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Estimates of Optical Power Output in Six Cases of Unexplained Aerial Objects with Defined Luminosity Characteristics¹

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Abstract — An analysis of six cases of unexplained aerial phenomena observed by qualified observers over a twenty-year period in various parts of the Earth and in known physical conditions yields estimates of optical power output ranging from a few kilowatts to thousands of megawatts. This paper surveys the methods by which this parameter can be derived from witnesses' statements, it discusses the various hypotheses one could propose to account for the observations and it calls for a broad re-examination of sighting files in an effort to apply this methodology to a larger sample and to better understand the luminosity characteristics of the reported objects.

Keywords: UFOs — UFO sightings — physical evidence

Introduction

Some of the most striking statements made by witnesses of unusual aerial objects during their debriefing by investigators have to do with the luminosity of the phenomenon. They frequently use expressions like "it lit up the whole landscape" or "every object in the area stood out, intensely thrown into relief." Beyond these subjective statements (which could be affected by physiological and psychological factors) it is difficult to obtain reliable quantitative data on the power output of the observed objects. Typically the witnesses are surprised by the phenomenon and it is rare for them to have any basis of comparison or calibration. A few such cases do exist, however, and a special effort has been made here to derive estimates from the data.

Obvious cautions are immediately raised by this exercise. By definition the source of the luminosity is an unknown phenomenon. We do not know if the light is a primary manifestation of its internal physical state (as would be the case for the sun) or a secondary one, as would be the case for the moon or an automobile headlight. We do not even know if most of the electromagnetic energy is released in the visible domain to which human witnesses and most cameras react.

Given these cautions one can, at best, hope to bracket a physical range to characterize the phenomenon in question. More relevant than the actual

¹Presented at the Physical Evidence Related to UFO Reports Workshop, Tarrytown, New York, Sept. 30-October 3, 1997.

numerical values obtained in a few cases is the methodology involved in acquiring and processing such parameters.

Case Studies

The cases that follow have been extracted from a larger sample where luminosity or power output data could be obtained. We have excluded some extreme cases (such as the Tunguska explosion of 1908 in Siberia) and all cases involving a single observer, leaving six adequately documented and researched incidents with multiple witnesses. In cases no. 2 and 3 the primary witnesses are known to the author, who has interviewed them personally. In case no. 4 the author has visited the site. In other cases we rely on the data assembled by qualified investigators, all of whom are known to us.²

Case no. 1: August 27, 1956. McCleod, Alberta (Canada) — Classification: MA-1³

The witnesses in this MA-1 case are Royal Canadian Air Force pilots who were flying in a formation of four F-86 Sabre jet aircraft (Figure 1). The planes were flying at 36,000 ft (about 11 km), headed due west over the Canadian Rockies, about an hour before sunset.⁴ As they were approaching a large thunderhead R. J. Childerhose, the pilot in the second position (left side of the formation) saw a "bright light which was sharply defined and disc-shaped" or "like a shiny silver dollar sitting horizontal," far below the planes but above the lower layer of clouds. It appeared to be "considerably brighter than the sunlight." (Figure 2.)

Sighting duration was variously quoted at 45 seconds (Klass, 1968) to three minutes. The pilot reported the observation to the flight leader, then took a photograph of it. That photograph, a Kodachrome color slide, was subsequently analyzed by Dr. Bruce Maccabee who considered the hypotheses that the object was a cloud, a plasma phenomenon, or ball lightning (kugelblitz). We refer the reader to his detailed study⁵ while presenting here only a summary of his arguments.

The cloud hypothesis was contradicted by two facts, namely the equal brightness of the object on both sides as opposed to the darker appearance of clouds away from the sunlight, and the fact that portions of the object were brighter than the brightest clouds.

The plasma or ball lightning hypothesis has been mentioned by Klass (Klass, 1968) and by Altschuler (Altschuler, 1968). It is contradicted by the radiance of the object and the duration of the observation. Maccabee derives

²The author is particularly indebted to Dr. Claude Poher, Dr. Bruce Maccabee, Dr. Illobrand von Ludwiger and Mr. Jean-Jacques Velasco who made investigation reports available for this study.

³The classification scheme (e.g. MA-1) was presented in a previous paper by Vallee.

⁴R. J. Childerhose: Affidavit written in May 1958, and private communication to Dr. B. Maccabee.

⁵Maccabee, Bruce. "Optical Power Output of an Unidentified High Altitude Light Source." Private communication.

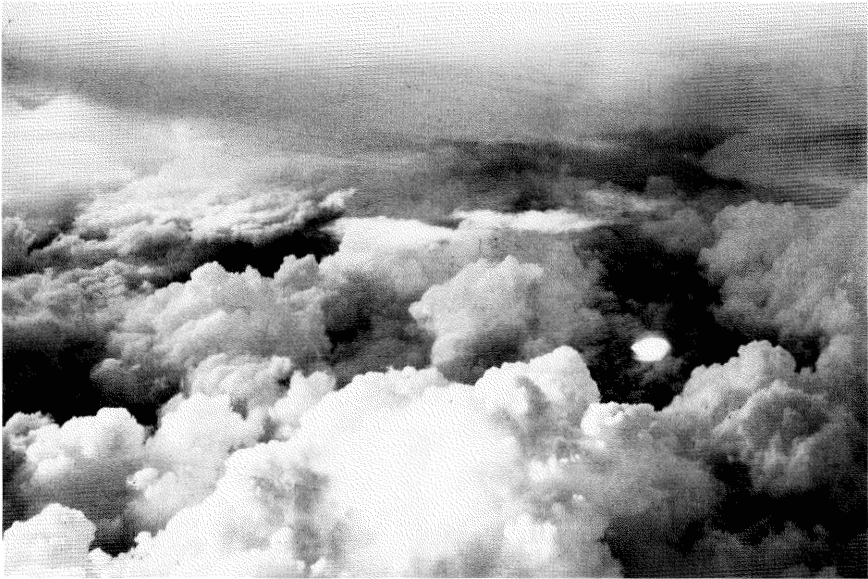


Fig. 1 Photograph of an unidentified high altitude bright light source. Picture taken by Royal Canadian Air Force pilot R. J. Childerhose on August 27, 1956 from an altitude of 36,000 ft (app 11 km). The object was higher than app. 4 km and was observed for more than 45 sec. If acting as an isotropic Lambertian radiator, the power output within the spectral range of the film would have been in excess of 10^{10} W (Courtesy of Bruce Maccabee)



Fig. 2. Childerhose was flying west in the second position (left side) of a formation of four F-86 Sabre jets of the Royal Canadian Air Force. (Courtesy of Bruce Maccabee)

the radiance L by solving the standard photographic equation, corrected for the effects of atmospheric attenuation:

$$L = 4Ef^2 \exp[(b-a)/\cos\theta] / T \cos^4\phi \quad (1)$$

where

$$E = H/t. \quad (2)$$

H is the film exposure level in J/cm^2 and t is the shutter time in seconds. L is the radiance of the object in the direction of the camera in W/sr/cm^2 , E is the irradiance on the focal plane of the camera in W/cm^2 , and f is the ratio of the focal length to the diameter, as set by the operator of the camera. The factor $\exp[(b-a)/\cos\theta]$ corrects for atmospheric attenuation, b being the optical thickness of the atmosphere from the ground to the altitude of the plane, a the optical thickness to the altitude of the object and θ the zenith angle of the slant path from the plane to the object. T is the transmission of the optics (aircraft window and lens) and ϕ is the angle between the optic axis of the camera and the optical path from the lens to the image.

We refer the reader to Maccabee's analysis for an excellent discussion of the range of values of these parameters. He finds a value between 1.09 and 1.34 for the attenuation correction factor, a value of 0.7 for T , shutter time of 1/1125 at $f/8$ and a value of 0.95 for $\cos^4\phi$. The average density over much of the image is estimated at 0.12, leading to a value of $H = 10^{-4} \text{ J/cm}^2$.

Inserting these values into (eq. 1) and (eq. 2) gives estimates of radiance of 1.7 to 2.0 W/sr/cm^2 if the object was at distances of 6 or 20 kilometers, respectively. Assuming that the object was a Lambertian emitter with constant emittance over its surface, Maccabee finds a range of $2.5 \times 10^9 \text{ W}$ (2,500 megawatts) to $3 \times 10^{10} \text{ W}$ (30,000 megawatts) for the power output within the spectral range of the film. As he rightly points out, however, "the total power emitted over all frequencies might be much greater."

Case no. 2: September 1965. Fort-de-France (Martinique) —
Classification: MA-1

On July 1, 1965, two French submarines, the *Junon* and the *Daphné*, escorted by the logistic support vessel *Rhône*, left the Toulon navy base in the Mediterranean and sailed toward Gibraltar. The ships traveled first to La Horta in the Azores, then to Norfolk, Virginia, to conduct a series of joint operations with the U.S. Navy, which was engaged at the time in the recovery of a Gemini capsule near Bermuda; the French submarines escorted the aircraft carrier *Wasp*. Later the ships went through Hurricane Betsy, whose effects they avoided by diving to three hundred meters. On the way back to France they stopped for ten days at Pointe-à-Pitre, Guadeloupe, and for one day at Saintes before reaching the island of Martinique, where they anchored in late September 1965.

It was during their layover in Fort-de-France one evening, by a dark sky and

clear weather, that a large luminous object arrived slowly and silently from the west, flew to the south, made three complete loops in the sky over the French vessels, and vanished like a rapidly extinguished light bulb (Vallee, 1990).

The person who reported this case to us, Mr. Michel Figuet, was at the time first timonier (helmsman) of the French fleet of the Mediterranean. He observed the arrival of the object from his position on the deck of the submarine Junon. He had time to go up to the conning tower, where he took six pairs of binoculars and distributed them to his companions. There were three hundred witnesses, including four officers on the Junon, three officers on the *Daphné*, a dozen French sailors, and personnel of the weather observatory.

All witnesses aboard the Junon saw the object as a large ball of light or a disk on edge arriving from the west at 9:15 p.m. It was the color of a fluorescent tube, about the same luminosity as the full moon. It moved slowly, horizontally, at a distance estimated at ten kilometers south of the ships, from west to east. It left a whitish trace similar to the glow of a television screen.

When it was directly south of the ships the object dropped toward the earth, made two complete loops, then hovered in the midst of a faint "halo." (Figure 3).

Mr. Figuet told the author that he observed the last part of this trajectory through binoculars; he was able to see two red spots under the disk. Shortly thereafter, the object vanished in the center of its glow "like a bulb turned off." The trail and the halo remained visible in the sky for a full minute. At 9:45 p.m. the halo reappeared at the same place, and the object seemed to emerge as

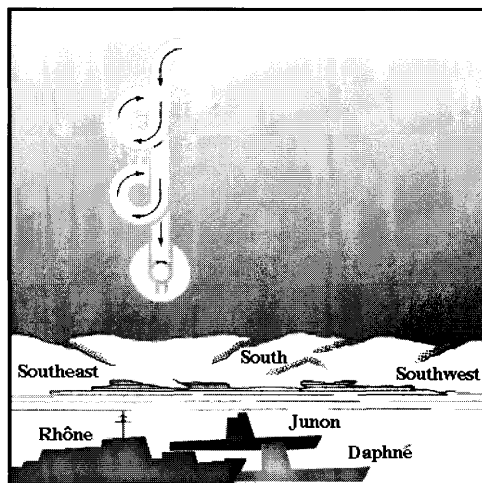


Fig. 3. The harbor at Fort-de-France.

if switched on. It rose, made two more loops and flew away to the west, where it disappeared at 9:50 p.m. The next day Mr. Figuet compared notes with a communications engineer who had observed the same object from the Navy fort. Together, they called the weather observatory at Fort-de-France. The man who answered the call had also observed the object. He stated that it was neither an aircraft, nor a rocket.

In 1988 the author was able to interview Michel Figuet in Brussels. He confirmed the maneuvers and the appearance of the object and stated that he had met again with some of the crew members whose recollections of the facts were equally precise. A landscape illuminated by the full moon receives 0.318 lux, or $1.8 \times 10^{-3} \text{ W/m}^2$. Since there is agreement among the observers that the object had approximately the same brightness as the full moon and was situated about 10 kilometers away, we can compute its total luminosity as:

$$P = I \times A \quad (3)$$

where I is the intensity in W/m^2 and A is the area over which light is spread.⁶

Here,

$$P = 1.8 \times 10^{-3} \times 4 \pi r^2 \quad (4)$$

where $r = 10,000 \text{ m}$, which gives $P = 2.3 \times 10^6 \text{ W}$ (2.3 megawatts).

Case no. 3: December 30, 1966. Haynesville (Louisiana) — *Classification*: CE-2

The third case is drawn from the official U.S. files. It took place at 8:15 p.m. on December 30, 1966, in the vicinity of Haynesville, Louisiana. The witnesses are a professor of physics, Dr. G., and his family. Inquiries with the weather bureau disclose that the weather was overcast, with fog and a light drizzle, ceiling about three hundred feet, all parameters that are in agreement with the witnesses' statements. There was no thunderstorm.

In early 1967 the author came across this sighting while reviewing the files of the U.S. Air Force as an associate of Dr. J. Allen Hynek at Northwestern University. The report by Dr. G. and his family had not been followed up by Air Force personnel, so we decided to pursue it on our own. Dr. G. told Dr. Hynek and myself that he was driving north that night on U.S. Highway 79 between Haynesville and the Arkansas border when his wife called his attention to a red-orange glow appearing through and above the trees ahead to their left. They continued to observe it as they drove down the highway. It appeared as a luminous hemisphere, pulsating regularly, ranging from dull red to bright orange, with a period of about two seconds. There was no smoke or flame that would have been characteristic of a fire.

⁶The author wishes to thank David A. Newton for bringing to his attention some important corrections and improvements to his initial calculations in this case and those that follow. (Private communication, August 8, 1993).

