Zero-Point Energy and Harold Puthoff

I always get the creeps when people talk about virtual particles.

—Victor Weisskopf, as quoted by K. C. Cole in *Science as Metaphor*

One longs for a new Einstein who will, in a flash of insight, give us back our lovely nothingness.

—Leon Lederman, in *The God Particle* (1993)

In the December 1997 issue of *Scientific American*, staff writer Philip Yam's article "Exploiting Zero-Point Energy" is devoted to a ten-year struggle by physicist Harold E. Puthoff to build a device that could tap the fluctuating energy of supposedly empty space-time. An episode called "Beyond Science" of PBS's *Scientific American Frontiers*, which aired on television the previous month, also had a segment devoted to Puthoff's ambitious research program.

What *Scientific American* failed to reveal, both in Yam's excellent piece and on its TV show, was that Puthoff is none other than the Harold Puthoff who twenty years ago validated the psychic powers of Uri Geller. In 1976 Puthoff and his friend Russell Targ were on the staff of what was then called the Stanford Research Institute (SRI), now SRI International. Their book *Mind-Reach* (1976) tried to convince the world that ESP, PK (psychokinesis), and precognition now have, thanks to their valiant efforts, become firmly established phenomena. Margaret Mead wrote the book's enthusiastic introduction.

Most of the work of Puthoff and Targ at SRI was devoted to what they called "remote viewing"—the ability of psychics to "see" scenery at any distance away—perhaps even to remote view the surfaces of other planets. Chapter 7 described experiments which they said proved that Israeli magician Uri Geller had strong psychic powers. In later papers Puthoff and Targ claimed astonishing success with an ESP teaching machine. They also claimed to have validated Geller's ability to guess correctly how a die had fallen when shaken inside a closed box.

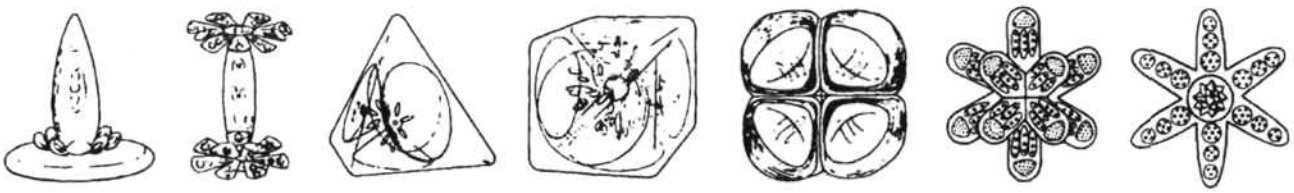
The original manuscript of *Mind-Reach* contained several pages outlining what the authors insisted was a sure-fire technique of using precognition to win large sums of money at roulette tables. Although Mead believed strongly in paranormal powers, she objected so vigorously to including this betting method in the book that it was removed from the published edition, though not from proofs sent to reviewers.

Prior to his work at SRI, Puthoff was an active Scientologist. He had been declared what the group calls a "clear"—a person free of "engrams." Engrams are alleged to be records on an embryo's brain, long before it grows ears, of what its pregnant mother is speaking or hearing. These records are said to cause neuroses and psychoses in one's adult life. When Puthoff married, a Scientology minister performed the ceremony. The Church of Scientology proudly published a 1970 notarized letter written by Puthoff when he was a Stanford University physicist specializing in laser research, a topic on which he had coauthored a textbook. Five years earlier he had earned his doctorate in electrical engineering at Stanford.

"Although critics viewing the system [Scientology] from the outside," Puthoff wrote in his letter, "may form the impression that Scientology is just another of many quasi-educational quasi-religious 'schemes,' it is in fact a highly sophistical and highly technological system more characteristic of the best of modern corporate planning and applied technology."

The letter goes on to praise Scientology's E-meter, a simple electronic device used by "auditors" to uncover a patient's engrams. "In the technical community here at Stanford, we have projects underway employing the techniques developed in Scien-

Martin Gardner's latest book is The Last Recreations *(Springer-Verlag, Copernicus, 1997), a collection of twenty-three of his* Scientific American *columns from the last seven years before his retirement from the magazine in 1981.*



Some typical examples of atomic structure as "seen" clairvoyantly by two leaders of theosophy and published in their 1910 book *Occult Chemistry*.

tology." Puthoff adds that Scientology is an "uplifting and workable system of concepts which blend the best of Eastern and Western traditions. After seeing these techniques in operation and experiencing them myself, I am certain that they will be incorporated eventually on a large scale in modern society as the readiness and awareness level develops."

