one's worldview and conduct.[75]

The felt experience of being nonlocally connected–all tangled up with all there is–may be a way out of the mess created by self-centered, greed-obsessed individuals who have no sense of wholeness and no concern for the integrity of the world. As Goldberg puts it, when we realize the unitary nature of consciousness,

> . . . one's sense of "I" and "we" opens out from the narrow identification with family, tribe, race, political affiliation, religion, and so on, to encompass a broader swath of humanity. With that comes a corresponding expansion of the moral compass. This not a fanciful imagining of "we are the world" harmony but a living experience of unity with other humans, with nature, and ultimately with the cosmos.[76]

"SOMETHING WENT BADLY WRONG"

The undivided wholeness portended by an entangled, nonlocal world may seem like a chic, modern discovery, but it is an old theme predating the origins of science. For two millennia this perspective was known as the Hermetic worldview, explicated in the ancient *Hermeticum,* a collection of writings ascribed to the legendary sage Hermes Trismegistus.[77] Hermiticism deeply influenced the life and work of the great early scientists–Bacon, Brahe, Kepler, Copernicus, Bruno, Galileo, Newton, Leibniz, Boyle, and many others, as Lynn Picknett and Clive Prince show in their brilliant book *The Forbidden Universe: The Occult Origins of Science and the Search for the Mind of God.*[78] "In the beginning all science was Hermetic science," they say. "But something went badly wrong." Thus, we see Giordano Bruno burned at the stake, Galileo barely avoiding execution for heresy and condemned to lifelong domestic imprisonment, and the other great pioneers going underground and off record with their Hermetic views of how the world works.

The reasons for these developments are too complex to examine in detail, but they occurred chiefly because the Church considered the Hermetic view a threat to its very existence. The Hermetic tradition maintained that humans are godlike, born with an innate connection with the divine, and in no need of clerical intermediaries to facilitate this relationship. The Church stood for the exact opposite, maintaining that all humans are born as weak, miserable, sinful, hell-bound creatures unless salvation, mediated by the Church, intervenes. The Church was horrified by Hermiticism and its potential to turn its institutional power upside down. It feared the Hermetic view of the intrinsic goodness of all humans and their inherent freedom to think for themselves about any subject that stirred their mind and heart, without the approval and guidance of their priest.

Even though the Renaissance was Hermetic to the core, as Picknett and Prince show, the Hermetic principle of natural unity between God and man, and of the unity between man and world and all its creatures, was rejected with all the vehemence the Church could summon. Its wrath fell with full force on many of the early scientists of that period. They were demonized, excommunicated, threatened, and sometimes imprisoned, tortured, and executed. For reasons largely having to do with survival, the early scientists not surprisingly went along, and science was whipped into shape. Although science at first disowned and disinherited the Hermetic views out of expediency, this rejection gradually became an ingrained prejudice. And so it remains. To this day, the enforcers of the ban are all too common–the irritating, voluble, militant atheist-scientists, the meaning-haters, and the psi and consciousness deniers who are blind to the faith-based nature of their scientism. The reputations of the early Hermetic scientists have been scrubbed; the victors always rewrite the histories. The Hermetic force–it was never just a thread–in early science is now concealed. When it does crop up–Newton's profound interest in alchemy is an example still on the books–it is often ridiculed, as in the recurring suggestion that poor Newton's brain was temporarily deranged by sniffing too much mercury vapor in his alchemical experiments.

Thus, the remnants of Hermetic belief were eventually hounded into the private domain, resulting in clandestine, veiled communications between adherents, and the formation of secret societies that have cropped up periodically ever since, as Dan Brown's novels remind us.

Meaning, direction, and purpose in the universe, and the divine worthiness of the world's creatures, are now considered silly superstitions by buttoned-up scientists. We are living with the results. As Picknett and Prince write, "When it junked the Hermetic philosophy, science began to preach that we owe our existence to a long series of accidents and that ultimately our lives have no meaning. The sense of unlimited horizons and the joy of being alive were eroded. When the scientific wisdom was plucked from Hermeticism to fuel the engines of progress for today's world and the underlying transcendentalism rejected, the whole tradition lost its soul–specifically the feminine aspect of its soul . . . And in the ironic replay of the excision of the sacred feminine from Christianity, here science lost not only its soul but also its heart."[79]

It could have turned out differently. Again, Picknett and Prince:

> If science had been uninterruptedly Hermetic, would the environment be in the same terrifying condition we find it in today? Almost certainly not. Without oversentimentalizing, the Earth itself would have been cherished as a living being. There would be no question of having to fight for human rights or the right of animals to be treated gently and with respect. If every human and every beast is an integral part of all creation, then they are all part of us in a very real way. Hurting them would be hurting ourselves. The Hermetic system adds a moral centre to science, which is largely lacking. . . [80]

There are stunning similarities between the wholeness and unity implied by the discovery of widespread entanglement and nonlocality, and the Hermetic principle of an unlimited, universal connectedness that unites all humans with the Absolute or Transcendent, however named. Straight-laced scientists deny these similarities, fearing the contamination of modern science by "the occult," one of their favorite epithets. But science desperately *needs* contamination by several factors that are missing from its equations, if we are to survive–a moral center, an earth ethic, a sense of responsibility for all of life–those qualities whose absence has led to an abyss that is becoming impossible to ignore. A one-sided science is not only incomplete,

it can be deadly. As Dr. Samuel Johnson put it nearly three centuries ago, "Integrity without knowledge is weak and useless, and knowledge without integrity is dangerous and dreadful."[81]

Dr. Johnson also observed, "When a man knows he is to be hanged in a fortnight, it concentrates his mind wonderfully."[81] Perhaps our sense of impending global disasters–I won't enumerate them–is concentrating our collective mind as a species, resulting in the return of ancient wisdom in the form of modern scientific insights, of which biological entanglement and nonlocality are an urgent example.

What we commonly call empathy, compassion, and love may be human entanglement banging on the doors of consciousness to gain entry. Albert Schweitzer, the legendary physician, missionary, priest, philanthropist, theologian, pacifist, musicologist, and winner of the 1952 Nobel Peace Prize, is an example of someone who opened those doors, and in so doing made the world a better place. In a kind of manifesto of wholeness, he wrote:

> What we call love is in its essence Reverence for Life[82] . . . Profound love demands a deep conception and out of this develops reverence for the mystery of life. It brings us close to all beings. To the poorest and smallest, as well as all others . . . [T]he idea of Reverence for Life gives us something more profound and mightier than the idea of humanism. It includes all living beings.[83]

At this stage of humankind's existence, the best we can wish for one another is not that we achieve success, clarity of purpose, or even happiness in life, but that we each realize that we are all tangled up with each other and everything, and that we find the courage to allow this realization to make a difference in how we live our life.

–Larry Dossey, MD
Executive Director

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