When the car came to a point about one mile from the source of the light, it suddenly brightened to a blinding white, washing out the headlights and casting sharp shadows. This burst of light not only forced Dr. G. to shield his eyes, but it woke up his children, who had been sleeping in the back seat. After about four seconds it returned to its red-orange appearance.

Several sightings were described by other persons in the area. One witness reported that about six days before a similar bright light had been seen near the same location.

When the University of Colorado received funding from the U.S. Air Force for a scientific study of UFOs, the author called Dr. Edward Condon's attention to this case. A field investigation was conducted by several scientists from Boulder but failed to locate the actual site. Dr. Condon concluded in his published report that the case was "of interest," and it remained as one of the many unidentified sightings in the University of Colorado files (Condon, 1969).

After the University of Colorado project was disbanded and after the Air Force, following its recommendations, closed down its own Blue Book, study of the case was resumed on a private basis. We came into contact with a qualified investigator, Mr. W., who had also pursued his own research with Dr. G. Through them the author learned that Mr. W. and Dr. G. had pinpointed the actual site where the object had hovered. The area in question is a clearing about thirty feet in diameter, located to the west of some railroad tracks. The chief dispatcher stated that no rolling equipment was within fifty miles of the location that night. The nearest high-tension power lines are about nine miles away to the west.

All the trees at the periphery of the clearing exhibited a blackening or burning of the bark in a direction pointing to the center of the area, as if they had been exposed to an intense source of radiated energy. Clearly we would like to know whether the wood was burned by light energy, direct heat, or chemical combustion. From an estimate of the energy required to produce the depth of the burn it may be possible to estimate the power of the source, assuming it was located in the center of the clearing fifteen feet away. However this work has not been done.

Fortunately, there are other ways to arrive at a power estimate, as Dr. G. realized when he saw that the light from the object washed out his own headlights about ten feet ahead of the car. This enabled him to equate the intensity of the unknown object, which is given by its power output divided by the square of the distance, to the intensity of his headlights, which is given by their power output, known to be 150 watts, divided by the square of ten feet. This gives a lower limit for the power output of the UFO.

The Condon report, which reprinted Dr. G.'s calculations, uses the very simple formula:

$$P=150d^2 \quad (5)$$

where d = distance between the car and the object.

This formula is arrived at as follows: Calling I_c the intensity of the car headlights at a distance of 10 feet ahead of the car, I_u the intensity of the unknown source at distance d , and P the optical power output of the object we can write:

$$I_c = 150 / (10 \text{ feet})^2 \quad (6)$$

and

$$I_u = P / d^2 \quad (7)$$

The fact that the headlights were washed out by the unknown source at a ten-foot distance provides a lower limit for I_u . If we assume that we can detect a "just noticeable difference" (JND) between I_u and $(I_u + I_c)$ we write:

$$I_u = 100 I_c \quad (\text{from Weber: JND curves}) \quad (8)$$

which leads to:

$$P / d^2 = 100 (150 / 10^2) \quad (9)$$

or $P = 150 d^2$.

In his report, Dr. Condon estimated the distance at 2,400 feet, which gave an energy of 9×10^8 W (900 megawatts) for the UFO. A more correct estimate is given by the subsequent investigation since the clearing is actually located 1,800 feet from the observation point. The energy output becomes 5×10^8 W (500 megawatts). These figures are approximations only: As David Newton has since pointed out in correspondence with the author, the fact that the car headlights were not radiating **uniformly** in all directions but were directed onto the road by reflectors, should be taken into account in any refined calculations.

Case no. 4: November 5, 1976. Grenoble (France) — Classification: MA-1

Another remarkable observation made near Grenoble, France, on November 5, 1976, by a senior French scientist is relevant here. As in the previous case, there were multiple witnesses and the duration was long enough to allow details of the object and its trajectory to be seen and recalled. There were two other remarkable characteristics: first, it was possible to establish the distance of the object with precision; second, the exceptional qualifications of one of the witnesses provided some physical parameters that have rarely been available in UFO cases.

We are indebted to GEPAN, the French government's official UFO investigation task force (now known as SEPRA), for communicating to me the details of the case, which the author had the opportunity to discuss with them at

length prior to visiting the site in 1988.⁷ In accordance with their policies, the names of the witnesses have been changed. The official files, of course, contain full particulars and in-depth interviews with all concerned.'

The first witness in the chronology of this observation is a Miss M., who was watching television at her home in the town of Rives, near Grenoble. The time was 8:08 p.m. She saw a bright light outside and called her father. Both went out on the balcony and observed an intense white source crossing the sky at high speed from the northwest to the southeast, disappearing behind the mountains in the direction of Montand. The father, when interrogated by the gendarmes, stated that the light appeared to be spinning.

While these two witnesses were observing the object in Rives, a French physicist we will call Dr. Serge was driving seven miles away near Voreppe on the road that goes from Rives to Grenoble. He had just returned from Paris on a plane that landed at Grenoble airport, and he was driving to his home. Looking up, he saw a luminous disk moving in the sky. He stopped his car and got out to observe it carefully. The time was **8: 10** p.m.

The disk, according to Dr. Serge, was brighter than the full moon. It was slightly flattened (with an aspect ratio of **0.9**) and an angular diameter about twelve arc minutes (the full moon has an angular diameter of about thirty arc minutes). The object was white in the center and bluish-white at the periphery. It was surrounded by an intense green halo about two or three arc minutes thick.

At the beginning of the observation, the disk was almost directly overhead. It flew at a constant velocity toward the east-southeast in less than eight seconds, covering approximately 1.3 degrees of arc per second. At that point the disk stopped, without changing size, and hovered for three to ten seconds. Then it started again in a different direction, thirty degrees away from the previous course, at much greater speed, covering about eight degrees of arc per second and passing in front of Le Taillefer Mountain, thirty-six kilometers away. Dr. Serge lost sight of the disk when it passed behind Le Néron Mountain, nine kilometers away.

The whole sighting had lasted about twenty to twenty-five seconds and there was absolutely no sound at any time. The sky was clear, no wind at ground level, and the temperature was about **40** degrees F. Late in **1988** the author drove through the area where the sighting had been made. The photographs and the drawings included in the GEPAN report do not do justice to the majesty of the site. Mountains rise on both sides of the Isère River. In places the road runs at the foot of sheer granite walls. This topography provides a fair estimate of the object's distance at various points, since it was seen flying behind one mountain and in front of another.

⁷GEPAN stands for Groupe d'Étude des Phénomènes Aériens Non-identifiés, while SEPRA stands for Service d'Étude des Phénomènes de Rentrée Atmosphérique. Both organizations were based in Toulouse, at the Centre National d'Études Spatiales, where files are maintained.

⁸The Grenoble observation is Gepan Case No. 76305443.

It is noteworthy that the investigation by GEPAN disclosed that a similar object had been seen three hours earlier about eighteen miles east of Rives, leaving a trail, and that a bright disk was seen two hours later by the civilian traffic controller in the tower of the military airport at Aulnat. Shortly after 8:05 p.m. that same day a witness located a few miles away near Vienne saw a slightly flattened sphere, whose light was similar to that of a very bright neon tube, with a fiery red-orange area underneath. It was about one-sixth of the diameter of the full moon and was flying very fast from the west-northwest to the east-southeast.

Given these detailed, competent observations, it is possible to bracket the energy and speed of the object with some reasonable numbers. From a careful reconstruction of the sighting it was estimated that the object was flying at an altitude of 1,500 to 2,500 feet, which would give it a diameter between six and twenty feet and a speed approximating one mile per second, or 3,600 miles per hour, during the second phase of its trajectory. Assuming that the disk gave off as much light as the full moon, as observed by Dr. Serge, its energy in the visible part of the spectrum was a modest 15 kW. This is only a minimum value, based on the assumption that *the landscape directly underneath the object* was illuminated with an intensity comparable to that of the full moon. If illumination at the much greater distance where Dr. Serge was located was also that of the full moon we would be in conditions similar to those of case no. 2, with a much higher power output value.

In the detailed interviews conducted by investigators of the French National Center for Space Studies (CNES), Dr. Serge expanded on his description of the object, noting that the halo reminded him of the color produced by the combustion of copper salts. It is also noteworthy that Dr. Serge, who serves as director of a nuclear physics laboratory, did not report the sighting to anyone and did not mention it to his colleagues. It was only when the observation by Miss M. and her father was mentioned in newspapers that he volunteered his own experience. It should be noted further that, in addition to the reports from the gendarmes, the letters from the witnesses, and the investigations by GEPAN scientists, several of the observers were interviewed in person by a judge, a former president of the regional Court of Appeals.

Case no. 5: June 19, 1978. Gujan-Mestras (France) — Classification: MA-2

This incident took place near Arcachon in France on June 19, 1978, and was also investigated in depth by GEPAN.⁹ While the Grenoble case was remarkable for the convergence and high quality of the observations, the present case introduces another exceptional parameter: the UFO triggered the photocells that control the lights for the whole town. From the distance and the threshold

⁹The Gujan-Mestras investigation was conducted on behalf of GEPAN by Messrs. Dorrer, Mauroy, and Mouilhayrat.

level of the cell it is possible to derive an estimate of the power output of the object.

The town where the sighting took place is Gujan-Mestras. There were independent witnesses near Céon and La Réole. A local newspaper described how two frightened young men, an eighteen year-old cook named Franck Pavia and a seventeen-year-old butcher's apprentice named Jean-Marc Guitard, knocked on the door of a baker, Mr. Varisse, who was preparing the next day's bread, at about 1:30 a.m.

The teenagers had stopped on the side of the road to repair the turn signal of their car when all the lights of the town were suddenly switched off. At the same time, a powerful rumble like an earthquake made them jump. Then they saw the object. It was, by their descriptions, oval, red, surrounded with white "flames," and it flew toward them at an altitude they estimated as 11,000 feet.

At this point Jean-Marc became unable to breathe and fainted. The object then changed direction and flew away. While telling their story to the baker (who reportedly laughed at them), both witnesses were reportedly terrified, had trouble speaking, and Jean-Marc had red, teary eyes.

At approximately the same time of night a thirty-five-year-old restaurant manager named Mr. Bachère, who was driving toward Bordeaux, saw "a large orange ball, very bright" that hovered over La Réole at about 1,000 feet before disappearing. It reappeared at the same spot one minute later. Mr. Bachère's wife confirmed his observation.

Given these reports, which were transmitted by law enforcement officials to GEPAN in Toulouse, the task force decided to investigate immediately: three of their scientists were at the site the next day. They interviewed the witnesses at length, took them to the location, and had them point a theodolite to the places where the object had appeared and disappeared in an effort to establish triangulation. Finally, the witnesses were given a set of standard color samples from which they made a selection corresponding to the phenomenon they had seen.

This investigation brought to light the testimony of additional witnesses who had previously remained silent. For instance, Mr. B., a student who lived in Gujan, confirmed that he was outside when the town lights died at a time that he estimated as half an hour past midnight; concurrently, he had heard a strong, low rumble that scared him. Mr. B. saw orange flashes above the pine trees, below the cloud ceiling.

The measurements made in the field established that all witnesses had observed the same object, within the expected errors of human recall. There was rough agreement on time, duration, distance, trajectory, sound, and luminosity parameters. Understandably there were also discrepancies regarding the altitude and apparent diameter of the object. One of the witnesses who gave the more consistent measures was used as the primary source for these estimates.

The manager of the town utility department was also interviewed. He showed the investigators the location of the photoelectric cells that control the

street lights. When these cells are exposed to a light that exceeds their threshold (10 mW/m^2), they assume that daylight has arrived and they turn off the system. The results of the analysis bracket the distance between the cell and the UFO: between 135 meters and 480 meters, or roughly between 400 and 1,500 feet. Although the diameter of the disc was estimated (5 meters) this is irrelevant to the calculation of the power output, which can be determined from the luminous flux at the photocell via equation (3). Assuming a distance of 135 m one obtains

$$P \geq 0.01 \times 4\pi(135)^2 \quad (10)$$

hence $P \geq 2.3 \text{ kW}$ whereas for 480 m, $P \geq 29 \text{ kW}$, assuming isotropic radiation from the object.

Curiously the GEPAN Report states that it assumes a continuous spectrum (black body radiation) and cites a range for the minimum power output between 160 kW and 5 MW. It is not a safe assumption that UFO emission is anything like a black body: The report states: "The fact that it was glowing red lets us put a — rather unhelpful — value of the wavelength of maximum emission at or above 700 nm."

Case no. 6: August 24, 1990 Greifswald (Germany) — Classification: MA-1

Numerous eyewitness reports, supported by videotapes and photographs, make this "one of the best-documented sightings in Europe," according to von Ludwiger, to whose analysis the reader is referred for full details of the case (Von Ludwiger, 1995). Independent witnesses observed formations of luminous spheres hovering in the sky Northeast of Greifswald. Hundreds of tourists and local residents saw, photographed and filmed the phenomena, characterized by rapid accelerations and abrupt changes of direction, inconsistent with known phenomena or manufactured objects. One private investigation group received six videotapes and eleven photographs from different individuals and interviewed in person more than a dozen witnesses.

The investigation concluded that the phenomena consisted of two groups of luminous spheres that hovered nearly motionless for about 30 minutes between 8:30 p.m. and 9:00 p.m. over the Pomeranian sea. The brighter and closer group formed a circle of six luminous spheres. The second group formed the shape of a Y."

The German weather service reported that approximately $5/8$ of the sky was covered with high, fleecy clouds in partly shaded masses and gray, sheet-like clouds at 2,500 meters. There was a light ENE wind and the temperature was about 60 degrees F, or 16 degrees C.

