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Current Research and Insights

Welcome to the Noöverse

Conscious Awareness in Alternative Healing

End-of-Life Experiences

Should Any Subject Be Off Limits to Science?

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Why EdgeScience? Because, contrary to public perception, scientific knowledge is still full of unknowns. What remains to be discovered—what we don't know—very likely dwarfs what we do know. And what we think we know may not be entirely correct or fully understood. Anomalies, which researchers tend to sweep under the rug, should be actively pursued as clues to potential breakthroughs and new directions in science.

The Society for Scientific Exploration (SSE) is a professional organization of scientists and scholars who study unusual and unexplained phenomena. The primary goal of the Society is to provide a professional forum for presentations, criticism, and debate concerning topics which are for various reasons ignored or studied inadequately within mainstream science. A secondary goal is to promote improved understanding of those factors that unnecessarily limit the scope of scientific inquiry, such as sociological constraints, restrictive world views, hidden theoretical assumptions, and the temptation to convert prevailing theory into prevailing dogma. Topics under investigation cover a wide spectrum. At one end are apparent anomalies in well established disciplines. At the other, we find paradoxical phenomena that belong to no established discipline and therefore may offer the greatest potential for scientific advance and the expansion of human knowledge. The SSE was founded in 1982 and has approximately 800 members in 45 countries worldwide. The Society also publishes the peer-reviewed *Journal of Scientific Exploration,* and holds annual meetings in the U.S. and biennial meetings in Europe. Associate and student memberships are available to the public. To join the Society, or for more information, visit the website at scientificexploration.org.

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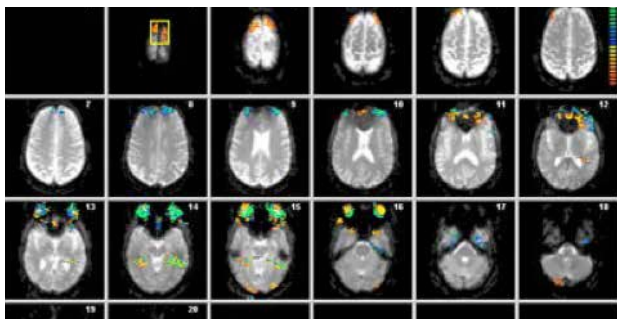

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Eric Wargo

Welcome to the Noöverse:
Big Data, Deep Anthropology, and Von Neumann Probes

"Space Aliens" are no longer fashionable as an explanation for UFOs, but the trajectory of human science shows why the extraterrestrial hypothesis (ETH), with some modifications, should be kept on the table.

Jacques Vallee has been a technological as well as Fortean visionary throughout his career. The astronomer and computer scientist was an early, articulate exponent of the extraterrestrial hypothesis (or ETH) in ufology; but he quickly revised his thinking and was among the first ufologists to question the ETH. His classic 1969 study *Passport to Magonia* vividly demonstrated that "aliens" have been around throughout recorded history and are deeply embedded in our folklore—as fairies, demons, angels, or whatever fits within local frames of belief.[1] The idea that ET astronauts started flying to our planet after World War II to contact a newly nuclear-capable civilization reflects mid-century sci-fi fantasies more than it does the available data.

A younger generation of thoughtful ufologists has picked up the many fascinating threads in Vallee's work and taken them farther, exploring links of UFOs to parapsychology[2] or fairy folklore[3] for example, or focusing on the all-too-human dimension of manipulation and deception.[4] Amazingly, Vallee's critiques have even started to penetrate the mainstream: After *The New York Times* broke the story of Senator Harry Reid's secret Pentagon UFO project this past December, the paper ran an op-ed by conservative columnist Ross Douthat extolling, of all things, Vallee's anti-ETH arguments.[5] In short, not only cool ufologists but even informed laypeople are starting to turn up their noses at the ETH, that old relic of Cold War pop culture.

Although by now it is gray and tarnished, it may be too soon to haul the ETH to the scrap-heap. While the old picture of flesh-and-blood aliens flying untold light years across space and time to abduct motorists and crash in our deserts looks somewhat ridiculous in hindsight, some of the criticisms Vallee leveled at the ETH decades ago were based on assumptions about the limited scope and aims of ET science that now appear too humble in light of recent developments in our own sciences. Even some of the strangest aspects of the UFO phenomenon would not be inconsistent with a massive, long-duration, and most importantly, automated ET program of behavioral research and surveillance.

It is entirely possible we are living in a *noöverse*: an already densely surveilled, studied, and networked cosmos swarming with artificially intelligent and infinitely patient "science machines."

Tomorrow's Science Singularities

One of the pillars of Vallee's argument against the ETH was that the estimated millions of "landings" just in human history vastly exceeds what would be needed for a survey of our planet and civilization. In his paper "Five Arguments Against the Extraterrestrial Origin of Unidentified Flying Objects," Vallee writes:

> It should be kept in mind that the surface of the earth is clearly visible from space, unlike Venus or other planetary bodies shrouded in a dense atmosphere. Furthermore, we have been broadcasting information on all aspects of our various cultures in the form of radio for most of this century and in the form of television for the last 30 years, so that most of the parameters about our planet and our civilization can readily be acquired by unobtrusive, remote technical means. The collecting of physical samples would require landing but it could also be accomplished unobtrusively with a few carefully targeted missions of the type of our own Viking experiments on Mars. All these considerations appear to contradict the ETH.[6]

When Vallee published his "Five Arguments" in 1990, the term "big data" was still a decade in the future. But the picture of ET space science limiting itself to thin-slicing data collection, isolated visits to reconnoiter and gather samples, coupled with remote monitoring of our TV broadcasts, did not take into account the scientific possibilities created by virtually unlimited data gathering, storage, and analytic capabilities emerging in the 21st century. It also misses a whole side of biological and behavioral research: experiment and replication. These become greatly enhanced in power and possible to automate on a large scale with the intertwined developments of big data, artificial intelligence (AI), and robotics.

We all know how robots have or will soon take boring and dangerous tasks like vacuuming our floors, driving our cars, and fighting our wars out of human hands. Most people don't realize what an infinitely tedious task it is to do good science. In not too long, we will have the ability to automate not only the gathering of information but also the very posing of research questions, and one of the first things we will teach AI to do (besides not kill us) is to ask questions and then answer them in a scientific fashion—that is, form hypotheses based on prior findings, and then design and conduct experiments to test those hypotheses…and then repeat this over and over and over. Already big data and machine learning are vastly accelerating scientific advances in health, astronomy, and many other fields.

Sergey Balakhnichev/iStock

Big Data and AI/robotics are thresholds that any space-faring ET will long since have crossed, just as it will have mastered 3-D printing. The use of local resources to create copies of machines and create needed supplies by rebuilding matter at the molecular level may make human life and work on the Moon and Mars and the asteroid belt feasible by the second half of this century. And once a 3-D printer prints out another 3-D printer, the robot reproductive system is a reality. Couple a 3-D printer to a smart probe or drone and you have exactly what John Von Neumann envisioned as the tool any advanced civilization would use to explore beyond its solar system.

Self-replicating probes can propagate from planet to planet, star system to star system (via solar sail or whatever better technology comes along), completely autonomously. Because they can perpetually repair themselves and reproduce, such probes would have limitless durability, and this would give them limitless patience. They could multiply like rabbits and conduct science tirelessly. When they encounter really interesting planets with life, or even a pre-biological soup of organic molecules, they could swarm such a world and dig in quietly for the long haul.

These will be more than space probes as we usually think of them, but full, autonomous science platforms, sharing data among themselves and constantly or periodically relaying that information back home for storage and future use by the civilization that built them, by that civilization's robot protectors, or by its machine descendants. They may continue to do science long after their original builders are gone.

The Psych Experiment

This is where the ancientness and ubiquity of the UFO phenomenon starts to make sense in terms of what we might call "machine ETH." Given the likelihood that countless ET civilizations have arisen over the past few billion years that are capable of populating space with such machines, a planet like ours could potentially have been swarmed with untold millions of probes, not only quietly observing and recording but also overtly interacting with the local flora and fauna for the purposes of experimentation and hypothesis-testing over the full course of the planet's history.

Again, Von Neumann probes would have a built-in motive for curiosity and the ability not merely to observe and record but to actually behave like experimenters: to generate their own hypotheses, design experiments to test them, and tediously replicate and re-replicate their findings alone or collaboratively, to constantly nuance and update their deepening understanding of their subject species. Such probes will not passively limit themselves to observation and sample collection but will also interact in a very precise, deliberate, controlled fashion, and repeat these interactions obsessively and tirelessly in the same and varied conditions, again and again and again, building up conclusions of high confidence.

