

# Alice and Bob at Play in the Zero Field

by Terry White

I was born in 1950. Hydrogen bombs would be tested from Pacific atolls to the Nevada desert by the time I reached my first elementary schoolroom, and old Father Hennessy would loom from the pulpit with thundering sermons about enslavement to Communism. (He liked to smack fist into his palm as he ended his oration on the evils of "the hammer and the sickle").

One morning, Fr. Hennessy came to our playground at recess where we were flipping baseball cards, horsing around, playing Rover, Red Rover. He had a head full of shiny silver hair, a kind drunkard's face (I once moved the wine cruet away too soon and he gripped my wrist hard and held it there until the wine emptied). The nuns despised him, but he paid them no mind. We ran to him. He extended his arms like the big statue of Christ the Redeemer above Rio de Janeiro. Probably intoxicated, he said we could all go home. We took off—all but the bus kids—at the word and raced homeward in all directions scattering like minnows.

My father, like my uncles and grandfather, worked for Great Lakes Towing Company. I myself sailed the Great Lakes and made very good money for a teenager. I didn't mind being on the water for weeks on end while moving up or down the lakes, because I liked to read. Religion and English were the two subjects favored by the sisters of the Holy Humility of Mary—or the blue nuns, as they were called.

When I was five, my mother took me down to George O'Leary's shoe store in the harbor to buy me a pair of new shoes. My family and all my cousins used to buy their shoes from him. He was a neat, tidy man who wore white shirts and a Navy blue suit. He was clean-shaven and completely bald, no Caesar fringe, so that top of his head gleamed under lights. His voice was soft, not like my father's, and had a musical, lilting quality.

My father worked belowdecks on the big diesels that propelled this 90-ton workhorse. As a boy occasionally allowed to tag along for the day, I watched the men prepare to make a tow while the captain stayed in the pilothouse. My father coiled thick tow ropes, as big around as pythons, in loops back and forth on the stern. I loved those red-and-green tugboats as they cut through the water. High above me in the bow of the lakeboat, I

would see an arm toss a painter tied to the hawser down to a tugman on the afterend. The steamship's cargo hold was like a great monster with its belly stuffed with billions of taconite pellets, as many as stars, mined from the ore fields of Minnesota.

There were three tugs tied to iron bits cemented into the dock. The men called them niggerheads. The Idaho and the America were my favorites. After a tow, the men would go to a bar and drink. I drank ginger ale or orange soda and played Skee-ball. The men had huge bellies from consuming so much beer.

Twenty-five years before I was born, sitting in his study in Göttingen reading the liberal Berliner Tageblatt, Werner Heisenberg dreamed of meeting Albert Einstein. His work with Niels Bohr at the University of Copenhagen would result in his appointment as the youngest Professor of Theoretical Physics at the University of Leipzig at the age of 26.

At 26, Einstein was living with his older Serbian wife Mileva and their infant son Hans Albert, at 49 Kramgasse, Bern. Their two-room apartment was reached after a long climb up a steep staircase, but it was all he could afford as a clerk in the patent office. In what would be known as his "miraculous year," Einstein would produce five papers for the *Annalen der Physik*. The fourth paper of 1905 would grab the world's attention with its  $E=mc^2$  formula, proving matter and energy were exchangeable concepts. His final paper, modestly entitled "On a Heuristic Point of View Concerning the Production and Transformation of Light," would set a course for modern physics that would change everyday notions of reality, nature, God, and the universe more profoundly than had Newton's *Principia*.

Gone forever was the notion of a gossamer ether through which light traveled and stars twinkled. (For Newton this pervasive condition of absolute rest was nothing other than the eternally enduring Almighty.) Einstein wrote to a friend in May that his light theory was "very revolutionary," but he did not wholly trust it, and he would never accept its probabilistic view of reality despite the fact that Heisenberg and Erwin Schrödinger in the 1920s were already establishing the validity for quantum theory with mathematical matrices.

Einstein philosophically desired a universe of causality, one comprised entirely of granular atoms or one existing in discrete, continuous bundles of energy (his quanta), these flowing, indivisible packets of energy, never at rest. "God does not play dice," Einstein would famously say—to which Heisenberg's Danish mentor Niels Bohr would respond—although no one is certain of the verbatim response: "Einstein, stop telling God what to

do with His dice."

I sailed the Great Lakes for a couple years as an ordinary seaman, then I hitchhiked home from the Bethlehem Steel plant in Gary, Indiana where my boat, the Lehigh, was tied up. My girlfriend and I eloped to Monroe, Michigan. We bought wedding rings at a jewelry store near the statue of General Custer. Back home, I asked our parish priest to marry us at Mother of Sorrows, where I had gone through the eighth grade and served hundreds of masses. Father Kelly had a brogue and an unwavering sternness and refused. I had stopped believing in God by then. My wife's face wet with tears as we left the parish house.