Given the number of precise observations, supported by photographs, it was possible to triangulate the position of the objects with some accuracy. From a distance of 14 km the Y formation appeared to be as bright as the full moon, according to one of the photographers, Mr. Ladwig. If the spectral distribution is equal to that of the moon, then the square distance law for the power output

of the moon with 0.138 lux yields an estimated optical power output of: $P = 1.8 \times 10^{-3} \times 4\pi \times 14,000^2 = 4.4 \times 10^6 \text{ W}$ by following the same reasoning as in the Fort-de-France situation (case no. 2).

Discussion

The figures derived from the six cases we have reviewed are summarized in Table 1. They range from low values (equivalent to the power of a small motor) to the energy range of a nuclear reactor. The estimates do not cluster around a particular value, and form no pattern. There may be several reasons for this. We may be in the position of a person trying to estimate the power of a truck by the intensity of its headlights: the actual energy figure may be orders of magnitude beyond our calculations. Alternately, light emission may be only a side effect of a hypothetical propulsion mechanism, as carbon monoxide is a side effect in the exhaust of an automobile engine.

The impact of the observations on human witnesses can be dramatic, suggesting that other physiological and psychological parameters are present. The main witness in case no. 3 (Dr. G.) was a physics professor who reported fear when confronted with the phenomenon. It forced him to shield his eyes and frightened his children, who woke up crying. One witness in case no. 5, a seventeen-year old male, developed breathing difficulties and fainted. Later his eyes appeared red and teary.

In discussing these figures one must keep in mind that the literature contains equally reliable cases when the objects were dark or had a dull surface with no light emission whatsoever, although they performed the same evolutions as the objects studied here.

Conclusion

Many investigators have been discouraged by the difficulty of deriving reliable parameters from chance observations made under uncalibrated field conditions by surprised witnesses. The present study does show, however, that a small percentage of reported UFO cases meet sufficient criteria of reliability to yield quantitative data regarding distance and brightness. From these data we have shown that it was possible to arrive at a rough estimate of power output.

In the present state of our ignorance about the physical nature of the reported objects, and given the lack of attention given the subject by scientific and technical personnel who might be in a position to improve the quality of the data, we can only speculate on the mechanisms that give rise to these emissions. A complete examination of the data reveals cases when witnesses were temporarily blinded by the light from such objects, and other cases when physiological sequelae were reported such as burns or skin injuries (Vallee, 1990). Whether the reported phenomena turn out to be natural or artificial in nature, their widely reported impact on human witnesses should encourage us to

TABLE 1.
Range of Power Output

Small Engine (Lawn Mower)	Small Car	Large Car or Truck	Airplane, Helicopter	Airliner	Industrial Plant	Nuclear Power Station
1					XXXXXXXX	2500-30000 MW
2			XXX 2.3 MW			
3					XXXXXXX	500-900 MW
4	XXX 15 kW					
5	XXXXXX 2.3-29 kW					
6			XXX 4.4 MW			

pursue this research and extend the coverage of existing data acquisition programs.

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Physical Analyses in Ten Cases of Unexplained Aerial Objects with Material Samples¹

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Abstract — A survey of ten cases of unexplained aerial phenomena accompanied by material residues shows a broad distribution of natural elements, many of which are metallic in nature. They can be roughly described as belonging in two categories: "light materials" of high conductivity such as aluminum, and "slag-like materials" reminiscent of industrial byproducts. Most of the cases under consideration strive to meet four criteria: 1) the literature gives sufficient ground to support the fact that an unusual aerial phenomenon occurred, 2) the circumstances of the actual recovery of the specimen are reported, 3) there is data to suggest that the specimen is in fact linked to the observed aerial object, and 4) physical analysis has been performed by a competent laboratory of known reliability. In several instances the sample is available for continuing study by independent scientists. In the absence of a firm chain of evidence and of professional field investigation, most cases cannot lead to a definite conclusion about the nature of the phenomena that gave rise to each specimen, but much can be learned from the methodology involved in such analysis. Furthermore, compilation of similar cases on an expanded basis may eventually lead to the discovery of underlying patterns.

Keywords: UFOs — UFO sightings — physical evidence — propulsion

Introduction

The combination of a reliable sighting of an unexplained aerial object with the recovery of a durable physical specimen is rare. While the media often allude to sensational finds and at least one former military intelligence officer has stated that he once had custody of advanced technology coming from a "crash," (Corso, 1997) the material is not available for independent study and the details of its composition are scanty and contradictory.

At a more modest level, in the course of their investigations of the phenomenon around the world, civilian researchers acting privately have patiently assembled the embryo of a sample collection, starting from physical specimens reportedly gathered at the site of a close encounter or "maneuver" type sighting.²

The present paper summarizes the data, stressing methodology while refraining from proposing premature explanations for the origin of the samples. We strived to find those cases where 1) the literature gives sufficient ground to

¹Presented at the Physical Evidence Related to UFO Reports Workshop, Tarrytown, New York, Sept. 30-October 3, 1997.

support the fact that an unusual aerial phenomenon occurred, 2) the circumstances of the actual recovery of the specimen are reported, 3) there is data to suggest that the specimen is in fact linked to the observed aerial object, and 4) physical analysis has been performed by a competent laboratory of known reliability. In several cases the sample is available for continuing study by independent scientists. In the present paper we will try to establish the frequency of such cases and the type of analysis they suggest. In conclusion we will examine hypotheses that may deserve further testing.

Statistical Frequency of Physical Sample Cases

In an excellent catalogue compiled by Mr. Larry Hatch³ and made available to researchers and to the general public one finds 15,181 unexplained aerial phenomena reports that have been tabulated in computer-readable form. We have broken down these cases according to the classification system used by this author (Vallee, 1990) in order to bring out the distribution of incidents across various situations. Under this classification, inspired from Hynek's definition of close encounters (Hynek, 1972), each case is given a type and a category. Hynek used a single digit representing the "kind" or type of incident, ranging from "1" for a simple sighting and "2" for physical effects to "3" for report of a **lifeform** or living entity. We have extended this typology using "4" in cases when witnesses experienced a transformation of **their** sense of reality (often corresponding to the popular characterization of the incident as an "**abduction**") and "5" in cases of lasting physiological impact, such as serious injury or death.

The categories to which the typology is applied range from "CE" for close encounters and "MA" for maneuvers (trajectory discontinuity) to "**FB**" for fly-by (no observed discontinuity in flight) and "**AN**" for simple anomalies in which no UFO was reported: unusual lights or unexplained entities fall into this last category.





















Using this classification we would speak of a particular case as a CE-3 incident, or a MA-2 incident, *etc.*, leading to the simple matrix of Table 1, which provides a convenient way for establishing a baseline in comparing reports from various countries or from various epochs.

When the Hatch catalogue is mapped into this classification the resulting distribution is that of Table 2, showing 3,175 cases of physical effects, or 21%

²The author is especially indebted to Dr. Peter Sturrock, Dr. Harold Puthoff, Dr. Robert Wood, Mr. Illobrand von Ludwiger and Mr. John Schuessler for help in analyzing materials or in communicating details of their own findings on various samples mentioned in this article. We owe recognition to pioneers of this research, such as Dr. Olavo Fontès in Brazil and Jim and Coral Lorenzen in the U.S. Assistance from Messrs. Robert Allen, Ricardo Vilchez, Richard Masilko and Mark Uriarte in securing access to various specimens is gratefully acknowledged. Several correspondents, notably Robert Kincheloe, Pierre Lagrange, James McCampbell, and Joe Roser, have called the author's attention to important documents and research ideas.

³Larry Hatch's computer catalogue is available from him in diskette format under the DOS operating system running on standard IBM-compatible PCs. His address is 142 Jeter street, Redwood City, California 96062.

TABLE 1
Classification of Anomalies

	1	2	3	4	5
AN ANOMALY					
FB FLY-BY					
MA MANEUVER					
CE CLOSE ENCOUNTER					
	Sighting	Physical Effects	Living Entities	Reality Transformation	physiological effect

of the catalogue, broken down as follows: 90 are associated with simple anomalies, 19 with a fly-by, 1,782 with maneuvers and 1,284 with close encounters. It should be noted that we are using the January 1997 version of the Hatch catalogue, which is an evolving entity. Statistics performed on other versions may differ from those given here.

In Table 2, "physical effects" may refer to soil disturbances, broken tree limbs, crushed grass, burned areas, or to a variety of electromagnetic effects.

TABLE 2
Incident Frequency in the Hatch Catalogue

Type	1	2	3	4	5		
Category	Sighting	Physical Effect	Lifeform	Reality Transformation	Physiological Effect		
A N Anomaly	323	90	103	78	56	650	4.3%
FB Fly-by	3,657	19	7	1	0	3,684	24.3%
MA Maneuver	4,551	1,782	139	412	89	6,973	45.9%
CE Close Encounter	1,158	1,284	593	530	309	3,874	25.5%
	9,689	3,175	842	1,021	454	15,181	100.0%
	63.8%	20.9%	5.5%	6.7%	3.0%	100.0%	

The Alleged Crash at Aurora (Texas): April 17, 1897.

In order to provide some background to the analysis that follows, it is interesting to note that allegations of extraterrestrial "crashes" are nothing new and did not even begin in the present century.

In the course of a survey of early aerial phenomena in the United States, Donald Hanlon and the author found numerous reports of sightings in the period 1896-1897, which has become known in the literature as the "airship wave." (Hanlon & Vallee, 1967) One of the most remarkable cases had been reported on April 17, 1897 in the small town of Aurora (Texas). The story, as told in a local newspaper, stated that an unidentified object "sailed over the public square and when it reached the north part of town collided with the tower of Judge Proctor's windmill and went to pieces with a terrific explosion, scattering debris over several acres."

Although Hanlon and this author regarded the story as an instance of early Americana and a probable hoax (in a context remarkably similar to that of Roswell, the press went on to state that the pilot of the ship, who "was not an inhabitant of this world," had died in the accident and that undecipherable papers were "found on his person"), our article re-awakened interest in the case. It was investigated again in 1973 by William Case, a journalist with the *Dallas Time-Herald*, and by personnel from the McDonnell Douglas aircraft company. While the 1897 story reported that the airship was "built of an unknown metal resembling somewhat a mixture of aluminum and silver," the fragment found by Case and his co-workers was determined to consist of aluminum (83%) and zinc (about 16%) with possible traces of manganese and copper. The combination could originate with numerous common aluminum alloys, according to the McDonnell scientists, but not prior to 1908.⁴

While we cite this case for completeness, it is not included in the overall analysis.

Case Studies

The cases that follow have been extracted from the small subset of physical effects cases where recovery of a material specimen was achieved under conditions that are of sufficient reliability to warrant serious follow-up. One case (the Council Bluffs incident of December 17, 1977) will be described in detail. Other incidents drawn from the literature and listed in chronological order will provide the relevant backdrop.

Case no. 1 : 1933 or 1934. Ubatuba, near Sao Paulo (Brazil)— Classification: MA-2

This incident came to light in 1957 through the efforts of Dr. Olavo Fontès

⁴Holliday, J. E.: McDonnell report on the Aurora case, unpublished, 13 August 1973. The on-site investigators were Ronald A. and N. Joseph Gurney (12 May 1973).

of Brazil and Jim and Coral Lorenzen, the founders of the Aerial Phenomena Research Organization, a now-defunct civilian research group in the U. S. Witnesses on the beach at Ubatuba are said to have reported seeing a disk that plunged toward the ocean at high speed, rose again to about 100 feet and exploded, showering the area with bright metallic fragments, some of which fell into shallow water. A few of the fragments were recovered and analyzed in Brazil by Dr. Luisa Barbosa at a laboratory specialized in mineral production studies. Dr. Barbosa identified the major component of the specimen as highly pure magnesium, more pure than commercially produced magnesium but possibly not as pure as multiply sublimed magnesium.

Subsequent work under the direction of Prof. Peter Sturrock has been conducted at Stanford University and at various laboratories in France, including Orsay University, confirming that the material was magnesium and magnesium oxide, with a very minute amount of impurities,⁵ primarily aluminum, calcium and iron. Analysis of this sample is still ongoing, with an effort to measure isotopic ratios that might help establish the origin of the material. (Lorin & Havette, 1986).⁶

The actual date of this event, often wrongly quoted in the literature as 1957, is actually imprecise. Dr. Pierre Kaufmann of Sao Paulo believes the original incident took place in 1933 or 1934 when a bolide indeed passed over Ubatuba and crashed at a nearby beach. The only aerial event to occur at or near Ubatuba in 1957 was the crash of a DC-3.

Case no. 2: June 21, 1947. Maury Island (Washington)— Classification: MA-2

On the afternoon of June 21, 1947 (three days before the Kenneth Arnold case) four people who were on a boat close to the shore of Maury Island near Tacoma, Washington, reported an observation which has puzzled and divided researchers ever since. According to the published story the witnesses were Mr. Harold Dahl (a salvage operator), his fifteen-year old son and two crewmen. They had a dog with them. They reported seeing a group of six large, flat doughnut-shaped objects flying at an estimated altitude of 2,000 feet. Their central holes were about 25 feet in diameter and they glistened with a gold-silvery color. One object suddenly started wobbling and dropped to an altitude of 500 feet above the boat. One of the disks came down (as if to "help" the one in difficulty, according to Dahl). A dull explosion was heard and numerous sheets of light, thin metal issued from the central opening in the troubled object. At the same time, the witnesses were showered with hot, dark fragments that resembled lava rock or slag compared to brass in color. The dog was reportedly hit by one of the fragments and died.

A man named Fred Crisman, to whom the incident was reported, allegedly

⁵Sturrock, Peter A.: "Brazil Magnesium Study," paper presented at the Third Annual Meeting of the Society for Scientific Exploration, Princeton (New Jersey).

⁶Sturrock, Peter A. "Material Isotopic Analysis," presentation at this conference.

went to the shore and found it littered with a glassy material and silver foil. Military authorities and the FBI, in a very confused series of investigations, attributed the case to a hoax: "analysis of the fragments shows them to be from a Tacoma slag mill."⁷ To this author's knowledge, however, the composition of the original samples, assuming that they were in fact studied by the FBI, was never released.