L. Ron Hubbard, the science-fiction writer who invented Scientology and became its guru, wrote a book titled *Scientology: A Religion.* Puthoff provided its preface. In it he blasts the FDA for calling the E-meter useless. He likens attacks on Scientology to attacks made on Harvey, Galileo, Semmelweiss and Copernicus. "Nevertheless," he concludes, "it is incumbent upon the pioneers of new developments to press forward their discoveries in the face of all opposition."

After leaving SRI in 1987, Puthoff was hired by a think tank in Austin, Texas, called The Institute for Advanced Studies. (It has no connection with the institute of a similar name in Princeton, New Jersey.) On May 28, 1987, at an Austin conference, Puthoff gave a speech on "One Hundred Years of Remote Viewing." He praised the value of precognition in making stock market predictions, and the ability of remote viewers to detect astronomical features of planets before those features are seen by telescopes or space probes. This was followed by a statement of which I hope Puthoff is now thoroughly ashamed. He referred to a 38-year effort by two followers of Madame H. P. Blavatsky, founder of theosophy, to remote view the inner structures of atoms!

Annie Besant and C. M. Leadbeater published their curious results in a book titled *Occult Chemistry* (1908). It swarms with drawings of the inner structures of atoms. These outlandish sketches have absolutely no scientific merit, but Puthoff was convinced that occasionally they anticipated modern particle physics! In an excerpt from his speech, quoted in *The Explorer* (Vol. 4, October 1987), Puthoff called these sketches a "remarkable" study of the "basic constituents of matter." The sketches, he said, "found relatively little correlation with known scientific fact until the recent development of quark and superstring theories, which show striking correspondence to the reported observations." The striking correspondence, alas, is visible only to Puthoff and theosophists.[1]

I do not know what Puthoff now believes about the Besant-Leadbeater micro-remote viewing of the interior of atoms, or about the "genius" of L. Ron Hubbard, or the efficiency of E-meters. Reincarnation was one of a raft of strange doctrines Hubbard added to dianetics when he turned it into a tax-free religion. Today it is as essential a belief for Scientologists as it is for theosophists. Puthoff is on record as saying he no longer is associated with Scientology, but how much of it does he still buy? Does Dr. Puthoff still think that mental ills can result from experiences in previous lives? As far as I know, Puthoff no longer conducts experiments in remote viewing. He and Targ went their separate ways after leaving SRI.

For the past decade Puthoff's tireless efforts, at the Institute for Advanced Studies where he is now director, have gone into searching for a way to obtain unlimited free energy from the quantum fluctuations of empty space. To almost all other experts, this search is as Quixotic and futile as the search for a perpetual motion machine. They see the situation as comparable to having research on how the brain works directed by a neuroscientist who believes in phrenology. According to Yam, Puthoff's institute has examined about ten devices for tapping the energy of space, all of them failures.

Zero-Point Energy (ZPE) is a term for the energy that constantly fluctuates in the vacuum of space and at the heart of all matter. If the temperature of matter could be lowered to absolute zero, it was once thought that its atoms and inner electrons would stop moving and the matter would collapse. It is now known this cannot occur. ZPE keeps the atom constantly jiggling. Heisenberg's famous uncertainty principle forbids it to become motionless.

This jiggling also applies to any particle supposedly at "rest." Imagine an electron being squeezed into a smaller and smaller space by a piston. As the electron's position becomes more accurately known, the uncertainty relation ensures that its momentum becomes fuzzy and more intense. The electron cannot be totally motionless because then its position and its zero momentum would be precisely known. As the electron is squeezed into an increasingly tiny space, its pressure on the piston increases as it strikes the piston with greater force and frequency. It is this pressure of electrons within every atom that preserves the atom in what is called its "ground state.

The incessant fluttering of all particles when at absolute zero has been verified in numerous ways. The Lamb shift, for example, results from the action of ZPE on spectra. In the famous Casimir effect, ZPE forces two parallel metal plates to move closer together. ZPE causes low-level noise in microwave receivers. It excites the atoms in fluorescent lamps. It plays a role in the surface

tension of liquids, in images on eye retinas, in the scattering of light that makes the sky blue, and many other physical phenomena. In cosmology it sends out radiation from black holes. Its pressure prevents gravity from collapsing white dwarf stars.