Three years before his prestigious appointment, Heisenberg hoped to meet the great man at a lecture to be given in Leipzig. Widespread anti-Semitic agitation at the time might have prevented this. Heisenberg was handed a leaflet on his way up the steps to the lecture by a student of the most prominent German physicist of the day; in it, Einstein's theories were deplored as Jewish propaganda. They would meet three years later in autumn at the Solvay Congress in Brussels. By then, Heisenberg had perfected his uncertainty principle based on Schrödinger's breakthrough experiments on wave mechanics. The meeting was cordial but Einstein refused to concede to the theory of uncertain relations, arguing that unobservable quantities were essential to all theories. Future mathematicians, he hoped, would prove this so.

In 1935 Einstein and two colleagues published a paper on the strange nature of quantum superposition. A quantum superposition is the combination of all the possible states of a system. If, for instance, a laser-bombarded isotope of beryllium has a top-spin, diagonal spin, or a down-spin, its mate will arrive at its detector with a corresponding opposite spin. Researchers have sent these

subatomic pairs down fiber-optic lines and discovered the same result every time. The isotopes (physicists facetiously call them "Bob" and "Alice") in these experiments) cannot communicate with each other en route to their detectors—unless it is at many times faster than the speed of light, the universe's automatic braking system, according to Einstein.

This brings me to Schrödinger's cat in the box. Schrödinger's what-if experiment works thusly: place a cat in a sealed box with a flask of hydrocyanic acid and a radioactive source in a Geiger counter. Isolate the box from any decoherence. If a single decayed atom is released, it causes the counter tube to discharge, releasing a hammer to break the glass tube of poison, which kills the cat. The cat's life is dependent on a single subatomic particle. After a short elapse of time, the cat, he argued, must be seen to remain both dead and alive to the universe outside the box. It's a classic *reductio ad absurdum* argument, but he never intended to prove that a cat could be dead and alive at the same time.

Schrödinger called it *Verschränkung*—"entanglement." Einstein called it "spooky action at a distance." When he and Schrödinger exchanged letters in 1950, Einstein was fulsome in praise of this so-called "Copenhagen interpretation." A system stops being a superposition at the moment of observation—one must look inside the box to see if the cat is alive or dead.

The problem with the cat paradox, as contemporary cosmologists have noted, is that the cat and the observer are necessarily "entangled" at the moment of observation.

When opening the box, the observer becomes entangled with the cat so states of observation corresponding to the cat's being alive or—as Schrödinger himself inelegantly expressed it, "mixed or



smear out in equal parts"—is not possible. At the moment of observation, the already split-cat has further separated into an observer looking into a box at a dead cat or an observer looking at a live cat. No single-state perception is possible until both observer and cat are joined in a common system state where the information known is held by both the cat inside the box and the observer looking down into it. Different branches of the universe, in other words. Both real, both possible. Einstein insisted nothing could travel faster than light, but quantum computers will make today's computers (i.e., Turing machines) with their ones and zeroes seem like quaint Amish buggies shambling up to the starting gate at the Grand Prix.

At 26 I taught for a small college in Salem, West Virginia that underwent a transformation from Baptist affiliation to a private, Japanese-owned university. I remember a couple of cousins named Fontana who played football. One of the cousins was illiterate and copied what I wrote on the board in his tiny, sloping penmanship.

On the day I went with my mother to George O'Leary's shoe store, however, something was wrong. Shoes boxes lay strewn all over the store as if someone were piling them up for bonfires. New shoes were scattered about, still folded in tissue. He was dressed in his dark blue suit and his mel-low voice was the same, but I sensed my mother growing nervous as Mister O'Leary brought one pair after the other for me to try on. He set each pair next to my feet as gently as if they were swaddled newborns. I don't recall how long we were inside but my mother hustled me out of there with a nervous explanation that I knew was a lie.

Did I read about his funeral or did someone tell me of it? I have no clear memory. I was too young to know what Alzheimer's was, and I would not learn of Newton's melancholy second law until high school.

In the zero-point field where all energy disappears, a single cubic centimeter of this emptiness (a "morphogenetic field" or "the thin stuff from which everything is made") has a density of ten thousand billion to the power of four more energy than all the matter in the known universe. We cannot measure it. Like Bob and Alice, "it" knows everything that happens in the universe, instantaneously and with absolute accuracy. It is where all action at a distance occurs in perfect synchronicity at ten-thousand times the speed of light. Jung called it the collective unconscious. It is a field of information or, if you prefer, a field of pure consciousness. Some say it is God.

We move inexorably toward something, if not chaos. The light that reached me is always eight minutes old. In the "diabolical mechanism" of

my brain is a box of memories where lonely misfits gather—but no cats, alive or dead. A man stands in an empty store, a boy watches his father coil a rope, and a gentle whiskey priest stretches his arms toward children at play.