In a book he co-authored with Kenneth Arnold (whose own classic observation took place three days later, on June 24, 1947) popular writer Ray Palmer published an analysis of the original fragments, whose primary constituents were calcium, iron, zinc and titanium. Also found were aluminum, manganese, copper, magnesium and silicon, nickel, lead, strontium and chromium. Traces of silver, tin and cadmium were also reported.

Those investigators who regard the case as a hoax base their opinion on the fact that it was Crisman who initially sent the samples to Ray Palmer, linking them to alleged experiences involving the "Shaver Mystery," a science-fiction tale of underground beings. In their opinion it is only after the Kenneth Arnold observation had been published that the story was changed to involve the alleged UFO incident. For the purpose of this discussion we will keep this weak case in the present list, but it is clear that no firm conclusion can be drawn from the reported facts. As Ray Palmer commented: "There we have it. The samples first sent by Crisman and Dahl were not slag nor were they natural rock. What were they?"

Case no. 3: 1952. Washington (DC) — Classification: MA-2

According to journalist Frank Edwards a metallic fragment coming from an object that fell in 1952 was examined a few years later by a Canadian researcher, Mr. Wilbert Smith. The fragment had been sawed off from the recovered sample, representing about one third of its volume. Over one inch in size, it was remarkably hard and reportedly consisted of "a matrix of magnesium orthosilicate" composed of "particles of 15 microns." (Edwards, 1996) Interviewed by two civilian researchers, Messrs. C.W. Fitch of Cleveland (Ohio) and George Popovitch of Akron (Ohio), Smith stated that a Navy pilot had been chasing a flying disk when he saw a bright "scintillating" fragment detach itself and fall to the ground. It was recovered an hour later and weighed in at 250 grams. Smith reportedly showed the sample to Admiral Knowles. Unfortunately there is no report of an independent analysis in the literature, and the sample is not available for further study.

⁷FBI teletype message dated August 5, 1947, on file. The Maury island case is mentioned in many books and magazines, notably in Ronald Story: *The Encyclopedia of UFOs* (Garden City, NY: Doubleday, 1980). Details can be found in *Fate Magazine* no. 1, Spring 1948, p.31 and in the book by Kenneth Arnold and Ray Palmer. *The Coming of the Saucers*, pp.106-108.

Case no. 4: December 14, 1954. Campinas (Brazil)- Classijication: MA-2

According to American journalist Frank Edwards (Edward, 1996) numerous witnesses in **Campinas** observed three disk-shaped objects in flight over the city. Again, one of them started wobbling wildly and lost altitude. The other objects followed it down and it stabilized at an altitude of about 300 feet. At that point the troubled disk emitted a thin stream of silvery liquid. The material was reported to splatter over a wide area including roofs, streets, sidewalks, even clothes left outside to dry. An analysis by an unnamed Brazilian government laboratory is said to have identified tin (Sn) as the main component of the collected samples. An independent analysis by a private chemist, Dr. Risvaldo Maffei, reported that 10% of the material was composed of other substances than tin, but gave no precise measurements.

Case no. 5: November 11, 1956. Vaddo island, Sweden — Classijication: CE-2

Prof. Sturrock has custody of a sample reportedly recovered by two witnesses of an aerial phenomenon (one of whom has since died). Although the material appears to be common tungsten-carbide, the original shape of the specimen was unusual and it has not been identified as an object serving a conventional use.

According to a summary of the case compiled by von Ludwiger^x the two witnesses, Stig Ekberg and Harry Sjoberg were building a house on the island of Vaddo, about 90 km NNW of Stockholm. At about 10 p.m. Ekberg was driving his Ford V8 pickup when they saw a bright flying object with the shape of a flattened sphere 8 m. wide and 3 m. high approaching from the right (from the east) against the clear night sky. They estimated that it flew about 1 km in front of them at an altitude of 100 meters. Suddenly it made a sharp turn towards them, at which time the truck engine sputtered and died and the headlights went out. The object started "slowly gliding down." It seemed to rock back and forth until it came to a stop in the middle of the road, about 100 m. in front of them, one meter above the ground. "It was illuminating the surrounding landscape with such a tremendous amount of light that even a barn, half a kilometer away, was visible as if the sun was shining." The air smelled like ozone and smoldering insulation.

After about 10 minutes the light of the object intensified, it lifted off the ground, moved to the left and up, made a sudden turn and accelerated away in the direction from which it came. At that point Ekberg was able to restart the truck normally, and the headlights came back on. Observing that the grass at the landing site had been flattened, they investigated further and found a shiny "rock" that was hot to the touch. It was a three-sided piece of metal about the size of a matchbox, and had a heavy weight.

After several unsuccessful attempts to have the sample studied, it was taken

^xVon Ludwiger, I. *Investigating a Mystery* (unpublished book manuscript). Personal communication, courtesy of the National Institute for Discovery Science.

to the SAAB airline manufacturing company where Mr. Sven Schalin conducted a thorough analysis. Other tests were later run in laboratories in Sweden, Denmark and Germany. The general conclusion was that the object was composed of tungsten carbide and cobalt, consistent with manufactured products. According to von Ludwiger, "all industrial countries have companies which produce such hard metals, and the manufacturing technology is in principle the same ... The overall quality of the material was outstanding, but not unusual for the early 1950s."

Case no. 6: July 13, 1967. Maumee (Ohio)— Classification: CE-2

At 11:26 p.m. EST a collision reportedly took place near Maumee, involving a car driven by two men and an unidentified light. Both witnesses were young Navy veterans, one of them a radar specialist. In their report to police they stated they had unexpectedly encountered an intense source of light in the middle of the pavement while traveling West on Stitt road towards Whitehouse, Ohio. They could see no outline or structure in the object. The driver swerved to the left, skidding for about 70 feet and expecting a catastrophic collision. When they stopped, however, there was no trace of the object. The passenger confirmed the report, adding that the light appeared "bright as a welder's arc".

Following the event the two men drove to Waterville where they phoned police. They were instructed to proceed to the Maumee Police Station and await the arrival of the State Highway Patrol. They revisited the scene with two patrolmen. The car itself was examined, as well as the surrounding area, the road and planted crops. No tangible evidence was reported, except for skid marks made by the vehicle and some damage to the car bumper and hood. Some time later the driver reported finding two metal samples he retrieved in the middle of the road and some "fibrous" metal found on the car. This fibrous sample turned out to contain 92% magnesium, according to Lorenzen and Condon.⁹

Neither witness experienced any unusual sensation during the incident, and their health was not affected.

Case no. 7: Early 1970s. Kiana (Alaska)— Classification: MA-2

In this case, where Prof. Sturrock has also obtained one of the recovered fragments, an Eskimo is reported to have found two pieces of material on a river bank near Kiana following an aerial phenomenon. Each specimen is silvery, light-weight, and looks as if it had been poured in a molten state from a source close to the ground."

⁹The author is indebted to Mark Rodeghier of the Center for UFO Studies for details of the Maumee, Ohio incident. (Condon, E., 1969).

¹⁰Sturrock, Peter A. Personal communication to the author. Quoted with permission.

Case no. 8: 1975 or 1976. Bogota (Columbia)— Classification: MA-2

Two students at the University of Bogota were about to take a cab at 4 a.m. that night when they heard a metallic sound overhead. They reported seeing a disk, about 12 feet in diameter, swinging in the air as if it had difficulty maintaining its altitude of 3,000 to 3,500 feet — obviously a very rough estimate since it is notoriously difficult to estimate the distance and size of luminous objects at night. Four other objects appeared, flying around the first one as if to provide assistance. Spouts of liquid were then ejected from the primary object. The witnesses took shelter under a tree and watched the liquid fall on the pavement, producing a vapor. The objects rose and disappeared into heavy rain clouds. After letting the material cool down for about ten minutes the witnesses were able to recover two metal chunks, about four inches by one inch and a quarter inch thick. The first analysis was performed in Central America by a mechanical engineer with a petroleum company. He concluded that the sample was an aluminum alloy with magnesium and tin. It was nonmagnetic and contained traces of unidentified materials. He also stated that the material was easy to cut and presented very fine granulation. In October 1985 the author was given a sample of this material by Mr. Ricardo Vilchez, a Latin American investigator, and brought it to the United States for analysis. Subsequent study led by Dr. Harold Puthoff and ourselves showed it to be formed mainly of aluminum (93.7%) with phosphorus (4.8%) and iron (0.9%) with traces of sulfur and an unexplained oxy-carbide layer.¹¹ The sample included no fluoride and no water, contrary to most aluminum samples: fluoride is a common by-product of aluminum production. One side of the specimen showed evidence of violent activity and bubbling, while the other side was flat, with some embedded material, possibly from the road asphalt. Its appearance was typical of an overheat and was indeed consistent with the blowup of a machine, although the hoax hypothesis could not be totally excluded.

The sample was subjected to analysis with a scanning electron microscope (SEM) which produces an X-ray fluorescence spectrum, leading to the above composition findings. It was further analyzed with a scanning ion mass spectroscopy (SIMS) which uses an electron beam in a vacuum, boring at various points into the material. This test found a surface layer of carbon, oxygen and nitrogen, beyond which we encountered aluminum as well as magnesium (as reported by the initial analysis in Central America), with potassium, sulfur, sodium and silicon. Phosphorus and iron also showed up in trace amounts.

Case no. 9: December 17, 1977. Council Bluffs (Iowa)— Classification: MA-2

In this incident (which is described at more length in the next section) two residents of Council Bluffs (Iowa) saw an object that crashed to the ground in the vicinity of a dike in Big Lake Park on the northern city limits. The time

¹¹The analysis of the Bogota sample conducted with Dr. Puthoff was first published in Vallee, J. F.: *Confrontations*, 1990, pp. 44-45.

was 7:45 p.m. A bright flash was observed, followed by flames eight to ten feet high. When the witnesses reached the scene they found a large area of the dike covered with a mass of molten metal that glowed red-orange, igniting the grass.

As opposed to many of the previous cases, where few exact times and detailed witness accounts are available, the present incident offers an abundance of information. Police and firefighters reached the scene within minutes of the event. One law officer described the molten mass "running, boiling down the edges of the levee" over an area of about four by six feet. The central portion remained **warm** to the touch for another two hours. There were eleven witnesses in all, eliminating the hoax hypothesis. Two of the witnesses had independently seen a hovering red object with lights blinking in sequence around the periphery. Inquiries made at Eppley Air Field and Offutt Air Force Base disclosed that no engine failure had taken place and there was no aircraft operation in the area.¹²

The recovered residue was analyzed at Iowa State University and the Griffin Pipe Products company, leading to the determination that the metal was chiefly iron with small amounts of alloying metals such as nickel and chromium. This composition excludes a meteoritic origin.

Case no. 10: Circa 1978. Jopala, near Puebla (Mexico)— Classification: MA-2

While in Mexico in November 1978 the author was told by local investigators of the fall and recovery of a metallic residue following an observation of an unknown aerial phenomenon in the mountains near Puebla. The object was reportedly composed of iron with silicon (1.13%) and traces of manganese (0.84%), chromium (0.77%) and carbon (0.28%).¹³

Analysis of the Council Bluffs Case

The weather in Council Bluffs the evening of Saturday, December 17, 1977 was overcast with a 2,500 foot ceiling, visibility 10 miles, temperature 32 degrees Fahrenheit. Wind was from the WNW at 16 mph, with gusts to 25 mph. The town is located on the southeastern shore of the Missouri river in Iowa, across from the city of Omaha (Figure 1.) The object hit the ground in the vicinity of "Gilbert's Pond" in Big Lake Park, across the Missouri from Eppley airport. The exact street address is 1900 N. Eighth street. It fell at a point 16 feet from the paved road and 6 feet from the top of the levee, burning an area 4 feet wide by 9 feet long. There was a secondary burn area 27 feet away on the side of the dike, measuring about 2 by 4 feet.

Some samples of the material were embedded in the ground in both areas but no crater was discovered. There was an indentation 2 to 3 inches deep and many metal spherules were found scattered about the area, particularly toward

¹²Telephone conversation with investigators, September 1978.

¹³Personal investigation.