Heisenberg's uncertainty principle also underlies one of the most bizarre aspects of quantum theory. The vacuum of space-time is by no means "nothing." It is a foaming sea of constantly bubbling particles that flash into existence for fleeting microseconds only to be absorbed back into the mother sea from which they momentarily borrowed a tiny bit of energy.

Time and energy, like position and momentum, also are subject to the uncertainty relation. If the time during which energy is measured is known exactly, the amount of energy becomes uncertain. The shorter the time interval, the greater the uncertainty. When the interval is short enough, it allows energy to appear from nowhere in the vacuum of space provided it vanishes fast enough back into the mother sea to preserve the vacuum's overall zero energy.

This energy that randomly pops out of empty space takes the form of particle-antiparticle pairs that mutually annihilate. This happens much too fast to be observed, but can be inferred from other phenomena. On the average, the pairs exist for about 0.00000 00000 00000 00000 1 of a second, with a maximum distance between them of about 0.00000 00001 of a centimeter.

Every type of particle known is believed to emerge briefly from the churning vacuum, the lighter particles such as electrons and photons more frequently than heavier particles such as protons, neutrons, and quarks. It is theoretically possible that a macro object such as an apple might be created for an instant, but the probability of this is far too low to allow it. These ghostly particles are called "virtual" to distinguish them from their "real" forms that persist in time.

The fluctuation of particle pairs occurs within all quantum fields, but mainly in electromagnetic and gravity fields. The gravity field presumably generates the conjectured, but so far undetected, massless graviton-antigraviton pairs. The energy-time uncertainty also allows every real particle to be surrounded by a cloud of virtual particles of all varieties that are constantly being emitted and absorbed by the seething vacuum that surrounds the real particle.

Here is how Heinz Pagels, in *The Cosmic Code*, describes the vacuum of space:

> Space looks empty only because this great creation and destruction of all the quanta takes place over such short times and distances. Over long distances the vacuum appears placid and smooth—like the ocean which appears quite smooth when we fly high above it in a jet airplane. But at the surface of the ocean, close up to it in a small boat, the sea can be high and fluctuating with great waves. Similarly, the vacuum fluctuates with the creation and destruction of quanta if we look closely at it.

In 1973 physicist Edward Tryon made a startling proposal in a two-page paper titled "Is the Universe a Vacuum Fluctuation?" (*Nature*, Vol. 246, pp. 396–97). He suggested that a vacuum fluctuation may have triggered the big bang! As he put it, "Our universe is simply one of those things which happen from time to time." This implies that space and time existed before the bang. Other physicists have since proposed slightly different ways a quantum fluctuation in a vacuum devoid of space and time could create a runaway universe, though how something could fluctuate without space and time is unclear. Of course our universe could not emerge from absolutely nothing. There would have to be quantum fields to fluctuate, leaving unanswered the ultimate question of where quantum fields and their laws came from, or why there is something rather than nothing.

In recent years a number of physicists have wondered if it possible to somehow tap the ZPE of the fidgety vacuum. Most physicists consider this hopeless. At the end of the PBS's *Scientific American Frontiers* show, Steven Weinberg, the Nobel prize-winning physicist now at the University of Texas, in Austin, pointed out how weak this energy is. In the entire universe, he said, it is enormous, but the total amount of ZPE available in a space the size of the earth is about the same as the energy obtainable from a gallon of gasoline. Trapping this energy of course means that a machine must be able to snatch energy from the virtual particles before they disappear. No one has any good idea of how this could be done, and even if it could be, the energy available would be insignificant.

British physicist Paul Davies, in *Other Worlds* (1980), had this to say in Chapter 4: "There is no question . . . of running a machine on borrowed energy. . . . The energy output from an electric light emitted in one second can only be borrowed via the uncertainty principle for a billion-billion-billion-billionth of a second. Put another way, the quantum loan mechanism can only enhance the output from an electric light by one part in one followed by 36 zeros."

Puthoff disagrees. Like other mavericks working on ZPE machines, he sees the opposition of mainstream physicists to such research as the irrational knee jerks of an elite. "Most working physicists are not really scientists," he told an interviewer in 1990. "They are number crunchers, computer operators, lab technicians. It's not all their fault. It's driven largely by the military-industrial complex."[2] In many technical papers and several popularly written articles he has defended the possibility of obtaining unlimited energy from empty space. In *Scientific American*'s PBS broadcast he predicted that just as this century is known as the nuclear age, so will the next millennium be known as the zero-point energy age.