One of Vallee's most far-reaching insights about UFO contact becomes highly relevant in this context. In *The Invisible College*, Vallee observed that there is a kind of irregular regularity to UFO encounters, reminiscent of a reinforcement schedule in behavioral research.[7] This insight supported his theory that UFOs may be some sort of control mechanism. The question is, control for what purpose, and by whom? That UFO encounters represent a deliberate, motivated, long-term effort to shape our culture or our evolution in some direction favorable to some alien agenda is where the sci-fi Gnostic (or paranoid) mind naturally goes with this idea. Maybe. But the simple, routine, dispassionate collection of behavioral science data is another possibility that, despite what Vallee argued in his "Five Arguments" paper, is not at all inconsistent with either the absurd, symbolic nature of many UFO encounters or with their sheer number and repetition throughout recorded time.

UFO encounters not only resemble Zen *koans*; they also resemble the contrived, surreal, occasionally uncanny situations that experiment participants in any campus psychology laboratory find themselves in. Even when they are aware they are part of an experiment, participants are generally deceived or not given full information about the purpose of the experiment. Experiments sometimes involve other "participants" who are actually confederates of the experimenter acting in a specific way to provoke some kind of response or decision on the part of the participant.

Crucially, to yield meaningful information, every science experiment must include at least two groups, differing on a single parameter—an experimental condition and a control. And you also need a large-enough sample size that your study has sufficient power to confidently detect an effect of interest. So, you recruit as many different volunteers as your grant money affords, and you run the experiment enough times that even a small behavioral difference between the experimental and control conditions will achieve statistical significance and thus pass muster as a robust finding.

Lastly you must then repeat the experiment, or ideally get other experimenters at different laboratories in different locations to repeat the experiment, and thereby replicate that finding. Generally, a single study will be part of a series, a whole research program, in which multiple experiments test numerous variations on a theme, in order to increasingly refine your understanding of the phenomenon under study.

Repeatability of findings happens to be a huge problem across our sciences these days, since perverse reward incentives (tenure and grant competition, pressure to publish "sexy" results, etc.) and other problems such as fraud are leading to the publication of data that are not as robust as they seem at first glance. But imagine if those perverse incentives weren't there. Imagine you were an objective, ego-less science machine with all the time in the world and thus infinite patience, and with no pressure to publish or obtain tenure with startling findings, and your only goal was to acquire a truly "thick" understanding of how the target species behaves and reacts to specific circumstances with a high level of confidence. Part of this imperative would include grasping that that species is highly complex, that it is culturally and socially and psychologically adaptable and even biologically still evolving, and that your own actions may contribute in unforeseen ways to that evolution.

It would mean, I think, that you would endlessly devise new experiments to test new and different emerging hypothesis,

running those experiments with large enough numbers of subjects that your findings would be robust but not so much that you swamped the signal with your own interfering behavior; and it would mean that you would need to re-run the various experiments again and again and again throughout history. Many, many "landings," in other words.

Thin Slicing vs. Deep Anthropology

One might ask why an ET civilization would want to engage in such "deep anthropology," but there is no real mystery there. Whatever varied forms alien *life* might take, there is nothing anthropocentric about saying that any space-exploring ET civilization will certainly have gotten there by following the exact same path we did: through science.

Our civilization is already built on centuries of *basic science*—that is, science undertaken for its own sake, often without any direct or foreseeable payoff in application. Knowing about the reproductive behavior of deep sea sponges or plate tectonics on Pluto's moon may seem useless to most people (including some taxpayers who do not grasp the importance of this kind of science), but scientists and smart policymakers who fund the science know that every little detail is part of a vast puzzle and that any bit of information may ultimately pay off in unforeseen ways, years or decades or centuries down the long road. Thus our basic curiosity about the universe, and our collective ability to invest resources in that curiosity, are adaptive.

More basically, knowledge is power. It enables prediction and control. There is no limit to the degree of prediction and control over illness, for example, that medical researchers at universities and government institutions would like to attain, given unlimited scientific resources. Likewise, if money (and legality) were no object, there is certainly no limit to the degree of prediction and control an intelligence agency like our NSA would like to achieve over even the remotest long-term threats to the nation's security. We are still on the eve of such a scientific/intelligence singularity, constrained by limits on funding and resources, limits of human bias, and limited ability to use all the data we are gathering effectively. But if those limitations can be overcome through advanced artificial intelligence and robotics, and if we do not destroy ourselves in the process (a big "if," obviously), we will be in a position to undertake knowledge acquisition of mind-boggling scope and resolution, and we will have no reason not to.

Any advanced civilization, even if it evolved in different directions than "outward" (i.e., colonization), would still send its eyes and ears and roving brains throughout its stellar neighborhood and beyond, if only for the sake of its own security. Everywhere, those eyes and ears would settle in for the long duration, learning all that is learnable over the whole history of every star and moon and planet, about its geology and weather and organic chemicals and primitive flora and fauna (if any)—because who knows what will happen in a million or a billion years? Who knows where life will emerge from primordial muck? Who knows what tree-dwelling shrew might become a spacefaring, militaristic species down the long road, and thus be worth learning how to predict and control should that species ever pose a threat to its security?

By some estimates, we are latecomers to the galactic party. There could be many civilizations or "intelligences" with the capabilities described, preceding us by millions or billions of years. Thus roving probes and CCTV cameras having many different origins, based on different kinds and levels of technology, could be literally everywhere. Some could be organic; some could be luminous; some could be embedded in the fabric of spacetime itself. Some may interact directly with consciousness. The bottom line is that, in the noöverse, there is no expectation of privacy, and no expectation of collecting your $20 after the ET-run psych experiment is over, because it is never over.

Does this explain the UFO phenomenon, or parts of it? Who knows…and Vallee is right that we need to stretch our minds to consider more nonintuitive possibilities like interdimensional beings. But the ETH is still a possibility that we should leave squarely on the table, even if other less boringly "nuts and bolts" hypotheses currently seem more challenging and exciting.

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William Bengston

Questioning the Importance of Conscious Awareness in Alternative Healing

In the culture of the Alternative and Complementary Medicine community is a widespread belief that some sort of conscious connection between the healer and the healee is important to a successful healing outcome. Indeed, many healers associate healing with a conscious spiritual practice or spiritual mindset. The frequent endpoint of this belief is the suggestion that getting into some sort of a spiritual state, or "higher vibration" on the part of both the healer and healee, may be an important component in healing efficacy.

My research in alternative healing, now going on for more than 35 years, is suggestive of the possibility that the link between healing and conscious spiritual connection may be oversimplified. Indeed, my research suggests that we may have the causal order reversed. That is, an awareness of "connection" may not be the proximate cause of healing. Instead, healing may be closer to an autonomic response to need, and the subjective awareness of spiritual connection may be unnecessary and optional at best.

I realize that this perspective may seem heretical to some. Bear with me please and take a look at some interesting and relevant data that supports this view. These data have been gathered using both *in vitro* cell cultures and *in vivo* live mouse models, while I have looked into some parameters of healing such as distance and dose; the physiological correlates of healing; and more recently, the attempt to reverse engineer the healing effect to make it scalable and reliable, a more conventional treatment. The mice research encompasses sixteen experiments using standard models of mammary cancer, sarcomas, naturally occurring oncogenic tumors, immune deficient nude mice, and extremely aggressive cancers. These experiments have been performed at eight independent institutions, including four medical schools. In addition, innumerable in vitro cell culture experiments on the consequences of "healing with intent" have been performed on human leukemia cells and human breast cancer cells, to name but a few.

The experimental protocol used in all of these experiments has been to take a "standard" mouse or cell model with a long history of conventional empirical research that has a known and predictable outcome,[1,2,3] and to introduce the variable of "healing with intent" using the rapid imaging healing technique which I helped to develop.[4] Additionally, human physiological correlates to healing have been examined using EEGs at a private lab, and fMRIs independently carried out at two medical schools. Volunteer healers, who have included both students and faculty, have all been pre-screened to be without any experience in alternative healing, nor were they in any way "believers" in the validity of alternative healing. Their healing attempts with me were the first of any kind for them.

The abridged summary of the results of these experiments include:

- The demonstration of a reliable full lifespan cure of cancer in experimental mice, including an apparent immunity to reinjection of the same cancer;
- A dose response to healing, with some minimum amount of healing time being necessary to effect a cure. Interestingly, the only predictor of the aggregate speed of cure is the number of mice in an experiment, the quicker cures being associated with *more* mice being treated;
- Healing proceeds in non-linear fashion, with sudden bursts of healing that resemble "phase transitions";
- There is a measurable "resonant bond" between the brains of healer and healee that is fluid;
- Healing appears to be fundamentally about "information" rather than "energy," despite the popular use of the latter term.

Perhaps most important for the following discussion on the place of conscious awareness in all this, *healing appears to be unrelated to a particular conscious state on the part of either the healer or the healee*, and instead appears to be more akin to an *autonomic* response to need.