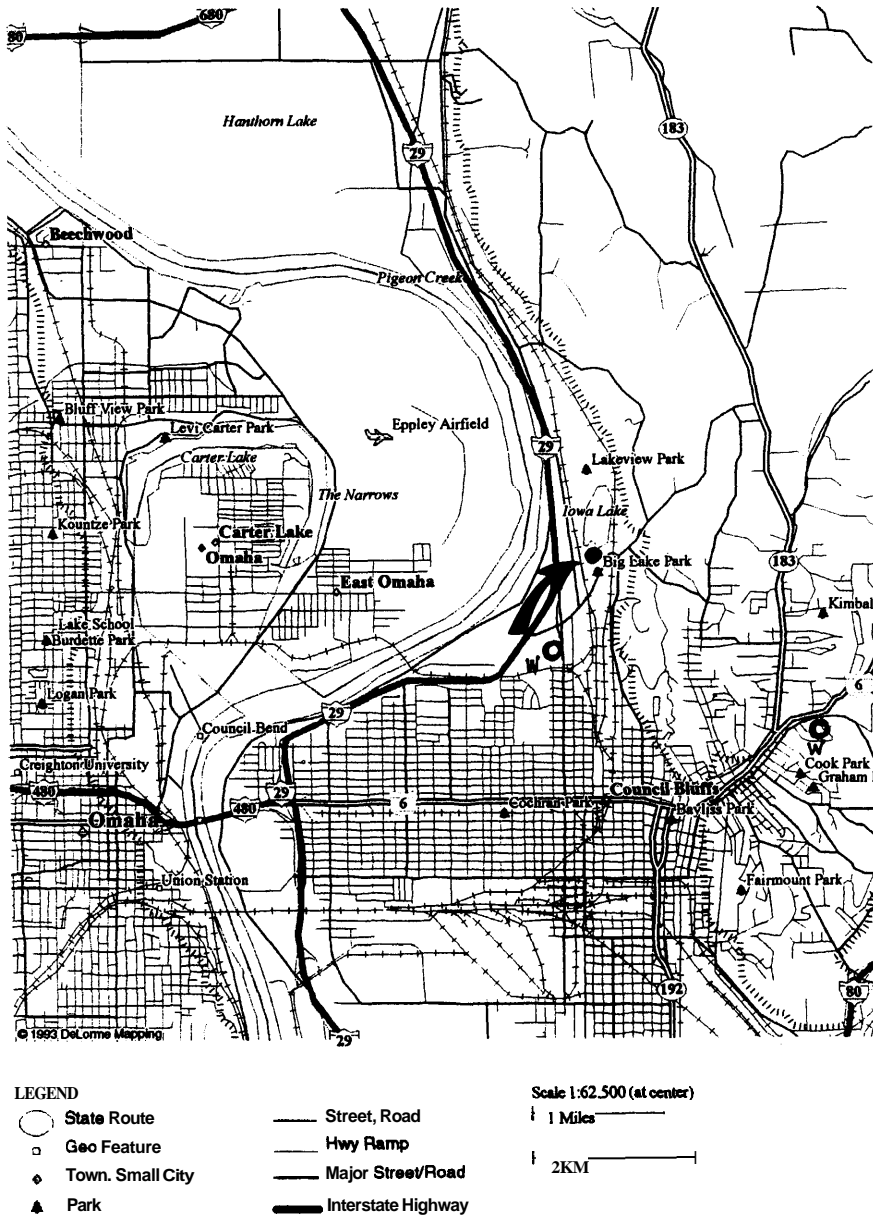


Fig.1. A city map of Council Bluffs.

many metal spherules were found scattered about the area, particularly toward the Northeast.

The initial witnesses were Kenny Drake and his wife Carol, and Kenny's 12-year old nephew Randy James. Two other witnesses, Mike Moore and his wife Criss, reported seeing a hovering red object with lights as they crossed 16th street on their way downtown along Broadway avenue. Criss reported "a big round thing hovering in the sky below the tree tops. It was hovering. It wasn't moving." She added that she saw red lights around the perimeter of the object, blinking in sequence. A middle-aged couple who saw the event spoke to the investigators by telephone, stating that they had seen "a bright red object rocket to the ground near Big Lake" but refused to be identified. Four teenagers in a small foreign car spoke to the Drakes at the time of the incident but did not make a report.

Secondary witnesses who observed the metal were Jack E. Moore, assistant fire chief (who took the 911 call from Kenny Drake), police officer Dennis Murphy and Robert E. Allen, who had served in the Air Force and wrote a weekly astronomy column for a local newspaper. Mr. Moore stated that the center of the metal mass was too hot to touch when he arrived on the scene about 8 p.m., only 15 minutes after the initial incident, and that it remained so for about an hour.¹⁴

Investigation proceeded as follows: Measurements taken at the impact point by Robert Allen indicate the object was traveling from the Southwest to the Northeast. Samples of the object were sent to the Ames Laboratory at the Iowa State University, and others were taken to the Griffin Pipe Products Company.

The material was determined to be carbon steel, "probably man-made," of a type common in manufacturing. The following four hypotheses were examined:

A. Hoax by Unknown Persons Pouring Molten Metal on the Ground

A check was made with every metal firm in the metropolitan area which has the remotest possibility of maintaining metal in a molten state. Griffin Pipe is the only company which has the capability for producing a similar product. Mr. Linton Stewart, Works Manager there, stated that they "drop the bottoms" from their cupolas on Friday afternoon and do no pouring until Monday. The melting point is close to 2500 F, which would require transporting in a brick oven of 6 inch thickness with a large truck, keeping the material at the melting point. Conclusion: negative.

B. Hoax by Unknown Persons Using Thermite and Ordinary Metal

Prof. Frank Kayser, of Iowa State University, observed that one might "collect the splatters from a casting or welding operation involving carbon steel,"

¹⁴"Mystery Flaming Object Definitely not Meteorite," *Omaha World-Herald*, 20 December 1977.

surround it with thermite powder and ignite it, heating the metal to the 1000 degrees C range. A cooling rate appropriate to wrought-iron microstructure could be achieved by spraying water on the mixture. However the material was in a molten state when the witnesses arrived. The surface of the ground was frozen to a depth of at least 4 inches and the air was at 32 F. Under such conditions, cooling by water spraying would have generated considerable amounts of ice. A check made with chemical and construction firms in the area disclosed no source of thermite. Negative conclusion.

C. Piece of Equipment from Aircraft

Because of the proximity to Eppley Air Field it was thought the object could have fallen from an aircraft landing on the runway heading 320 degrees. However a check with the airport indicated no abnormal aircraft activity at the time. All airlines operating into Eppley Field responded that they had no arrival using that runway which would bring an aircraft within the vicinity of the impact site (Braniff had landed at 7:32 p.m.) Furthermore the aircraft would be low and the metal could not be heated by the air to the melting point while falling. Negative conclusion.

D. Meteoritic Impact

There was no significant crater, the material remained in a molten state quite long, the composition is not compatible with meteoritic nature as noted above (very low nickel element in particular) and the spectrographic analysis did not disclose any metal components which should be an integral part of meteoritic materials. Negative.

The material sent to Ames Laboratory at Iowa State University was analyzed by Dr. Robert S. Hansen, director of the Ames Energy and Mineral Resources Research Institute. The material was found to consist of solid metal, slag and white ash inclusions in the slag. These were examined by X-ray fluorescence, electron beam microprobe and emission microscopic techniques under the supervision of Edward DeKalb of the analytical spectroscopy section.

Ames' findings were as follows: "The metal is chiefly iron with very small amounts (less than 1%) of alloying metals such as nickel and chromium. The slag is a foam material containing metallic iron and aluminum with smaller amounts of magnesium, silicon and titanium." The white ash was found to be calcium, with some magnesium.

In the course of research and follow-up for this paper the author contacted Mr. Robert Allen, who confirmed that the case had remained unsolved after twenty years.¹⁵ He kindly supplied us with copies of his correspondence with Air Force Space Systems, who had stated that in their opinion the material was

¹⁵ Author's telephone conversations and correspondence with R. Allen, September 1997.

not space debris from a man-made object, citing four reasons: (1) reentering spacecraft debris does not impact the Earth's surface in a molten state, (2) the 35- to 40-pound mass left no crater or indentation, (3) reported visual sighting was at an altitude of only 500 to 600 feet, where reentering debris would not be glowing and (4) the lack of structural indications is inconsistent with space debris.

Discussion of Element Frequency

The samples described in the ten cases we have reviewed are summarized in Table 3. They belong, broadly speaking, in two major classes: samples resembling slag or industrial residue, and light silvery alloys, with one incident (case no. 2, Maury Island) involving both types of materials. Unfortunately, as we have seen, the analysis of the original samples in this particular case was never released by authorities, and we can only refer to sources of dubious reliability.

In incidents involving slag-like material one primarily finds iron with traces of chromium, manganese and silicon, notably in Jopala and in Council Bluffs.

In cases involving light silvery material we find references to magnesium (cases 1, 3 and 6) and aluminum (cases 1 and 8), with iron mentioned in trace amounts. Some of the details of the composition remain puzzling: We cannot account for the very high degree of purity of the Ubatuba magnesium sample, or for the absence of water and fluoride in the Bogota specimen.

We have encountered no case of unknown elements and no case with advanced technology materials exhibiting an unusual structure. However the samples, as analyzed, appear to be consistent with the accounts given by witnesses, lending credibility to the reports in spite of their sometimes extraordinary details.

In summary, the analysis supports the thesis that an unidentified phenomenon has been repeatedly observed in various parts of the world over a long period, that it manifests through a physical, material support, and that it is amenable to scientific study. On the other hand, the patterns observed in the composition of the samples at our disposal do not point to any clear hypothesis for the nature of the phenomenon.

The fact that no exotic composition was found in these ten cases cannot be used to negate the theory that an advanced technology of unknown origin may have generated the samples. In the case of our own automobile industry, for example, environmentally-compliant engines produce more mundane exhaust (such as pure water) than older models, where one could find complex combination of gases.

Liquid Metal Technology

The similarities between many of the above cases point to a common scenario for the generation of the recovered samples: metal is observed to be ejected in molten form by an unidentified aerial object, commonly described

TABLE 3
Summary of Sample Composition

Case No.	Location	"Slag"		"Light Silvery Alloy"	
		Primary	Secondary	Primary	Secondary
1	Ubatuba		none	Mg	Al,Ca,Fe
2	Maury Is.	Ca, Fe, Zn, Ti	Si, Cu, Ni, Pb, Cr, Al, Mg, Mn, Sr	Ag, Sn, Cd	
3	Washington		none	Mg, Si	
4	Campinas		none	Sn? (90%)	
5	Sweden	W(94.9%),	Co (4.1%) Zr(0.6%), Fe(0.3%)	none	
6	Maumee		none	Mg(92%)	
7	Kiana		none	YES	
8	Bogota		none	Al(94%)	P(5%),Fe(1%)
9	Council Bluffs	Fe	Ni,Cr,Mn,Si,Ti	none	
10	Jopala	Fe	Si(1%), Mn(0.8%) Cr(0.8%),C(0.3%)	none	

as a disk, occasionally as a vehicle flying in an unstable condition. The material, in liquid form, falls over a fairly wide area where it takes minutes to hours to cool down. When analyzed, it turns out to be made up of common terrestrial elements, often in a form resembling ordinary industrial byproducts.

Given this scenario, it is appropriate to ask under what conditions one might want to use liquid metal in a flying vehicle. In the words of J. R. **Bumby** of the University of Durham, "the high conductivity of liquid metals makes them an attractive means of current collection for homopolar machines." (**Bumby**, 1983) **Bumby** goes on to cite a number of such machines, both superconducting and non-superconducting, that have been built (Watt, 1958; Doyle, 1974; Chabrerie et al., Mailfert, 1972) and one that is commercially available (Lewis, 1971). Similarly, liquid metal designs have been proposed for magneto-hydrodynamic (MHD) generators, for the decomposition of toxic wastes and for superconducting airborne platforms (Southall & Oberly, 1979). However the composition of the liquids used in such machines is radically different from the list of elements found in Table 3. As noted by **Bumby**, "At room temperature the only pure liquid metal is mercury, although at slightly higher temperatures gallium (29.8 degrees C) and sodium (97.8 degrees C) become liquid." Actual machines are using sodium-potassium and gallium-indium mixtures as current conductors, thus minimizing wear and friction. The latter

is liquid above 15.7 degrees C. Yet none of these elements has been identified among the samples we have reviewed.

A different approach has been proposed by J. Roser in correspondence with the author. Noting the composition of the Bogota specimen as mentioned in our earlier publication¹⁶ he hypothesized a nuclear design for the object's power plant, utilizing direct energy conversion rather than a heat driven mechanical prime mover. "A closed cycle MHD generator using a liquid metal working fluid with no vapor staging pumping could be configured in a torus or circular shape and would make very little noise due to the lack of moving parts," he wrote, adding that the nuclear process known as beta decay might allow the design to extract a surplus of power in the form of free electrons.

Assuming a working fluid of Aluminum 27 plus some percentage of Phosphorus 31 (solitary stable isotopes of their respective elements) Roser speculates that depleted fluid might need to be occasionally ejected: "This discarded material would contain Al.27, P.31, iron from original melt or housing erosion, plus isotopes of nuclei close to aluminum and phosphorus such as Mg, Na, Si and S," Accordingly he suggests isotopic analysis of the Bogota sample to determine if it reveals anomalous isotopes such as Si.32 (half-life 280 years) which would indicate a nuclear-based power source.

Conclusion

Reports of unusual metallic residue following the observation of an unexplained aerial phenomenon are detailed enough for a comparative study to be undertaken. This research is hampered, however, by several problems of methodology where lack of money or analytical resources is only a secondary obstacle. The primary concerns have to do with inaccuracies in data gathering, lack of information about exact dates and times, lack of detailed, critical field investigation, and failure to provide an irrefutable chain of evidence in the collection, transportation and examination of the samples.

In spite of these shortcomings (which could be addressed through the setting up of better standards and through collaborative agreements among investigators) this paper has shown that significant progress had been made towards the analysis of a number of relevant incidents. In one case at least (Council Bluffs) the conditions of witness availability and reliability, on-site testimony by law enforcement officers, chain of custody and timely analysis were met. Other cases, such as Ubatuba and Bogota, are sufficiently intriguing to encourage investigators to expand their work in the field.

Over the years discussions of the UFO issue have remained narrowly polarized between advocates and adversaries of a single theory, namely the extraterrestrial hypothesis (ETH), defined as contact with an alien civilization originating in another solar system in our universe. This fixation on the ETH has narrowed and impoverished the debate, precluding examination of other

¹⁶Vallee, J. F.: *Confrontations*, 1990, pp. 44-45.

possible theories of the phenomenon. To the extent that recovered samples did not show an exotic composition or complex structure supporting their preconceived hypothesis, both sides of the extraterrestrial argument lost interest in the cases. In the view of the present author such lack of follow-up is unfortunate, because much could be learned from comparative analysis of such material even if it is mundane. Therefore our hope is that further field research may be stimulated by publication of the present survey.

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Do Any Near-Death Experiences Provide Evidence for the Survival of Human Personality after Death? Relevant Features and Illustrative Case Reports

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Abstract — One of the main reasons that near-death experiences have generated so much interest in recent years among the general public is because they seem to provide evidence that consciousness survives the death of the physical body. It is puzzling, therefore, that most researchers — both those interested in NDEs and those interested in survival research — have neglected to address the question of whether NDEs do provide evidence for survival. We describe three features of NDEs — enhanced mentation, the experience of seeing the physical body from a different position in space, and paranormal perceptions — that we believe might provide convergent evidence supporting the survival hypothesis. We then describe 7 published cases and 7 cases from our own collection that contain all three features. These cases are all — with one possible exception — somewhat deficient with regard to their recording and investigation, but they exemplify the type of case that should be identified earlier and investigated more thoroughly than these have been, and that may then help us decide the extent to which NDEs can contribute to the evidence for survival of consciousness after death.