Puthoff sees himself as a lonely pioneer whose research he is confident will usher in this awesome new age. In his paper "Quantum Fluctuations of Empty Space: A New Rosetta Stone of Physics?" (a speech reprinted in *Frontier Perspectives*, Vol. 2, Fall/Winter 1991, 19–23, 43) he predicts that tapping ZPE will revolutionize history. "Only the

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future," he concludes, "will reveal to what use humanity will eventually put this remaining fire of the gods. . . ."

Many of Puthoff's recent conjectures are far out on the fringes of physics. He believes that gravity may be caused by ZPE in a manner similar to the way it causes the Casimir effect. He suggests that electrons are kept in their atomic orbits by ZPE, and that if atoms could be "shrunk" to a lower ground state they would radiate ZPE. Inertia, he thinks, may be caused by resistance of ZPE whenever objects are accelerated. If this resistance could be reduced, it would provide a great advance in the rocket propulsion speed of spaceships. In "SETI, the Velocity-of-Light Limitation, and the Alcubierre Warp Drive: An Integrating Overview" (in *Physics Essays*, Vol. 9, 1996, pp. 156–58), Puthoff defends the possibility that spaceships could travel faster than light if the ZPE could be handled properly.[3]

Just as Puthoff and Targ were able to obtain millions in funding dollars for their SRI research on remote viewing, so Puthoff is now raking in considerable funds from sources he prefers not to disclose. Many physicists are dismayed by this because they regard Puthoff's views as pseudoscience that is diverting funds from more promising investigations. It remains to be seen if in the next few decades this eccentric physicist will turn out to be one of the greatest scientists of all time, or whether his ZPE speculations and work will blow away like the flawed research he supervised when he and Targ were in their glory days at SRI.

Notes

1. For details on the remote viewing of atoms, consult *Extrasensory Perception of Quarks* (Theosophical Publishing House, 1980), by British physicist Stephen M. Phillips; his two-part article "Extrasensory Perception of Subatomic Particles," in *Fate* (April and May 1987); and "Resolution in Remote-Viewing Studies: Mini- and Micro Targets," by Puthoff, Targ, and Charles Tart, an SRI report of June 1979.

2. Puthoff is so quoted in "Power Structure," by Tom Chalkey, in Baltimore's *City Paper*, June 29, 1990.

3. Arthur C. Clarke, in his 1997 novel *3001*, takes Puthoff's conjecture about inertia seriously enough to base an inertial space drive on ZPE. See Chapter 9 and notes on this chapter at the back of the book. □

A SKEPTIC IN ROSWELL

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during the actual Fourth of July weekend. I was afraid Roswell would resemble a cross between Woodstock and *The X-Files*, and I wanted no part of it. But I did come back to town that Sunday afternoon, in time to catch the tail end of the celebrations going on at the civic center. Just out of curiosity, I took a peek.

The civic center was jammed with salespeople hawking every conceivable UFO souvenir. Besides the ubiquitous T-shirts, there were porcelain pins depicting an alien face, sticky green "alien goo," and hand-painted ceramic plates with maps showing the location of the crash site. I saw pewter spacecraft jewelry, silver alien-face necklaces, videos, rubber stamps, bumper stickers, spaceship cookies, and every conceivable souvenir item in the world, all in the outer-space theme. The *Roswell Daily Record* had a prominent display, including the usual coffee mugs and T-shirts, along with full-sized reproductions of its original 1947 front-page story about a flying disc. Outside, parking lots were jammed with cars sporting license plates from Oregon, Vermont, Arkansas, and many other exotic places.

Some experts in mass hysteria warn us of the dangers of UFO legends, with the associated whisperings about government coverups and other paranoid ideas. Elaine Showalter, author of *Hystories*, theorizes that the UFO mania feeds off the same insanity that fuels the likes of Timothy McVeigh. Personally, I think the rumors about satanic cults and "repressed memories" are a more immediate danger to society. So, as a skeptic living in Roswell, I usually keep quiet about my views on the UFO issue, preferring to crack the repressed-memory *nuts*.

If it were up to me, Roswell would stop advertising itself as the UFO capital. I would prefer to see this town gain notoriety for its dairy industry, or its cheese factory, or as a producer of lollipops. The local candy factory does produce ordinary round lollipops, but of course it also produces glow-in-the-dark alien suckers that come in neon pink, green, or blue.

There is something rather poetic about an alien sucker. □