And, to top it all off, healing can apparently be stored in both biological and physical systems. That is,

- Cells transplanted from a mouse infected with cancer that has been treated by the healing technique can independently cure otherwise infected mice, without further healing with intent, suggesting some sort of biological "memory" of the healing information;

- Water treated with healing with intent can reproduce the cancer cures in mice without further intervention on the part of a healer, suggesting some sort of physical "memory" of the healing information. Additionally,
- *In vitro* cancer cells treated with a cell medium that has been "charged" with the healing with intent will result in a robust acceleration of growth;
- *In vitro* cancer cells treated with cotton "charged" with healing with intent will undergo significant genomic changes related to immunology and inflammation;
- And finally, these apparent effects of healing, whether through healing with intent or through charged cotton, produce significant responses *only when there is a biological healing need present in the healee.*

An Illustration of the *In Vivo* Experimental Model

In the basic experimental in vivo protocol, mice are injected with a known dose of cancer sufficient to guarantee death within a specified interval. Mice obtained from either the Jackson Laboratories or the National Cancer Institute are injected with at least 200,000 mammary adenocarcinoma cells, double the lethal dosage. Published life expectancy has been found to be between 14 and 27 days subsequent to injection. Mice develop a non-metastatic externally palpable tumor that results in death either by the crushing of the internal organs or by malnutrition, or both.

Figure 1 – An example of a mouse injected with cancer in the end stages of life

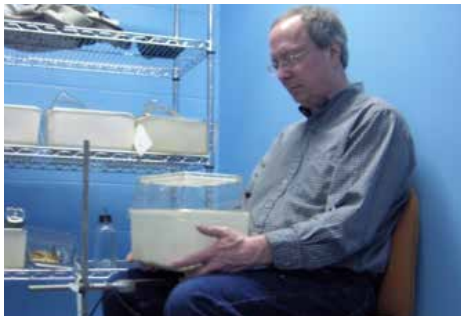


Figure 2 – A typical healing session, with the author serving as the healer. Treatment length, number of treatments, and number of mice per treatment have all been part of various experimental protocols, including other variables such as distance of hands from the cages, extending to thousands of miles.

Healing treatment of the mice generally involves the volunteer healer placing his or her hands on the outside of the cages and practicing the healing technique for a specified duration.

Those mice that have been treated by the healing with intent techniques typically develop an encrusted blackened area on the surface of the tumor, followed by tumor ulceration and then implosion to full lifespan cure.

Histology indicates that at all stages of remission there are viable cancer cells in the mouse. When full cure is achieved, the mouse is completely free of cancer and is further apparently immune to subsequent injections of the same cancer for its entire life.

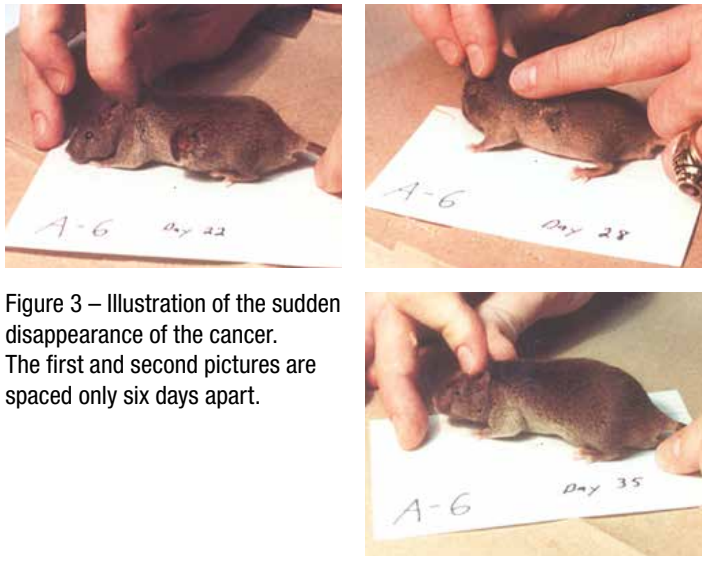


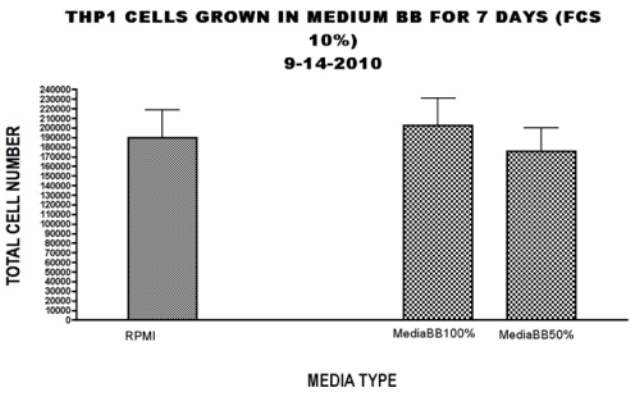
Figure 3 – Illustration of the sudden disappearance of the cancer. The first and second pictures are spaced only six days apart.

Sudden shifts, analogous to "phase transitions," have been the pattern in all experiments, whether *in vivo* or *in vitro*. That is, in the early stages of healing treatment, mice (and cell cultures) show no apparent effect of the healing intention, until suddenly there are non-linear dramatic shifts in tumors (in vivo models) or cell growth (in vitro models). After the first week, there is no significant difference between cells treated and untreated. After the second week, the cells grown in the treated medium are significantly stimulated.

Healing and the Sense of "Connection": Part 1

In addition to the anomalous healing in and of itself, there is apparently an anomalous connection that can occur between subjects.

Synchronizing EEGs between the healer and subject indicate that the healer's EEG data shows harmonic frequency coupling across the spectra, followed by frequency entrainment effects with the healee, followed by EEG phase locking. These results suggest the presence of a connection between the healer and healee.[5] Of central importance, in addition to the apparent connection established at a distance, is that neither the healer nor healee are consciously aware of the connection. The healee has a need, and the healer practices the rapid imaging healing technique with only a passing intention to help. The connection simply occurs.



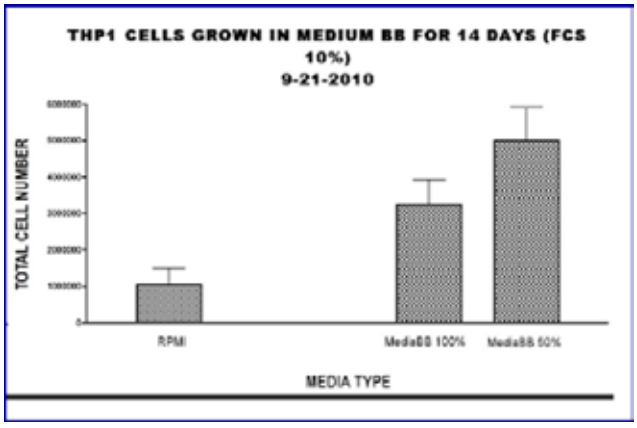


Figure 4 – A treated/not treated medium comparison of cell growth in human leukemia cells at one and two weeks. Note the sudden "explosion" of growth only in the second week. the non-linear sudden growth in cells in response to being grown in medium that has been charged with the healing with intent method. After the first week, there is no significant difference in cell growth between treated and untreated medium. But in the second week there is a sudden burst in growth in cells grown in the treated medium.

Figure 5 shows waveforms revealing the 7.5 to 8 Hz frequency range in both healer and subject at three parietal locations. Early in the healer's sustained amplitude burst, the phase of the subject does not match the healer's. As the healer's burst continues, the subject's phase synchronizes with the healer's as the subject's amplitude also increases to near its maximum for the entire 11-min session. Note: Given the healer's greater amplitude generally, the subject's entire waveform was amplified for clarity (50 vs. 15 microvolts/cm sensitivity)

Healing and the Sense of "Connection": Part 2

Research questions have included whether healing with intent might have a specific location in the brain. In order to gather data using functional MRIs, it would be necessary to produce a "toggling" of healing intention into "on" and "off" states. To my amazement, this was achieved through conscious intent. At the University of Connecticut and Thomas Jefferson Medical Schools, an exploratory pilot study with a simple protocol had

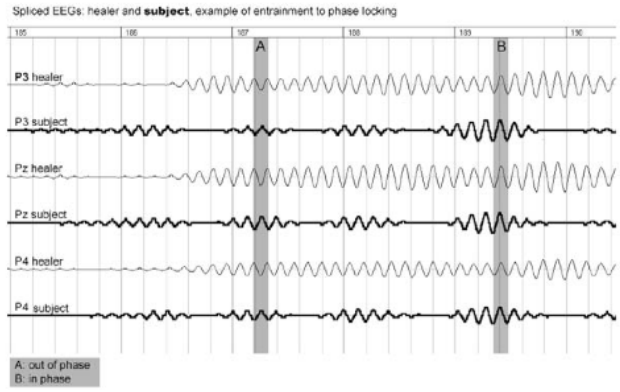


Figure 5: Spliced EEGs: healer and subject, example of entrainment to phase locking.