Keywords: near-death experiences (NDEs) — survival of death — mind-body relationship — out-of-body experiences (OBEs) — **paranormal** perception — consciousness

Introduction

The question in our title may seem inappropriate, or even gratuitous, to the majority of people who have had an experience of the type that has become widely known over the past two decades as a near-death experience (NDE). Their NDEs have convinced these people that death is a transition to a different life rather than an end to life (Ring, 1984, pp. 156-157). On the other hand, to many people who have *not* had such an experience, the question of our title will seem the central and most important question that one can ask about this phenomenon. The widespread interest among the general public in NDEs seems to stem in large part from the belief that NDEs occur when a person is on the brink of death or even clinically dead and that NDEs therefore provide a brief glimpse or preview of what awaits us after death.

It may seem puzzling, therefore, that although reports of NDEs have proliferated during the past two decades, investigators of NDEs have with rare exceptions completely ignored the question of the survival of consciousness after the death of the body. They have gravitated instead toward less controversial activities — such as studying the transformations in attitudes and values that are almost universally reported by near-death experiencers, and speculating about physiological mechanisms possibly underlying the phenomenon — and they have shied away from the more challenging problem of whether NDEs have implications for the question of survival of human personality after death.

Likewise, investigators of evidence for survival after death — few though they have been — have shied away from NDEs, judging that they offer little promise of yielding convincing data bearing on the survival question. To these researchers, because NDEs are primarily subjective experiences, with little or no verifiable content reported, there is no reason to consider them to be anything other than hallucinatory imagery that may occur under certain physiological or psychological conditions. Moreover, these researchers have recognized that many of the features associated with NDEs are by no means unique to them. Phenomenologically similar experiences can occur when a person is ill but not at all near death (Owens *et al.*, 1990; Stevenson *et al.*, 1989-1990); and completely healthy persons have long reported experiences of feeling detached from the physical body (in so-called out-of-body experiences), of seeing an unusual bright light (in mystical experiences, conversion experiences, and even some paranormal experiences), of seeing deceased persons (in apparitional experiences), or of perceiving events outside one's sensory range (in clairvoyant experiences). The consensus of many people who study the evidence for life after death has been that NDEs may have something to contribute to the study of altered states of consciousness, but not to the problem of survival. Researchers have therefore concentrated instead on other, apparently more promising lines of research, such as veridical apparitions, objectively verifiable statements of mediums, or the statements, behavior, and physical features of young children who claim to remember the life of an identified deceased person (for reviews of such research, see, *e.g.*, Gauld, 1982; Stevenson, 1987).

Although the evidence for survival from NDEs is far from compelling, it also does not in our opinion deserve the neglect it has received from researchers. In this paper we describe the kinds of NDEs that we believe could potentially lend support to the suggestion that consciousness might be capable of functioning independently of the physical body and might therefore survive death. We will first identify the types of features of NDEs that might provide such support, and we will then describe some specific cases, both published ones and ones from our own collection, that illustrate some of these features.

Types of NDE Features that Might Support the Survival Hypothesis

Enhanced Mentation

Individuals reporting NDEs usually describe the NDE as being quite unlike a dream, in that their mental processes during the NDE were remarkably clear and lucid and their sensory experiences unusually vivid, equalling or even surpassing those of their normal waking state. Contrary to popular belief, NDEs (or experiences closely similar) can occur when a person is not seriously ill, or is even quite healthy. Nevertheless, many other NDEs do in fact occur at a time when there was a documented loss of vital signs, such as during cardiac arrest or another cause of a sudden loss of blood pressure. In two earlier papers, we called attention to the importance of normal or even enhanced mentation accompanying such severe physiological impairment (Owens et al., 1990; Stevenson & Cook, 1995). Persisting or enhanced mentation at a time when one would expect it to be diminishing, or entirely absent, because of diminishing physiological functioning at least suggests that consciousness might not be so dependent on physiological processes as most scientists now assume.

Crosscultural studies of NDEs may support this suggestion. The vast majority of NDEs reported and studied have occurred in Western cultures, but NDE researchers have in recent years begun to examine cases in non-Western cultures and in earlier historical periods, hoping to learn whether NDEs are primarily culturally determined hallucinations or indicate a more universal phenomenon (*e.g.*, Becker, 1984; Feng Zhi-ying & Liu Jian-xun, 1992; Pasricha, 1993; Pasricha & Stevenson, 1986; Zaleski, 1987). Thus far, the number of non-Western cases reported is small, and the picture they present is indeterminate and could be used to support both the interpretation that NDEs are culturally determined and the interpretation that, at their core, they transcend cultural expectations and influences. Moreover, even if there are cross-cultural similarities, many of these may reflect universal physiological or psychological adaptive responses to stress rather than universal perceptions of an objective, postmortem state. Nevertheless, regardless of which interpretation ultimately prevails, for the survival hypothesis the most important finding from crosscultural studies may be that, in widely divergent cultures and times, there are recurring reports of complicated cognitive and perceptual experiences — whatever form they take — at a time of severely impaired physiological functioning.

Out-of-Body Experiences

Another feature of NDEs that may lend support to the survival hypothesis is the commonly reported experience of viewing the physical body and its immediate physical environment as if from a different position in space. Many people report, for example, watching from above the attempts of medical personnel to resuscitate their physical bodies at the scene of an accident or in an

emergency room. As we mentioned earlier, this feature is not limited to near-death situations; out-of-body experiences (OBEs) are also reported by healthy persons as occurring both spontaneously and in experimental conditions (see, *e.g.*, Blackmore, 1982; Irwin, 1985). Many of those who have such experiences, as well as some who have not, have concluded that OBEs provide evidence that the mind can function outside the body and hence may survive the death of the body.

However, out-of-body experiencers, including near-death experiencers, are in fact still alive at the time of their experience and have not existed independently of their bodies. Even those persons who may have been pronounced dead by medical personnel were physically intact enough to have been revivable. Consciousness may therefore *seem* to be detached from the physical body, but it may still remain dependent on it for its continued existence. Furthermore, the vast majority of both NDEs and OBEs are entirely subjective phenomena, providing no objective evidence that the person has in fact been separated from the physical body. Even when a person later describes accurately events going on around him or her while he or she was ostensibly unconscious (for example, under general anesthesia), such information may derive from that person's persisting ability to hear (see, *e.g.*, Ghoneim & Block, 1992; Jones, 1994; Moerman *et al.*, 1993).¹ As a result, other observers of OBEs and NDEs have concluded that such experiences are probably produced by processes of imagination (Blackmore, 1982; Palmer, 1978).

Nevertheless, there has been one notable attempt to determine whether the OBEs reported in connection with NDEs are solely the product of subjective imagery or whether they sometimes include objective, out-of-body perceptions. Michael Sabom, a cardiologist, compared the accuracy of the descriptions by near-death experiencers of their resuscitations with the descriptions of cardiac patients who did not report an NDE but who were asked to imagine what a resuscitation looked like. He concluded that the near-death experiencers seemed to be describing actual observations rather than imagined events (Sabom, 1982).

A different approach for testing the hypothesis that one actually leaves the body during an OBE or an NDE is to try to detect whatever it is that leaves. In an experiment designed to test a subject's ability to perceive a distant object while he was having an OBE (Osis & McCormick, 1980), strain gauges situated near the target object were activated when the subject was successful in perceiving the target and perceived himself as being out of his body. The investigators concluded that these results suggested that some aspect of the subject's personality had been present at the target site, activating the strain gauges.

¹ Trustman *et al.* (1977) urged caution in evaluating claims of auditory perception during general anesthesia, because they found methodological problems in the studies of this phenomenon that they reviewed. Additionally, most recent reviewers of the phenomenon agree that much of the evidence comes from individual case reports and clinical studies, rather than experimental studies, and that the incidence is extremely low (Ghoneim & Block, 1992; Jones, 1994; Moerman *et al.*, 1993).

Morris, Harary, Janis, Hartwell, and Roll (1978) also conducted some experiments with another subject who was proficient at inducing OBEs in himself, and they used a variety of human, animal, and physical detectors to try to identify the times when the subject was having an OBE. Some of these experiments seem to have been successful on some occasions, but overall they were inconclusive.

Paranormal Perceptions

An even more important kind of NDE for suggesting that NDEs are not simply subjective hallucinations or imagination are those in which experiencers report perceiving events that occurred beyond the normal range of the physical senses, events that they could not have perceived normally even if they had been conscious. As critics and researchers alike have long recognized, reports of this type are infrequent, and most of them unfortunately remain unsubstantiated anecdotes (Blackmore, 1983; Cook, 1984; Ring & Lawrence, 1993). Even those investigators who have recognized the importance of corroborating these accounts, and have tried to do so, have published only the most sketchy of reports of them (Clark, 1984, pp. 242-243; Owens, 1995, pp. 160-162; Ring & Lawrence, 1993). Nevertheless, throughout the literature of both NDEs and OBEs, firsthand accounts of experiences of this sort keep recurring. (We will describe some of these below.) Hart (1954) identified 288 published cases in which a person claimed to have perceived events at some distant location at a time when he or she seemed to be out of the physical body. (Ninety-nine of these met Hart's criteria for evidentiality, in that the events seen were later verified and had also been reported to someone by the experient *before* that verification took place.)

Like many other features of NDEs, claims of paranormally perceiving distant events are by no means limited to NDEs or even OBEs in general, and many people have argued that we cannot differentiate true out-of-body perception from extrasensory perception by the person inside the body. In an attempt to address this problem, Osis and McCormick (1980) designed a visual target that could be identified only if viewed from one particular visual perspective, and they recruited as the subject for their experiments a person skilled at inducing OBEs in himself. The success of this person in identifying the target led Osis and McCormick to conclude that he had done so by viewing it while out of his physical body, rather than by clairvoyance while inside his physical body.

One other feature of NDEs may also suggest that they are not entirely subjective hallucinations. Some people who have had an NDE say that during the experience they met deceased relatives and friends. Osis and Haraldsson (1977/1986, pp. 64-65) found that dying persons are more likely to report hallucinations of deceased persons than do healthy persons, who more often hallucinate living persons. As with other features of NDEs, many such visions may be subjective hallucinations. People who believe that they are dying

would presumably hope or expect to be reunited with deceased loved ones; and the visions may also represent a defensive attempt to reduce fear of impending death by imagining reunion with familiar persons. However, there are cases reported of the so-called "Peak in Darien" type (Cobbe, 1882), in which a person near death has reported seeing a recently deceased person of whose death the experiencer had no normal knowledge (Barrett, 1926, pp. 10-26; Callanan & Kelley, 1992, pp. 86-87, 93-94; Crookall, 1960/1966, pp. 21-22; Gurney & Myers, 1889, pp. 459-460; Hyslop, 1908, pp. 88-89; Myers, 1903, ii, pp. 339-342; Osis & Haraldsson, 1977/1986, p. 166; Ring, 1980, p. 208; Sidgwick, 1885, pp. 92-93). Such cases weaken the conjecture that the vision was an hallucination related to the experiencer's expectations; in many of them the experiencer has even expressed surprise at seeing someone thought to be living.

In sum, the NDE features that seem to us to have the most potential for contributing to the evidence suggesting survival after death fall into three broad categories. First, there are those features suggesting enhanced mentation at a time of diminished physiological functioning, including a rapid, detailed, and often extremely vivid revival of memories (Stevenson & Cook, 1995), complex and vivid imagery and sensations, and lucid cognitive functioning. Second, there is the experience of viewing one's physical body and the immediate environment as if from a spatial location different from that of the physical body. Finally, there are those cases in which the person has gained previously unknown but potentially verifiable information, usually either by viewing distant events or by meeting deceased persons. The first group of features suggests that mental clarity is not entirely dependent on physiological functioning; the second suggests that consciousness can function apart from, if not independently of, the physical body; and the third group suggests that NDEs are not entirely subjective in origin. Separately, none of these features provides compelling evidence for the survival of consciousness after death, since they all might be explained by other normal or paranormal mechanisms. Taken together, however, and particularly when all three types of features occur together in individual cases, the hypothesis of survival begins to seem more worthy of consideration.

Illustrative Cases

We turn now to presenting some brief reports of cases, both previously published ones and ones in our own collection, that illustrate the kinds of cases that we believe must be identified, investigated, and published if NDE research is to contribute to an assessment of the survival hypothesis. Perhaps the most important cases are those that involve veridical, apparently paranormally derived knowledge. As we pointed out earlier, there are relatively few reports of such cases in the literature, and none of these have been adequately corroborated or investigated. The reports we present here will not substantially alter that picture. We emphasize from the outset that all of the cases we will describe — with one important exception — suffer from weaknesses, usually be-

cause by the time we learned about the case, potential witnesses who could verify or corroborate the experiencer's statements were unavailable. None of the cases should be considered compelling evidence for anything except the need to identify similar, but more recent cases that can now be investigated more thoroughly than most of these have been.

We also wish to emphasize that most of the cases that we will describe involved additional features commonly reported in NDEs, such as feelings of great peace or joy, tunnel experiences, a bright light, or visions of "other-worldly" places. Although an adequate interpretation of the nature of NDEs must take into account all features reported, we focus in this paper only on those particular features that we think are most relevant for assessing whether NDEs provide evidence for survival.