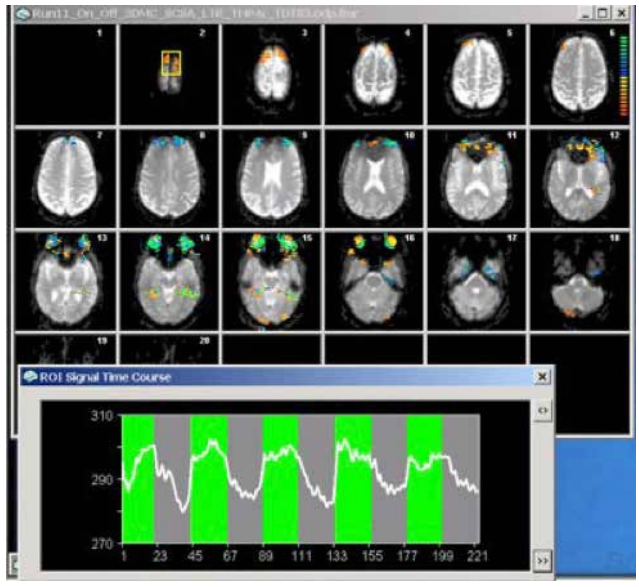


Figure 6 – fMRI data contrasting "on" and "off" healing intention, with a control run. The green and gray bars at the bottom illustrate "activation" and "deactivation" of a part of the brain when cycling is "on" and "off" at 45 second intervals. The part of the brain that was most affected by the cycling was the back of the frontal lobes of the brain (illustrated by the brain images through each successive slice). Each successive image of the brain is a "slice" of the brain at different depths. The first row of images, for example, has the highest parts of the brain.

healers inside an enclosed fMRI intend to "heal" and then to "not heal" during 45-second cycles to see if healing intention can be toggled.

Apparently, healing can indeed be "toggled." These results were reproduced by several people acting as healers, always contrasting "on" and "off" states of healing intention, using the same techniques as were applied to the mice and in the EEG studies.

An interesting modification of the protocol involved the healer standing outside the fMRI, approximately 25 feet from

the fMRI, and a volunteer healee located inside the fMRI. The healee had no specific intention and was instructed to simply lie inside of the fMRI. Here too, the healer was the one cued to direct healing intention in an on/off cycle of 45 seconds each, except this time the healee was the one being monitored. *The same basic pattern of on/off cueing in the brain of the healee was produced, apparently indicating a brain connection across some distance. Once again, there was no conscious awareness on the part of the healee that anything was out of the ordinary. The heelee's only task was to lie still inside the fMRI.*

The third and possibly the most important variant on the fMRI protocol involved the gathering of 10 pictures and hair samples of cancerous animals (there were dogs, cats, horses, and sheep) which were each placed inside of an opaque envelope. To serve as controls, an equal number of opaque envelopes were prepared that had only index cards inside of them. The envelopes were randomized, and in double blind fashion, one was placed on the left palm of volunteer healers who were lying in an enclosed fMRI. *Results clearly indicate that the brains of the volunteer healers "turned on" only when the envelopes had "need" expressed in them (pictures and hair samples of cancerous animals). This apparent activation in response to need essentially duplicated the results when the healers consciously attempted to toggle healing and non-healing in specified intervals. The brains of the volunteer healers "knew" when a need was present in the envelopes.*

This kind of "on" and "off" contrast occurred whether the person was cycling, intending to actually heal someone, or had an envelope with healing "need" inside. And, this contrast was similar to ones where a volunteer was inside the fMRI and the healer was on the outside, some distance away. The healer, turning "on" and "off," produced similar patterns in the (non-healer) person in the fMRI.

Need and a Biological/Behavioral Response to Healing in Mice

Among the curious phenomena that have been observed is the apparent response of mice to the healing environment. In all experiments, we have seen a preference by the mice to situate their tumors as close as possible to the left palm of the healer. This occurs regardless of the orientation of the cage.

This left-handed attraction occurs regardless of the healer, or the type of cancer, only so long as the mice have cancer. Once the mice have been completely cured, they no longer have an inclination to move towards the left hand. It appears as if the mice actually take turns putting their tumor as close as possible to the left palm of the healer, and they switch off after approximately 1 minute of minimum distance from that placement.

Healing and Need in Cell Cultures

Ordinary cotton obtained from a pharmacy was "charged" by volunteer healers for approximately 20 to 30 minutes. Charged and un-charged (control) pieces of cotton were then placed next to well plates with cells that have "need" and cells without need.

Figure 7 – Apparent left-hand attraction in two different mouse models

Several growth experiments were done on bacteria cells without healing need, comparing the effects of "treated" and "untreated" cotton. There was no significant effect on cell growth. But when human breast cancer cells with a healing "need" were exposed to the treated vs. un-treated cotton, significant changes occurred in cell proliferation and migration.

Genomics performed on human breast cancer cells, comparing exposure to treated and untreated cotton, demonstrated significant changes in six genes if the cotton was charged, with strong suggestion of an additional two genes that may be of importance.

Interestingly, Raman spectra analysis failed to detect any difference between the charged cotton that had produced genomic effects, and uncharged cotton. The testing of other materials besides cotton included clear quartz, pink quartz, water, selenite, and cellulose—all with no detectable difference between "charged" and "uncharged."

To date, *only life in need* seems to respond to charged materials. And so, the interesting speculative hypothesis might be that the detector for the difference between healing and non-healing might need to be both alive and in need.

Some Concluding Thoughts

Several interesting patterns emerge from these data. First, the theme of "need" consistently occurs. Mice that have a healing

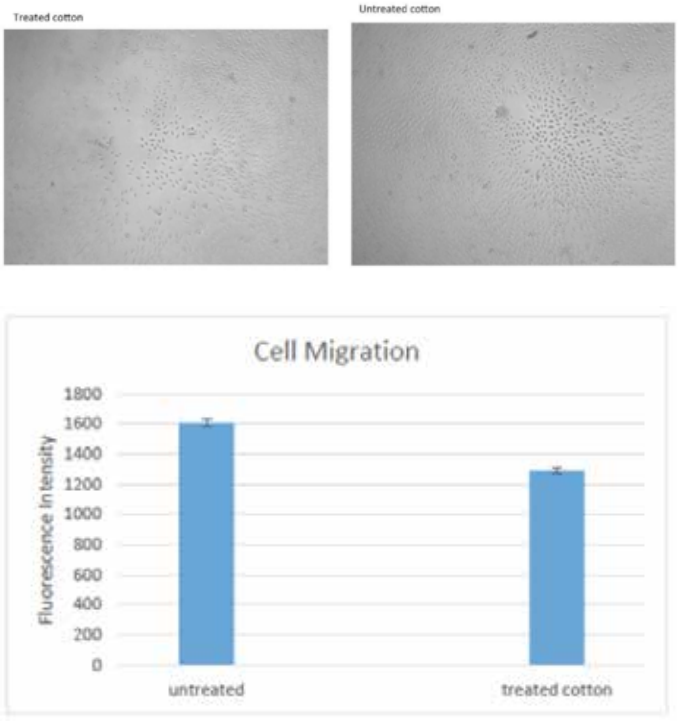


Figure 8 – Human breast cancer cell proliferation and migration comparisons between charged and uncharged cotton. Cotton treated cells demonstrated slower cell proliferation and migration.

Human Breast Cancer cells exposed to Energized Cotton (4 replicates)			
Gene Description	Gene Symbol	Energized cotton	
		Fold Change	P-Value
Caspase 9, apoptosis-related cysteine peptidase	CASP9	-1.241	0.017
E2F transcription factor 4, p107/p130-binding	E2F4	1.123	0.023
Heme oxygenase (decycling) 1	HMOX1	-1.310	0.034
Insulin-like growth factor binding protein 3	IGFBP3	1.181	0.016
Minichromosome maintenance complex component 2	MCM2	1.320	0.020
Protein phosphatase 1, regulatory (inhibitor) subunit 15A	PPP1R15A	-1.435	0.008
Serpin peptidase inhibitor, clade F (alpha-2 antiplasmin, pigment epithelium derived factor), member 1	SERPINF1	1.406	0.083
Vascular endothelial growth factor C	VEGFC	1.218	0.093

Figure 9 – Significant genomic changes in human breast cancer exposed to charged cotton

need will move to the left hand of the healer. Once they are completely cured, this no longer happens. Similarly, cells which have a healing need will respond to healing with intent, whether that healing source comes directly from the hands of a healer, or healing apparently stored in substances such as water, cell medium, or cotton. Cells with no healing need exhibit no anomalous changes when offered healing with intent. And so, at a minimum, it can be posited that biological need is a crucial component in healing, and it may be the healee that instigates the healing effect.

Second, conscious awareness on the part of the either the healer or healee is not likely to be necessary to produce a healing effect. The extent or quality of consciousness on the part of mice or cells may be debatable, but there is little question that they are unlike anything that parallels human consciousness. Yet mice in need "know" to move proximate to a healing source; cells in need do likewise if they possess motility. Can there be serious doubt that these responses to healing are natural biological responses?

The volunteer healer logs vary widely in the extent to which they were consciously aware of anything associated with healing. Some occasionally felt some sort of "connection" with their mice; some felt nothing at all, the latter to the point that they seemed not to understand the question when asked to comment about feelings associated with healing. In multiple experiments, there has been no association between healing efficacy and subjective states of connection. *And so, it may be posited that a conscious awareness of healing may be unnecessary for healing to take place.*

At the same time, both EEG and fMRI data clearly indicate that some sort of biological connection actually does take place. For one, at least in the case of healing humans, healer and healee go into harmonic brain phase locking, and do so without any necessary conscious awareness that the healing phenomenon might be taking place.

Yet, while there can be high confidence that conscious *awareness* on the part of either the healer or healee is optional at best, the role of *intention* on the part of the healer becomes more problematic. That is, the simple act of putting hands around a cage, or attempting to "charge" materials for a healing experiment, signifies intention of some sort. That intention may be fleeting, and certainly separate from anything approaching either belief or sustained awareness. But if action is taken in order to produce or to test healing of any sort, there must be intention. This intention is akin to the intention expended for many forms of action. I "intend" to walk down the street, but there is nothing approaching "belief" or sustained "attention." Indeed, attentive walking will diminish efficacy. There must have been some intention to begin the walking, but the activity is driven not by sustained effort or attention, but by a letting go. The mastery of many skills, whether walking or healing, likely involves the transition from "mindful" attention to relatively "mindless" fleeting intention.

Connection can be seen as an autonomic response to need. Consider that in one fMRI protocol, blinded envelopes with pictures and hair samples of animals placed onto the palm produced significant brain response in the healer if "need" was present in those envelopes. These responses were biologically similar to the brain changes that occurred if the healer intentionally attempted to heal. If the envelopes placed into the palms of volunteer healers did not contain need, then no significant brain changes ensued. Again, there was no conscious awareness of whether any envelopes did or did not have any pictures of animals in need.

The commonly found association between certain states of consciousness and healing, often associated with being "spiritual," likely has the causal order and temporal sequence inverted. Instead of a "spiritual" sense of connection first being necessary in order to produce healing, the data indicate that healing occurs more as an autonomic response to biological need, and the subjective sense of spiritual connection is an

optional consequence of that need. Since more subjectively sensitive individuals are more likely to be drawn to healing, the mistaken association can be made that this sensitivity is the source of healing. It turns out that people who are less subjectively sensitive can heal just as well without ever experiencing connection. Conscious awareness of spiritual connection is optional.

That healing intention can apparently be stored in materials and later be used to stimulate healing effects is extremely suggestive that consciousness may have an associative technology. Data presented here on the apparent storage of healing in water, cell medium, and cotton, which can produce a future healing effect when need is present, begs inquiry into future studies that may help to unravel some of the mysteries of healing. And, there is the additional possibility that this storage ability might be able to make healing more conventional and scalable.

Finally, the lack of necessity of awareness of spiritual connection on either the part of the healer or healee makes it likely that healing does not conform to models of psychokinesis that support conscious intention as the operative agent. That is, healing outcome is not "willed" in the way that operators can bring about intended alterations in, say, the theoretical output of random number generators. Volunteer healers may have "intended" healing in that they went through some training in a healing technique and placed their hands around cages, but there are no cases of these healers having healing follow their wishes. Indeed, initial experiments proceeded under the assumption that if healing were to work, then mice that were treated shortly after being injected with cancer would avoid tumor growth altogether. In all cases, regardless of type of cancer, and regardless of how soon after injection treatment began, tumors grew, sometimes very large, before the process of ulceration and implosion commenced. The volunteer healers were successful in the outcome; they were upset and concerned when their mice developed tumors. Certainly, the pattern and stages of healing do not conform to the wishes of the healers.

The data output from the experiments, and the experiences of the healers, do not conform to anything like a direct PK effect. Instead, there is merit to thinking of healing as a non-directed outcome similar to that proposed by Jahn and Dunne in their M5 model for explaining their consciousness-related anomalies with random event generators and remote perception studies.[6] That model proposes the notion that the conscious mind might connect to the tangible physical world not directly, but by way of a circuitous route involving unconscious processes and intangible physical mechanisms. Further speculation involves a timeless and spaceless "Source" in which the unconscious and intangible merge.

While a full examination of the application of the M5 model to healing is beyond the scope of this discussion, let me simply say that the actual healing technique used in these experiments, as well as the subjective experiences of a selection of volunteer healers, is remarkably consistent with this model.[7] I would add, however, that a full explication of the usefulness of the model to understanding healing would actually and controversially minimize the importance of the conscious mind.

This article has been abridged and edited from a chapter entitled "Some Reflections on Consciousness, Intention, and Healing," in *Being and Biology: Is Consciousness the Life Force?* Edited by Brenda Dunne and Robert Jahn, ICRL Press, 2017.

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Alejandro Parra

Experiences at the End of Life In Nursing Homes

It has become the task of nurses and caregivers to make the end, the parting from the physical world of human beings, as pleasant as possible, for others as well as ourselves. During the last century, the manner of parting for old people has changed drastically.[1] Rather than being cared for within the family context, many elderly people now end their lives in nursing homes or hospitals. This institutionalization of the dying process means that medical staff have become the managers of how the elderly die[2] in a culture where death is often viewed as a mechanical process rather than a spiritually subjective journey.[3] But end-of-life experiences are being reported by doctors and nurses.[4–8] According to caregivers, these experiences are profoundly meaningful for the dying and help to ease the passage of death.

Existing reports of anomalous experiences by doctors and nurses[4–8] consist of visions, "coincidences," and other phenomena. Visions involve the appearance of dead relatives who have come to help patients and residents through the dying process, providing comfort to them and their relatives. Coincidences are experienced by someone emotionally close to the dying person but physically distant who is somehow aware of their moment of death, or says the person "visited."

These "visions" can occur in waking or dreaming states. Others describe seeing a light, associated with a feeling of compassion and love, surrounding the dying person. Both the imperative need to reconcile with one's life and the sometimes sudden lucidity from coma or dementia sufficient to say goodbye are also regarded as significant experiences. Nevertheless, the experiences of elderly patients are often diagnosed as being caused by confusion, dementia, or drug-induced hallucinations. This is confirmed by an Open University study of spiritual support for the elderly. Other than in nursing homes with a religious affiliation, few managers explicitly acknowledged the existential pain of the elderly, although

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they recognized that residents could be frightened of dying.[9]

The resounding message from many older people facing death is that they want to be treated as individual human beings, with emotions, feelings and spiritual needs, not as a machine that needs "fixing." In this context, questions arise about whether anomalous experiences are not just the province of those who die "before their time,"[4–8] but are also a profound part of the dying process irrespective of age or medical diagnosis.

In addition, "the sanitization of death," as Dr. Sherwin Nuland calls it,[10] has changed how relatives perceive the end of life. Rather than the traditional family wake in the front room where friends and family could gather around the body before burial, bodies are usually kept in funeral homes. From the deathbed to the grave, undertakers assume all the responsibility for handling the body. Society has therefore not only lost many traditional spiritually focused deathbed rituals and ceremonies, but relatives are often psychologically and emotionally removed from being receptive to the anomalous experiences of the dying or are afraid to speak about them for fear of being labeled "crazy."[10]

The Interviews

Between 2014 and 2016, I conducted interviews with nurses and care assistants about the end-of life experiences of the elderly as a follow-up to a questionnaire survey I conducted. A total of 450 questionnaires were sent to the nurses of elderly residents in a Buenos Aires nursing home. The nurse participants were recruited with the cooperation of the Nursing Department of each (the Principal Nursing Officers). They gave me permission to administer the set of questionnaires.[11] Some care assistants were also recruited from courses and seminars through nursing schools and health centers seminars, where the questionnaires were completed in a classroom setting with the permission of their teachers and directors.

After they completed the questionnaire, those who agreed to an interview were invited to take part in a tape-recorded session that lasted between 1 and 1½ hours. The interviewees were encouraged to talk freely about their experiences with dying residents. These interviews were transcribed verbatim to enable examination of how anomalous experiences may have affected the interviewee personally and professionally and to explore further training needs in order to enhance best practice for end-of-life care. Potential interviewees were approached through the management team. Ten responded, five of whom were trained nurses, including the matron and the undermatron, and five were care assistants, including a care assistant supervisor.