Published Cases

1) *The Case of Sir Alexander Ogston*. The experiencer of this case, a British army officer, reported it in the memoirs of his military campaigns (Ogston, 1920, pp. 221-223). It occurred during his service in the South African War (also known as the Boer War), which lasted from 1899 to 1902. Ogston suffered from typhoid fever and was admitted to Bloemfontain Hospital, where his experience occurred. We continue with his own words:

In my delirium night and day made little difference to me. In the four-bedded ward, where they first placed me I lay, as it seemed, in a constant stupor which excluded the existence of any hopes or fears. Mind and body seemed to be dual, and to some extent separate. I was conscious of the body as an inert, tumbled mass near a door; it belonged to me but it was not I. I was conscious that my mental self used regularly to leave the body... until something produced a consciousness that the chilly mass, which I then recalled was my body, was being stirred as it lay by the door. I was then drawn rapidly back to it, joined it with disgust, and it became I, and was fed, spoken to, and cared for. When it was again left I seemed to wander off as before....

In my wanderings there was a strange consciousness that I could see through the walls of the building, though I was aware that they were there, and that everything was transparent to my senses. I saw plainly, for instance a poor R.A.M.C. [Royal Army Medical Corps] surgeon, of whose existence I had not known, and who was in quite another part of the hospital, grow very ill and scream and die; I saw them cover his corpse and carry him softly out on shoeless feet, quietly and surreptitiously, lest we should know that he had died, and the next night — I thought — take him away to the cemetery. Afterwards, when I told these happenings to the sisters [senior nurses], they informed me that all this had happened....

2) *The Case of Dr. X*. This case was published by Stratton (1957). The essential details were as follows: In 1916, during World War I, Dr. X was a Medical Officer stationed in France with a brigade of the Royal Flying Corps (later to be known as the Royal Air Force). A pilot at another airport was shot down and managed to land his airplane, but he could not be removed from his

machine because of his injured condition. Dr. X was asked to go to the other airport and supervise the extraction of the wounded pilot. He was to be flown there in another airplane.

The pilot flying Dr. X to the other airport was less than adequately competent, and the airplane with Dr. X in it crashed within the area of the airport almost as soon as it had taken off. The airport was badly located on two slopes with a crest between them. The hangars and other quarters were on one side of the crest; and the crash occurred on the other side, so that the site of the crash was not visible to persons at the hangars. Likewise, the hangars were not visible from the site of the crash. Dr. X was ejected from the airplane and landed on his back. The published account continues, in the words of Dr. X:

Suddenly I was looking down on my body on the ground from some 200 feet vertically above it.... I remember vividly being, as it were, in a state of pleasant awareness, about 200 feet directly above my body, and seeing the Brigadier and Lieutenant Colonel [who had come to the airport to watch the airplane take off] and also the pilot running towards my body, the pilot being on that occasion unhurt. My spirit, or whatever you like to call it, hovering there, was wondering why they were bothering to pay any attention to my body, and I distinctly remember wishing they would leave it alone.

While I was up above my body, it did not seem in the least queer that I could see... a number of activities at the hangars.... The Crossley tender [an ambulance] started out of the hangar in which it was garaged. When about a car or a car and a half length outside the hangar, the engine stalled, and I saw the chauffeur jump out and pull the starting handle. Then he raced back to his driving seat and started off towards the crash over the crest, and down to the hollow [where Dr. X lay on his back].

While this small episode was occurring my Medical orderly had rushed out of my nearby medical hut, and jumped into the back of the Crossley tender.

The ambulance, or tender, then stopped again, but this time it was the Medical orderly who jumped out, rushed into the Medical hut, and came out with something extra, and jumped into the ambulance, which then resumed its twice interrupted journey.

The experienter's account then included details of some "travels" far from the airport before he regained normal consciousness. We omit these, because they included nothing verifiable. The experienter's account continued:

A sort of retraction occurred, definitely not a turning around, and then, once more, for a brief space, I was hovering immediately above my body.

Suddenly, "Pop," and I was aware that the Medical orderly was pouring neat sal volatile [ammonium carbonate, used to stimulate persons who fainted or collapsed] down my throat! I told him to stop doing this and I became conscious....

When I was safely in the hospital... I realised that it was quite impossible for me to have seen all or the majority of the events that took place at the hangars as I have detailed them.... This impressed me so much, that I mentioned it to the C[ommanding] O[fficer] when he visited me.... [H]e then and there in the hospital, wrote down an account at my slow dictation, of every detail concerned with the ambulance, and the re-starting of the engine, and the Medical orderly running in and out of his hut, and he took it back, and verified that all these occurrences actually did take place after I was on the ground, and lying on my back where it was absolutely physically impossible to see anything but the lip of the hill that rose between the landing ground and the hangars.

Stratton, who reported the case, tried many years later to meet witnesses of the accident and of Dr. X's statements, including Dr. Abrahams, a physician who supervised Dr. X's transport from the scene of the accident to the hospital. Stratton was able to obtain a written statement from Dr. Abrahams, who confirmed the gravity of Dr. X's condition after the crash; but informants who might have verified Dr. X's apparent paranormal perceptions had either died or could not be traced.

3) *The Case of Mr. W. A. Laufmann.* Muldoon and Carrington (1951/1969, pp. 83-84) described the case of Mr. W. A. Laufmann, a traveling salesman who had been hospitalized with an unspecified, but apparently grave, illness while in Omaha. They said that Mr. Laufmann became "conscious of something like a fleecy ball releasing itself from his physical form," and they then quoted from Mr. Laufmann's own description of his experience:

I was standing there in the middle of the room and distinctly saw my dead body lying upon the bed.... I started to leave the room and met one of the physicians, and was surprised that he said nothing to me, but since he made no effort to stop me I walked out into the street where I met an acquaintance of mine, Mr. Milton Blose.

I tried to greet Mr. Blose by hitting him on the back, but my arm went through him.... It was impossible for me to attract his attention.... I saw that he went across the street and looked into a shop window where a miniature "Ferris wheel" was on display.

Mr. Laufmann then returned to his hospital room, where he saw the doctors standing over his physical body, discussing his condition. He saw one of the doctors applying an electric current to his feet, he felt intense pain, and he then found himself back in his body. According to Muldoon and Carrington, Mr. Laufmann later claimed "to possess a testimonial letter from Mr. Blose verifying the fact that the latter actually had been in Omaha at the time, and had walked down the street and stopped to look at a 'Ferris wheel' in a shop window" (p. 84).

4) *Case Reported by Green (1968).* In the following case — for which Green did not provide the experiencer's name — the events described by the percipient took place in the same hospital room in which she was lying; but some of them took place out of her visual range, and they included details that could not have been detected by auditory means:

I was in the hospital having had an operation for peritonitis; I developed pneumonia and was very ill. The ward was L shaped; so that anyone in bed at one part of the ward, could not see round the corner.

One morning I felt myself floating upwards, and found I was looking down on the rest of the patients. I could see myself; propped up against pillows, very white and ill. I saw the sister and nurse rush to my bed with oxygen. Then everything went blank. The next I remember; was opening my eyes to see the sister bending over me.

I told her what had happened; but at first she thought I was rambling. Then I said,

"There is a big woman sitting up in bed with her head wrapped in bandages; and she is knitting something with blue wool. She has a very red face." This certainly shook her; as apparently the lady concerned had a mastoid operation and was just as I described.

She was not allowed out of bed; and of course I hadn't been up at all. After several other details; such as the time by the clock on the wall (which had broken down) I convinced her that at least something strange had happened to me. (Green, 1968, p. 121)

5) *The Case of Mrs. R. M. Crookall* (1972, p. 76) briefly quoted the following account from Mrs. R. M., who was "very ill in hospital":

I looked down at my body. I thought I was dead. I went out into the corridor and saw my husband.

I wondered where my daughter was and the next instant I was standing beside her in a gift shop. She was looking at some "Get Well" cards. I could "hear" her read the verse. She decided it would be disrespectful and bought another.

Then I was back in my body. When my daughter came with the card, I repeated the verse she had read.

6) *The Case of the Rev. L. J. Bertrand.* The following case occurred in the mid-19th century, and Mr. Bertrand did not write out an account of it for 30 years, when he sent a long description to William James in a letter of October 10, 1891. Frederic Myers published Mr. Bertrand's account the following year (Myers, 1892, pp. 194-200).

Mr. Bertrand, an experienced mountain-climber who took several pupils climbing in the Alps and the Pyrenees every year, was climbing the Titlis in the Alps on one occasion when he, exhausted by his efforts, suggested that his companions go on to the summit without him and that he would rest until they returned. As the leader of the group, however, he gave explicit instructions that they climb the peak on its left side and come down on its right side, since he knew that there was a dangerous cut on the left side that was more easily seen from below than from above. He also instructed his strongest pupil to take the position at the end of the rope.

While waiting for the return of his companions, Mr. Bertrand apparently began to freeze to death, such that he was unable to rouse himself. After a brief moment of acute pain, he suddenly found himself "a ball of air in the air, a captive balloon still attached to earth by a kind of elastic string and going up and always up. How strange! I see better than ever, and I am dead.... Looking down, I was astounded to recognise my own envelope" (p. 196). Mr. Bertrand then went on to explain that he saw the climbing party going up by the right side of the mountain rather than the left, as they had promised him they would, and he saw that the pupil who had promised to be on the end of the rope was neither at the beginning nor at the end, but away from it altogether. He also saw the guide drinking out of Mr. Bertrand's bottle of Madeira and eating a piece of Mr. Bertrand's chicken. Finally, he saw his wife, with a party of four

other people, at a hotel en route to meet him in Lucerne, although she had told him that she would not be traveling until at least a day later.

When the climbing party returned and found him, they were able to rescue and revive him. According to Mr. Bertrand, he confronted the guide, who seems to have confirmed by his reactions to Mr. Bertrand's statements that they had gone up the right slope rather than the left, that two of the pupils had left their appointed places on the rope, and that the guide had pilfered some of Mr. Bertrand's Madeira and chicken. Mr. Bertrand also said that he confirmed the next day that his wife had set off for Lucerne earlier than she had planned, with four traveling companions, and that she had stayed at the hotel at which Mr. Bertrand had seen her.

7) *The Case of W. Martin.* The following report was published in the (London) *Sunday Express* on May 26, 1935:

In 1911, at the age of sixteen, I was staying about twelve miles from my own home when a high wall was blown down by a sudden gust of wind as I was passing.

A huge coping stone hit me on top of the head.

It then seemed as if I could see myself lying on the ground, huddled up, with one corner of the stone resting on my head and quite a number of people rushing towards me.

I watched them move the stone and some one took off his coat and put it under my head, and I heard all their comments: "Fetch a doctor." "His neck is broken." "Skull smashed like an eggshell."

He [apparently a doctor] then wanted to know if anyone knew where I lived, and on being told that I was lodging just around the corner he instructed them to carry me there.

Now all this time it appeared as though I was disembodied from the **form** lying on the ground and suspended in mid-air in the center of the group, and could hear everything that was said.

As they started to carry me it was remarked that it would come as a blow to my people, and I was immediately conscious of a desire to be with my mother.

Instantly I was at home, and father and mother were just sitting down to their midday meal. On my entrance mother sat bolt upright in her chair and said, "Bert, something has happened to our boy."

"Nonsense," he said, "whatever has put such an idea into your head?"

There followed an argument, but mother refused to be pacified, and said that if she caught the 2 p.m. train she could be with me before three and satisfy herself.

She had hardly left the room when there came a knock on the front door. It was a porter from the railway station with a telegram saying I was badly hurt.

Then suddenly I was again transported — this time it seemed to be against my wish — to a bed-room, where a woman whom I recognized was in bed, and two other women were quietly bustling around, and a doctor was leaning over the bed.

Then the doctor had a baby in his hands.

At once I became aware of an almost irresistible impulse to press my face through the back of the baby's head so that my face would come into the same place as the child's.

The doctor said, "It looks as though we have lost them both." And again I felt the urge to take the baby's place in order to show him he was wrong, but the thought of my mother crying turned my thoughts in her direction, when straightway I was in a railway carriage with both her and father.

He [Mr. Martin's father] was looking at his watch, and she [Mr. Martin's mother] was saying that trains always crawled when you were in a hurry, and dad's reply was that the train was right on time.

I was still with them when they arrived at my lodgings and were shown into my room where I had been put to bed.

Mother sat beside the bed and I longed to comfort her, and the realization came that I ought to do the same thing as I felt impelled to do in the case of the baby and climb into the body in the bed.

At last I succeeded, and the effort caused the real me to sit up in bed fully conscious.

Mother made me lie down again, but I said I was all right, and remarked that it was odd she knew something was wrong before the porter had brought the telegram.

Both she and dad were amazed at my knowledge. Their astonishment further increased when I repeated almost word for word some of the conversation they had had at home and in the train.

Mother remarked that she supposed that when some people came close to death they were gifted with second sight.

I replied by saying I had also been close to birth as well, and told them that Mrs. Wilson, who lived close to us at home, had a baby that day, but it was dead because I would not get into its body.²

We subsequently learned that Mrs. Wilson died on the same day at 2:05 p.m. after delivering a stillborn girl.

I am convinced that if I had willed myself into that baby's body, today I would be a Miss Wilson, instead of still being — W. Martin, 107 Grove Street, Liverpool.

One of us (I.S.) read Mr. Martin's account of his experience in the early 1960s and resolved to try to meet him. Accordingly, in the summer of 1963 I.S. went to Liverpool and knocked at the door of 107 Grove Street. No one there knew anything about W. Martin, who had evidently moved away long before. I.S. then tried telephoning a number of W. Martins listed in the Liverpool telephone directory. The wife of one who answered the telephone said that her father-in-law was also called W. Martin, but she gave I.S. to understand that the senior W. Martin had died. She said that she vaguely remembered having heard something about an experience similar to the one that I.S. had read about in the *Sunday Express*. Her husband was not available then, and I.S. did not remain longer in Liverpool to meet him. The case therefore remains uninvestigated.