Hallucinations or Anomalous Experience?

All the interviewees agreed that listening to the manner in which patients spoke provided valuable information. One interviewee believed that when residents reported strange things, it was a signal. "When they say that they're seeing things, I feel they will go soon. So they need understanding and support."

Three interviewees talked about the difficulties of distinguishing between anomalous experiences and drug-induced hallucinations, dementia, and confusion. Said one care assistant: "It's hard to tell really because I don't know if the medication may cause them to hallucinate or make them confused. I know some drugs may cause hallucinations."

Another interviewee said that anomalous experiences and hallucinations might be the same thing. She cited an example of an elderly woman whose husband had died recently. The wife became ill, and after returning to the nursing home from the hospital, she began calling out to her dead husband. "She was always saying her husband's name, 'Bob, I am coming,' whenever she talked about her husband. I think sometimes it's because they have dementia, and that's the reason they have hallucinations like that."

Another nurse concluded that anomalous experiences were often a comfort to residents, commenting, "There's no fear at all." The interviewees explicitly cited examples where anomalous experiences provided great comfort to the dying in contrast to the anxiety caused by drug-induced hallucinations.

Seeing Children

Four interviewees reported residents seeing apparitions of children shortly before they died. One interviewee spoke about a resident who had been confined to bed because her condition was deteriorating. Apart from anti-inflammatory drugs for rheumatoid arthritis, the resident was not taking medication. "She was dying and she had brightened up considerably. She said she had seen children playing in her room, two or three of them. She didn't say if they were male or female, she just said children . . . she was very clear about it." The resident had not been frightened even though she had seen the children during the night. It was a comfort to her. She died a couple of days later.

One care assistant spoke of a resident seeing children going past the window of a room that was on the second floor of the nursing home; it was impossible for children to be outside the second floor. Again, the children appeared to provide comfort to the elderly person. The resident died a few weeks later.

Another care assistant described how a resident saw a group of children at the end of his bed. He could also hear old-fashioned playground music playing and was reassured by it. "I think he was seeing the children from when he was at school. It was in the war and [he told me] they had little black shorts on. He said, 'They're waiting for me. I can see them now, they are calling for me.'" At the time, even though the caregiver had participated in an end-of-life training program, she was concerned with how to deal with the situation. She wanted to go and fetch help but realized the resident did not want her to leave. She understood it was more important to stay with the resident, irrespective of feeling out of her depth

Another interviewee spoke of a female resident seeing a little girl dressed in a yellow cotton dress with flowers. The resident died a couple of days later. (Incidentally, this interviewee also said that her own mother and father-in-law both spoke of seeing children shortly before each died.)

Change of Room Temperature

Four interviewees spoke about experiencing a change in room temperature or atmosphere at the time of death, or shortly after. One said, "Sometimes the room is freezing. At other times it is really, really hot. Opening a window often helps. You feel a calm going out of the window."

One care assistant spoke of a physical sensation after one resident died. "I felt ever so warm and it was nice." Another interviewee experienced the same warmth, but described it as "Like a feeling when you give love to someone, there's that kind of feeling of warmth and peace . . . I feel as though I am connected to it . . . Sometimes it's there when you're laying them out, there's a feeling that you are doing something for them. When I go off to do other things and come back, it's not there so therefore it may be momentary."

Dreams

Eight of the nursing home's interviewees also spoke about the power and impact that dreams can have to prepare for death. A nurse spoke of a resident whose dream, she believed, indicated his impending death. "He said he saw animals he had owned during his life that were obviously dead. He felt they were waiting for him." Greatly comforted, the resident died within the week.

Another nurse spoke of a relative being awoken by a dream in the middle of the night telling her that her mother was dying. The relative arrived at the nursing home at 4 o'clock in the morning and sat beside her mother until she died at 7 o'clock. Without the dream, the relative would not have been present at her mother's death.

It could be argued that dreams also act as a bridge between the care giver and the cared for. An example was given by one interviewee concerning a resident she had grown close to. "In the dream, he was sitting in a chair facing me. He asked me if I was coming to his funeral to give him flowers if he died." The interviewee told a colleague about the dream and said she believed the resident would die shortly. But because it was a dream, the colleague did not believe her. Yet, the resident did indeed die the next week.

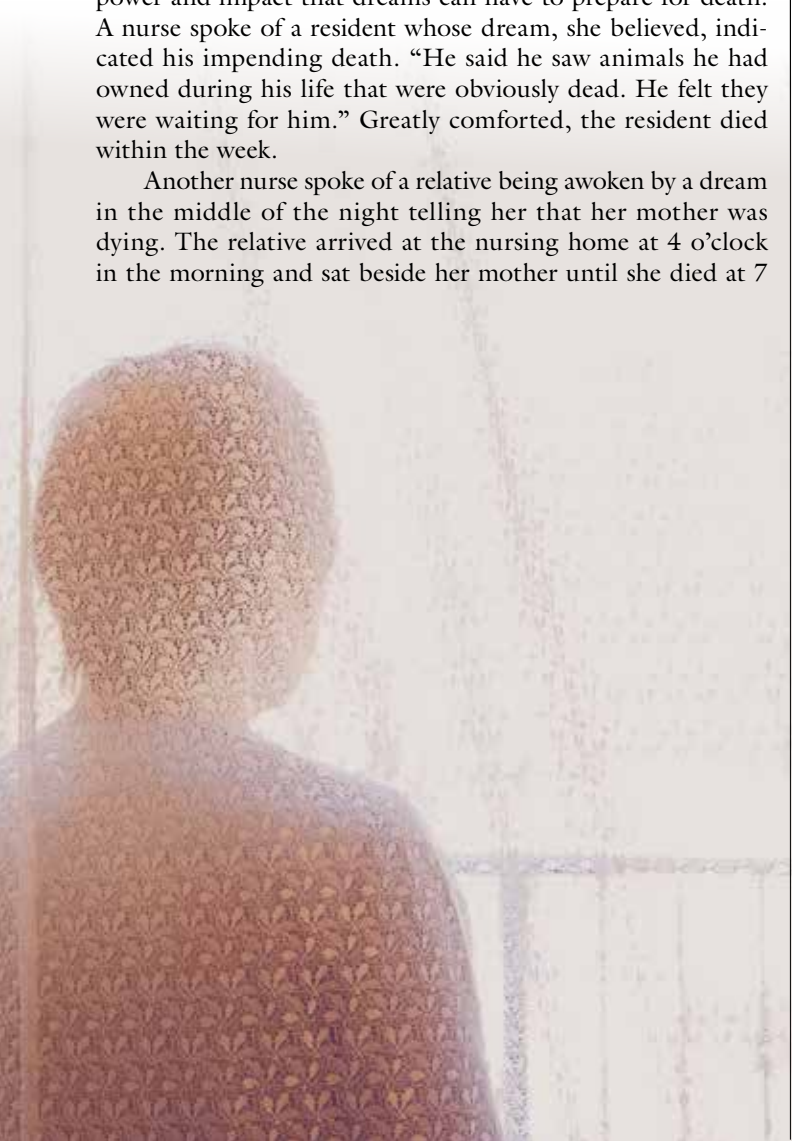
One nurse described a strange waking dream concerning a resident of whom she had grown very fond. The resident's beloved husband had died a year previously. The resident's health had subsequently deteriorated, and she was no longer able to walk. The nurse had gone home after tending to the resident during her dying process. While taking a bath, the nurse had an image of the resident standing with her dead husband holding his arm with a wonderful smile on her face, "She was saying to me, 'I can walk now!' It was odd, but very comforting."

Animals anticipate death

A frequent experience reported by caregivers and nurses in nursing homes are the behaviors of some animals, such as birds and cats, in the vicinity of a dying patient. Animals seem to sense certain information before humans do. Rupert Sheldrake,[12] who analyzed 2,500 cases of unexplained behavior in animals, distinguishes three main types: telepathy, sense of direction (e.g., animals that can return home from places many miles away), and premonitions (e.g., animals that have anticipated a natural disaster and have fled the threatened area). I also found testimony from family members of hospitalized patients whose dogs barked and were very restless close to the moment of death of the resident.

One nurse told of a cat that was prowling in the hospital park and walking around the residents' room windows: "Some patients fed him through the windows. One night, the cat was very insistent to enter the room of Mary, a tracheostomized patient, and although I threw it out, the cat insisted, again and again, to enter through the window. The next day, I found out that the patient had cardio-respiratory arrest and died . . . Even in some rooms, when the cat visited a room, you had to see where it was because it went right to the service with the most serious patients, some of them which are terminals. The cat had the habit of circling around some patient, and this indicated that someone was going to die. For example, Ruda, a patient who had had a car accident and had been in a vegetative state; the cat was hanging around the window of her room and the patient, a few minutes later, passed away."

A nursing home nurse in Buenos Aires recalled: "It was summer and a beautiful, bright white dove perched on the bedside of an elderly patient. My companion and I watched in stupor as the dove remained for a long time asleep, next to the old woman, who closed her eyes, and minutes later passed away. This event surprised us a lot. Immediately afterwards, we



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experienced a scent of roses, very intense, that disappeared in the same way as the strange and beautiful dove arrived."

A more persuasive story concerned an account of a resident's cat, which the interviewee found very significant. The cat had come into the nursing home with the resident and always slept on the resident's bed. The interviewee was present when the cat came into the room at the moment the resident died. "Its hackles went up. It shrieked, and it just sped around the room a couple of times and then it shot out of the room as though it didn't want to be there." The interviewee is convinced the cat sensed the "spirits had finally come for the resident." Of interest are reports of the antics of Oscar the Cat, as recounted by Dr. David Dosa, a geriatrician at Rhode Island Hospital. He claims that Oscar has an uncanny ability to predict when elderly residents are about to die.[14]

Lucid Moments[13]

Seven interviewees reported residents who had dementia and confusion becoming lucid in the last few days of life. This is an experience that Karlis Osis and Erlendur Haraldsson drew attention to in their 1977 study.[4] One nursing home interviewee explained: "It happens quite often… they just seem to awaken and are able to acknowledge who is with them and sometimes say things." The interviewee continued with her own personal story: "It happened with my mother. She had dementia and didn't really know any of us before the end. But for the last 24 hours she certainly did... just before she died she said to me 'I love you.'"

Another nurse said, "Very often, before the person dies, they will rally round and can open their eyes and have a conversation which they haven't been able to do for the past couple of days. It's a little spooky sometimes if somebody has been practically unconscious. But then they will just open their eyes and say a few words and say hello to the person who is there. I wouldn't say alert, but certainly peaceful."

Other interviewees reported how residents who were physically incapacitated suddenly were able to pull themselves up and or do something that they normally would not have the strength to perform. Several of the interviewees told the remarkable story of a resident who had severe spinal fusion to the extent that the resident could only look at the floor. "A couple of days before she died," said one of the interviewees, "her head was up and she could look out of the window. She [the resident] said 'Oh I can see the house over there.'" The nurses were so delighted, they wheeled her to the window so she could enjoy the view for the first time in years. She died shortly after. One of the interviewees described this phenomenon as a suddenly burst of energy, enabling the resident to communicate to those present for the last time.

Need for Reconciliation

Five interviewees found a resident's need to right past wrongs as anomalous. One resident became increasingly agitated about her estrangement from her daughter. "She wanted to sort everything out with her daughter. She just wanted to get

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everything settled," said an interviewee. The nursing staff arranged for the daughter to visit the resident. "They were fine, and then she passed away," the interviewee concluded.

Another interviewee told a moving story about an elderly resident who had been abused as a child. The resident was a bitter woman who had never married, and her whole life had been colored by what had happened to her. "Only before she died did she tell one of the caregiver what had happened. Nobody had ever been there for her to resolve it. Once she told the caregiver, who she particularly liked, she was fine. Everything fell into place as to why she'd been so bitter." Commented an interviewee: "It's mostly the people who have a fear that's not resolved who don't seem to have a good death. But you don't often see people when they die look anxious or anything. Their faces relax and they almost look like they are smiling."

Physical phenomena

All the interviewees also spoke about what might be described as paranormal incidents, such as lights going on and off in the room of a resident who had recently died. Others reported an episode involving a bell in the room of a resident who had died. This phenomenon was also reported by Deborah O'Connor.[8] The bell mysteriously continued to ring on the day of the resident's funeral, even though no one else was in the room. "Well," responded one interviewee to her colleagues at the time, "he's saying goodbye then, isn't he?"

One interviewee remarked she had been pushed on the shoulder after she had entered the room of a resident who had died. "I remember I thought I had tripped and it's just like a sensation coming from my shoulder. A lot of things happen at night when residents are dying." Another time, the same interviewee had sensed someone coming into the room while she was laying out a body and had heard footsteps in the corridor although no one was there.

One nurse spoke of seeing an apparition while she was working in another nursing home. She was having a tea break

with colleagues around mid-afternoon and looked up at the doorway to see a lady walk past in a nightdress. The interviewee quickly got up to run after the lady because she thought the resident was going to get out the front door. But when she looked down the corridor, no one was there. "She was as real as you are," she said to me.

Residents also reported seeing apparitions. One of the interviewees reported, of a person who had died, that "After a few days his former roommate saw him sitting there in his usual chair. He saw him and he told the nurses." The second interviewee had gone to collect the dead resident's clothes from his room. Again the roommate, who was not on any medication, told her the same thing. "You know that man came back! Yes, I know he is dead. Why is he still there sitting in the wheelchair?" The interviewee was scared.

Most of the interviewees appeared to be unfazed by these strange afterlife presences. One interviewee said, "Staff need to have an understanding that what the person is seeing is real to them, and so they then must be able to discuss it and not make the person feel that it's not real." Several interviewees also said they believed the residents are not frightened by what they see. "It's as if they are seeing real people. I didn't believe in ghosts and things like that, but it's always on my mind because a lot of residents have these experiences and tell me or ask me about them." Other interviewees reported personal stories by the residents of seeing dead relatives.

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Final Thoughts

In line with reports from the present study and from O'Connor's investigation with palliative care nurses, the nursing home interviewees considered anomalous experiences to be neither rare nor surprising. The many new ideas revealed in this report will help us conduct a wider survey of other nursing homes in the future.

The anomalous phenomena reported to us seem to be powerful subjective experiences that hold profound personal meaning for those who experience them. It could therefore be argued that although the end-of-life for the elderly is becoming increasingly institutionalized in hospitals and residential homes,[3] the dying process itself has not been affected by this institutionalization. In addition, the nursing home interviewees told us that unconscious residents often seem to possess the capacity to wait for the arrival of beloved relatives before they died.

The aim of these interviews, which followed the study I did with Paola Gimenez Amarilla on anomalous experiences related to nurses in a hospital,[11] was to determine the extent of occurrence of certain types of anomalous perceptual experiences and their relationship to the nurses' job stress, the residents' proneness to hallucination, and their psychological absorption. Those with hallucinations and a high level of psychological absorption tended to score higher for anomalous/paranormal experiences compared with those who did not report such experiences.

Generally speaking, the information that most people have about these experiences and their association with psychiatric disorders leads to prejudice and resistance to providing data. Thus, there are a number of drawbacks connected with this research in hospital settings as they are conservative institutions, unlikely to be open about their population and even more so with respect to providing information relating to the subject of this investigation. The nurses did reveal their personal and professional experiences and those of their patients, noting that they considered experiences of paranormal phenomena within a hospital setting not to be infrequent or unexpected. They were not frightened by their patients' experiences, or their own, and exhibited a quiet confidence in the reality of the experiences for themselves and the dying person. Acceptance of these experiences, without interpretation or explanation, characterized their responses.

By reassuring them that the occurrence of paranormal phenomena was not only common but also a comfort to the dying person, we may assist nurses in normalizing a potentially misunderstood and frightening experience. The response of health professionals, specifically nurses, to anomalous experiences is an area not widely reported. Even palliative care literature is mostly silent on this topic.

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‘BACKSCATTER’

Henry Bauer

Should Any Subject Be Off Limits to Science?

I used to think that no subject should be off limits to science. Discovering that science does in fact ignore or even shun some topics led eventually to a change in my academic career, from chemistry to science & technology studies (STS); to active participation in the Society for Scientific Exploration; and later still to joining HIV/AIDS dissenters. Which all helped me learn what science really is and what it is not.

Like my fellow budding scientists in the 1940s and 1950s, I had been in awe of what science had accomplished, in ending World War II with atomic bombs and not forgetting penicillin, sonar, radar, and more. We could imagine nothing better than contributing to further advances, helping science find answers to all the questions human beings could ask.

I also read very widely. The local library had a large bin for returned books, and I used to browse in that bin, presuming that what had just been read was probably worth reading. One day I picked up *Loch Ness Monster* by Tim Dinsdale, about what I then knew—and just about everyone still knows—is a hoax by the Scottish Tourist industry. But the book included some still photographs from a film that raised the unlikely possibility that the Loch Ness Monster might be somehow real after all. I borrowed and read the book, and wanted more information, properly scientific and authoritative information—and was taken aback that I could find nothing at all about it in the scientific literature; encyclopedias had just short entries confirming what everyone knew, that Loch Ness Monsters were not real animals.

But how had science demonstrated that? And how did everyone come to know that? Quite generally: How does society as a whole learn what science has found? Who decides what science has found?

Those nagging questions led me eventually, as I said, to change my academic career from chemistry to science studies, an interdisciplinary mix of the history, philosophy, sociology of science as well as economics, political science—whatever relates in some way to science in today’s world, where “science” is looked to for answers and advice about everything under the sun. And so I came to learn what science really is and why science has taken no interest in Loch Ness Monsters.

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What, Who, and How

What is science? For us science students half a century ago, and for many people right up to the present time, “science” means the disciplined, evidence-based study of everything that human beings encounter or observe. But that omits an essential ingredient: Who is carrying on the studies? How are they doing that?

Scientists in the 20th century were not investigating claims about Loch Ness Monsters because scientists in the 20th century (and to the present time) worked at science *professionally*, making their living at it. That means they can study only those things for which they are able get the needed resources; moreover, things whose pursuit offers a reasonable chance of getting useful results, thereby giving careers a boost. The accumulated folk knowledge about Loch Ness Monsters, however, indicates that sightings are rare, and that whole careers could pass by in waiting for useful data. No reasonably practical and available method seems up to the task.

Science was not always a profession, of course. What’s generally called “modern” science dates from about the 17th century when those doing “science”—trying to understand how the natural world works—were driven by curiosity and not by career considerations. How drastically science has changed since then is not widely enough appreciated.[1]

“Should any subject be off limits…” asks about ethics, about values, about what would be desirable. As with any value-loaded issue, people may differ over the answer. More agreement might be attainable by asking, “Is science capable of studying everything that humans might want to know about?” Even more to the point, “Is science capable of finding useful answers for everything that humans might want to know about?”

Insisting what science should do will be whistling in the wind if it concerns something that science is incapable of doing. Recognizing what science is—rather than stating what it should be—makes clear what science's limitations are and how to gauge its trustworthiness on specific issues.

Methods, Facts, Theories

There are three necessary, interacting aspects to science: methods, facts, theories.[2] Viewed in those terms, one can see why some things are and others are not accepted within organized science (the contemporary scientific community and science-related institutions and organizations);[3] and one can gain insight into what is wrong with some current mainstream views that are vigorously contested by informed scientific minorities (HIV/AIDS, global warming), but that's a topic for another day.

New observations and measurements made by standard methods and that seem explainable by currently accepted theories are quite readily accepted into organized science, expanding the range of accredited scientific knowledge. That is what Thomas Kuhn labeled "normal science," and it is what most scientific work consists of. Sometimes, though, and often without the researcher's intent, something turns up that doesn't seem to fit, that's anomalous in some way. Such oddities are usually brushed aside as distractions from what is being aimed for; but if similar disparities pile up and become un-ignorable, they may force a change in accepted views. Kuhn labeled such episodes "scientific revolutions" that mark major advances (and it's too often forgotten that they also reveal earlier beliefs to have been flawed). Every science can point to more-or-less discrete matters that were revolutionary in this sort of way: that burning is the uptake of oxygen and not the release of "phlogiston," say; or that atoms are not permanently stable and indivisible.

As with social or political revolutions, scientific revolutions are not welcomed by the powers that be, in this case the scientific community and its scientific consensus.

The history of science suggests that scientific revolutions typically involve just one aspect of science. For example, the facts obtained by standard methods may be unexpected, say, yet not incompatible with overall theory; that one of the "inert" gases could form compounds after all was surprising, but standard methods could achieve it and the result called for no significant change in the theory of chemical bonding; or that "inorganic" chemicals could be combined to form the "organic" compound urea again called for no change in chemical methods or theories (it had earlier been believed that there was something special about compounds isolated from living matter). Perhaps the best known scientific revolutions are those involving new theories that handle existing facts obtained by standard methods in a startlingly new way: relativity, say, or natural selection as a mechanism for biological evolution.

Beware of Novelty

Sometimes a researcher may claim novelty in more than one of the three aspects of science. The scientific community is then highly wary. Molecular biologist Gunther Stent has described some such episodes as "premature" discoveries. For instance, a physician and medical researcher named Oswald Avery demonstrated in the 1940s that bacterial species could be transformed by DNA from another species, but this was before DNA had been identified as the carrier of hereditary information; so the method was unconventional and there was nothing in accepted theory to explain the result—novelty on two counts. Again, Gregor Mendel's discovery of quantitative laws of heredity in the 1860s was at a time when analyzing biological matters mathematically was a new departure, and of course there was no way to explain the results under contemporary ideas on heredity, again novelty on two counts. So Mendel's work was not taken further until re-discovered some four decades later. Avery was given some credit a decade or more later, once James Watson and Francis Crick had shown how DNA could incorporate genetic information. Another premature discovery would be Alfred Wegener's suggestion (~1912) that the Earth's continents had moved, because fossils and geological formations on opposite sides of the Atlantic, in South America and Africa, are so strikingly similar—a very novel method, comparing such things across oceans, and no theory to explain the force or mechanism that could generate continental motions; it was half a century before the scientific consensus accepted this, and only after physical evidence of moving ocean floors had been observed.

Least acceptable, of course, are claims that offer new facts obtained by unconventional methods and apparently incompatible with contemporary theory—for example, and where I came in, claimed evidence for the real existence of unknown aquatic animals in Loch Ness. Biology recognizes a species when it has a specimen, not on the basis of eyewitness testimony, photographs, and traces on sonar charts; moreover, the descriptions of sightings paint a picture of creatures like the plesiosaurs, which roamed the oceans up to about 60 million years ago, living largely at or near the surface. Unconventional methods, doubtful facts, no theoretical basis in the tree of life. No wonder that the scientific consensus labels the quest for Nessies a pseudo-science.

So being as careful about gathering evidence as science is supposed to be is not in itself enough to gain acceptance. It is unlikely that any mainstream organization will take evidence seriously unless it has been obtained by recognized techniques and fits into contemporary theories. Even when well-established scientists work in conventional ways at studies not considered part of science, it is more likely that they will be denigrated than that their work gets taken seriously. Inventor and lawyer Robert Rines had obtained underwater photographs at Loch Ness with the help of highly regarded photographic expert, Charles Wyckoff, and further assistance from Harold Edgerton, lauded electrical engineer and master of strobe photography, winner of many honors including the National Medal of Science; yet those collaborations with recognized experts did not bring Nessie into the realm of recognized science.

So looking at science in terms of its aspects of methods, facts, theories, leads to rules of thumb about what is likely to be acceptable to organized science, the scientific community.

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Giving Unorthodox Work a Second Look

But back to the question, should any subject be off limits to science?

Since science is present-day society's authority on acceptable knowledge, of course no subject of interest to human beings should be off the table. However, the fact is that there are subjects that contemporary science shuns. The question then becomes, how to inveigle science into looking into the sort of matters that it has tended to shun?

Key would be to find the right incentives. As George Mason University economist Gordon Tullock noted long ago, science nowadays is driven not by the native curiosity of truth-seekers but by "induced curiosity," offering benefits or rewards for those who display the appropriate curiosity in the desired direction.[4] Accordingly, one way to have scientists look into unconventional topics might then be to offer sufficiently attractive rewards for useful answers, say, a large prize for succeeding at what Rines tried at Loch Ness, locating and recovering what might be remains of carcasses on the lake's bottom. However, that could not bring work by those who need immediate and continuing resources to support their research. A more widely effective mechanism would be to offer through existing channels support for flagrantly unconventional research. Could it ever be feasible for established, bureaucratic institutions to harbor and facilitate unorthodox work?

Perhaps. For instance, the determination of influential politicians succeeded in having established within the National Institutes of Health an Office of Alternative Medicine (1992), which led in 1998 to the National Center for Complementary and Alternative Medicine (renamed the National Center for Complementary and Integrative Health in 2014). Some of its sponsored studies debunked commonly touted claims,[5] but others found benefits from approaches often denigrated as pseudoscience: acupuncture did help some people suffering from osteoarthritis, and chelation therapy did benefit some people who had suffered heart attacks.[6] The National Institutes of Health also offers grants under the High-Risk, High-Reward Research Program. The Department of Defense sponsors unorthodox studies through the Defense Advanced Research Projects Agency (DARPA).

Another possible way to fund unorthodox work (suggested long ago by someone, I cannot now recall who) might be to require that some portion, say 10%, of available research funds in every field be designated for studies that are in some manner unconventional. An approach more directly pertinent to the question in this essay's title, though, would be to establish "a dedicated program of federal funding of research in response to public interest."[7]

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3 Of course, anyone can attempt "disciplined, evidence-based study" of anything at all; but if the outcome isn't accepted by the institutions of the scientific community, it could hardly be said to be part of "science," the contemporary scientific consensus.

4 Gordon Tullock, *The Organization of Inquiry*, Duke University Press, 1966; Liberty Fund reprint, 2004.

5 St. John's wort not effective against depression; echinacea not effective against common colds.

6 National Center for Complementary and Integrative Health, NCCIH Timeline; https://nccih.nih.gov/about/nccih-timeline.

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