Cases from Our Collection

8) *The Case of Linda McKnight*. (For this, and for most of the other cases from our collection, we are using pseudonyms.) This case was first drawn to our attention early in 1961 by a psychiatric resident of the University of Virginia Hospital. Mrs. McKnight had been a schoolteacher of the resident's

² The detail of seeming on the verge of being reborn in a baby's body has a parallel in some cases of near-death experiences among the Druses of Lebanon. We have notes of three cases in which the subject, while near death, found himself suddenly at a place where a baby was being born and died or was stillborn (Stevenson, 1980, p. 12). These experiences accord with the Druse belief that rebirth occurs immediately after death.

wife, and she had once told her class about her experience; it had remained clear in the memory of the student who later became the psychiatric resident's wife. Mrs. McKnight was 34 years old at the time of the experience, which occurred in 1930. In 1961 it seemed worth investigating, if that were possible. I.S. asked the resident to write to Mrs. McKnight requesting her to send us a written account of her experience. She replied in a letter dated January 20, 1961, from which we quote the following:

And now for my story:

As it would seem to an observer.

The day after a gall-bladder operation, I was supposed to be "doing as well as could be expected," when a friend of mine — [a] former nurse — was allowed to bring me some flowers. She gave one look [at me], rushed out to inquire where my nurse was and said I looked as if I were sinking fast. Then she phoned my husband at his office to tell him to come to the hospital immediately. (This trip with police escorting the taxi took about 23 minutes.) Fortunately, my surgeon was in the hospital and he, the resident, and I think an intern came down immediately. He administered heart stimulants by hypodermic, *etc.*, but when my husband came in, the Doctor said: "It's too late, Sir. And this shouldn't have happened because she was making a good recovery." Then he told the nurses to hold the body so it wouldn't slip and had the men lift the mattress to an upright position. He said they were to drop the mattress on signal. When he gave the signal, the jar of the fall started the heart beating again — and the patient lives.

Now as it occurred to me.

When my friend came in she seemed to move as before a slow motion picture camera laying the bouquet of flowers on the table with much deliberation, turning very, very slowly and moving toward the door. I was aware of a sensation of deep cold, an inner cold, and things grew dark, then black — "blackier than midnight in a cypress swamp" as James Meldon Johnson describes the world before God created day and night. After this coldness and blackness came oblivion. Suddenly it was as if someone had turned on a flood light and I glowed in its warmth. My first thought was "no pain — wonderful — I'm free — I can go where I please!" I went to the window to see what was outside. In the street four stories down a boy was teasing a much smaller girl, trying to take away her skates. I thought I should intervene but before I had really left the room my husband came in. He said: "Linda, why do you leave us?" and I turned back. I remember thinking it odd he was bowed over a figure on the bed instead of looking at me. Then I "heard" the conversation [between the doctor and the husband and between the doctor and the nurses] and saw them raise this body and mattress. Suddenly as if someone snapped a rubber band I was jerked into the room, into cold, into blackness, into oblivion. Then there I was in bed with the pain again and people standing around.

My first reaction was I had dreamed this fantastic thing. I said to my husband: "Did you think I had left you?" He began to cry. When the surgeon came I said: "So you thought you'd lost me, didn't you?" and he said gruffly: "We never lose patients. Who's been talking to you?" By this time, because of their reactions, I felt I must *prove* this experience. I knew the children wouldn't still be playing on the walk. I tried to recall other details. I remembered seeing a Christmas tree on the balcony below (this was February) and a whole area of sheets flapping in the wind. I asked my nurse what was out the window and she said she didn't know but she'd look. Fortunately I spoke in time. "Don't tell me," I said, "Let me tell you. There's a Christmas tree on the balcony below." She had to open the window and lean out to see this. She confirmed the drying area [of the sheets] behind to the left.

Then I knew I had *died* and had come back again.

I.S. entered into correspondence with Mrs. McKnight about details and obtained the following additional information.

Mrs. McKnight was sure that she had told the nurse about the sheets drying below the window before the nurse looked out the window. She wrote: "I know I did [this] because I was trying to recall details which I had seen which would prove the reality of an experience."

In reply to a question about whether Mrs. McKnight might have seen the area below her hospital window as she was brought into the hospital, she replied: "I entered the hospital at 3.00 a.m. in agony of a gall-bladder attack. I'd never been there before. I was taken to my room, where I was put to bed against the inner wall. Soon afterward I went to sleep under sedation. The only time I left the bed was to be wheeled to the operating room." I.S., not fully satisfied, pressed for more details about the location of the yard where the sheets had been drying in relation to the hospital entrance. Mrs. McKnight replied: "If a drying yard had been beside its [the hospital's] front door, I wouldn't have seen it the night I entered the hospital about 2.00 a.m. in the throes of a violent gall-bladder attack. I'm sure however when I looked out of the window it [the drying area] was on some side street. I don't remember which direction the room faced."

Mrs. McKnight could not remember the name of the hospital where she had had her experience. She did remember the names of the two principal doctors concerned in her operation and experience; but they had both died before 1961. More than 20 years later we began a systematic search for medical records associated with NDEs. We wrote to Mrs. McKnight again. In reply, her daughter wrote to say that Mrs. McKnight had died on March 28, 1984 at the age of 88. Her daughter remembered hearing her mother describe her experience of nearly dying. She thought her mother had had her operation in a hospital in New York City, which she named. We applied to this hospital for the medical records (for which Mrs. McKnight's daughter, as her next of kin, had signed a release to us), but the records could not be found.

Mrs. McKnight, faced with some skepticism on the part of her surgeon, as described above, wanted to discuss her experience with someone else and had asked to see her minister. He was still alive in 1961, and she gave us his name and address. The Rev. Colin Weston replied cordially to our letter. He said that he remembered listening to Mrs. McKnight recount her experience the day after it happened. Unfortunately, he could remember no details clearly. He wrote: "It seems to me she spoke of being outside a window while her body was inside the house. More than this I cannot say, though, I remember, she was very earnest about the experience."

9) *The Case of Jean Morrow.* In 1991 Mrs. Morrow read about our research in a magazine and wrote to tell us about an experience that she had had in 1956, during the birth of her first child. Mrs. Morrow, a nurse, described the beginning of her experience as follows:

Due to blood loss my blood pressure dropped. My blood type wasn't available and nurses were in a panic. When I heard "Oh my God, we're losing her," I was "out of body" at once and on the ceiling of [the] operating room looking down — watching them working on a body. I knew I wasn't dead — it took a while to recognize the person I was viewing was me!! I watched my Dr. arrive and procedures being done — conversations and baby being born. Also comments and concern for her. It was [a] small hospital and I found myself over my Mom in the waiting room. She was smoking — my Mom doesn't smoke but she admitted much later that she had "tried" one or two because she was so nervous! I returned to [the] O.R. and my baby was doing better — I was not.

Mrs. Morrow went on to describe the rest of her experience, which included, among other things, moving in a dark tunnel toward an extremely bright light, seeing her deceased grandmother, and seeing a review of her life.

E.W.C. recently wrote to Mrs. Morrow to try to corroborate from her mother or other witnesses that her mother had uncharacteristically been smoking in the waiting room of the hospital, but unfortunately Mrs. Morrow had by then moved, and we have not been able to trace her.

10) The Case of Jennifer Edwards. I.S. interviewed Jennifer Edwards in May 1990, shortly after we first learned about her experience. Ms. Edwards was then 33 years old, and her experience had occurred about 17 years earlier, when she was 16. She had gone skiing in Vermont one weekend with her family, a boyfriend, and another friend. Ms. Edwards and the two friends were skiing down an expert-level trail when Ms. Edwards hit a bad spot, somersaulted, and landed hitting her head first. Her friends stopped to help her, and because they were not far from the ski lines, they were able to call to nearby people. The ski patrol was summoned, Ms. Edwards was transported back to the lodge by toboggan, and she was then taken to a nearby hospital. According to the medical records, Ms. Edwards suffered a neck sprain with some displacement. She was kept in the hospital overnight for observation and then released.

About 2 hours elapsed between the time Ms. Edwards had the accident and the time she arrived at the hospital. She was conscious when she arrived at the hospital. According to the medical records, there was some uncertainty about whether she had at any time lost consciousness, at least from an onlooker's perspective. From Ms. Edwards's perspective, however, she never lost consciousness: "I remember everything that happened after that [the accident] but it was as if I was above as an observer." From this position, she seemed to watch the efforts of people helping her from the time of the accident until she arrived at the hospital. Most of the events that she described seeing were those occurring in the immediate vicinity of her physical body, but at one point she seemed to see her parents, who had not been with her at the time of the accident:

I watched from higher up now my parents reading a skiers' announcement board at the base of the mountain. Mr. and Mrs. Strong, please report to the First Aid office. They looked alarmed, I tried to console them from where I was but they didn't seem to hear me.

Ms. Edwards estimated that the announcement board was probably about half a mile away from where her physical body lay.

Although Ms. Edwards was cooperative in being interviewed, in filling out our questionnaire, and in allowing us to obtain her medical records, she was reluctant to allow us to contact her parents, who might have been able to provide important corroboration of her claim to have seen them reading a notice on the skiers' announcement board telling them to report to the First Aid office. Her relationship with her parents was apparently not an altogether good one, and she believed that they would be annoyed at inquiries from us about her experience.

11) *The Case of Peggy Raso.* On August 6, 1960, Mrs. Peggy Raso gave birth uneventfully to a baby girl in a hospital in West Virginia. At the time of her admission to the hospital for the delivery she was found to have severe varicose veins, and she already had had two episodes of pulmonary emboli during pregnancies. It seemed wise to prevent further pregnancies, and therefore on August 11 she had an elective bilateral partial salpingectomy. We quote now from the medical records that we later obtained from the hospital:

The patient withstood the operation well and, apparently, was progressing well, when, on the 15th of August, 1960 at 5.00 a.m. the patient suddenly became cyanotic and had severe chest pain. She became unconscious and was treated symptomatically, given anticoagulants, because it was felt that she had thrown another pulmonary embolism. The patient had a very stormy course, but did progress and was discharged from the hospital on August 27, 1960, in good condition.

While outwardly unconscious, Mrs. Raso had an unusual experience that she tried to tell to other persons later. In particular, when she was a patient at the University of Virginia Hospital in 1961, she described her experience to doctors caring for her. She noted that most of them responded with titters or by looking strangely at her. She overheard one, however, who said: "We should have her talk to Dr. Stevenson." I.S. had already been studying these cases, and his interest was known to at least some of his colleagues. Nevertheless, no one referred Mrs. Raso to him in 1961 or later. In 1987, she herself wrote to I.S., and he promptly responded by asking her to send him a detailed account of her experience. This reached him in May 1987, and we now quote from it. (Before quoting Mrs. Raso's own statements, we need to explain that she had a premonition that something, presumably adverse, "was going to happen." In what we shall quote she refers to this expected happening as "it."):

I didn't want to leave my room. I just wanted to stay there and wait for it. This feeling persisted all night. I woke at intervals waiting for it. Finally, at five a.m. [on August 15, 1960] my baby was brought to me. I threw the sheets back and noticed the air was thick with my feeling. I swung my legs out of bed toward my blue slippers and knew this was the time I had been waiting for. "This is it," I said to myself.

The room spun, went black, and I slid to the floor. I felt great pain in my chest. The small room filled with hospital personnel. I saw myself on the floor. My gown had landed around my waist and one nurse was pulling it down. An orderly came in and lifted my body to the bed. Another brought a tank of oxygen into the room. I heard the nurses saying call the doctor, call her husband, call the priest, *etc.* One nurse was on the phone beside the bed and I heard her say: "Yes, doctor, we have her back on the bed and oxygen is being administered." I, the real me, was not on the bed and I began to think about this. I knew I didn't feel the bed beneath me. I looked down at the bed from my vantage point near the ceiling. (See Figure 1.) I saw a girl there who looked to be in a great deal of pain. Her eyebrows were drawn together, her lips were blue, she appeared to have a blue mustache, there was an oxygen tube in her nose, her hair was wet looking and strung out on the pillow. I felt sorry for her. Doctors and nurses were coming and going from the room. I saw one doctor hit her hard in the chest. I really felt confused at what I was seeing and hearing. The nurses' station was about fifty feet from my room. I saw a doctor come to the station that I recognized. He was a family friend and I had been raised next door to him. The nurse told him Peggy Adams [Mrs. Raso's maiden name] had just died. He replied he would call Margaret (my mother). My hearing was extremely acute. I heard and saw another patient on the floor complaining about the activity and noise coming from my room. [This patient's room was on the other side of the hallway from Mrs. Raso's room; see Figure 1.]

It dawned on me they were talking about me. I tried to tell them I was not down there. It became obvious they were not hearing me. I recognized another nurse from another floor come into the room. I knew her thoughts. She had heard from the hospital grapevine that I had died and wanted to see. She leaned on the foot of the bed and said, "Too bad, and she was only twenty-five." She left the room shaking her head negatively and said to someone in the hall, "I'm so sorry." I was aware of a priest being in the room and from my vantage point I watched him leave. As he entered the hall, I heard him say, "I will pray for her soul." I saw my husband softly crying in the hall. He said, "What can I tell the children?" My aunt, an RN, answered him with, "God just wanted her." I felt sorry for them.... [Mrs. Raso here described other features of her experience.]

My attention was called back to the hall by my aunt's voice. I saw her sitting in a squatting position leaning against the wall and talking to another nurse who was on duty. She said, "She was such a good little mother." I knew she was talking about me and I thought, "I am still a good little mother." Her words startled me into realizing I was dead. I looked at the body again and I knew it was mine. I tried so hard to tell them I wasn't there anymore and I wasn't in pain. I wished they could all be up there with me. Once I realized the lifeless body was mine, my confusion vanished and I felt my face relax into a knowing smile. Well, maybe more of a smirk. I realized I was privy to something they were not understanding.

One of the doctors leaned close to the body's ear and began calling, "Peggy, Peggy." I knew I was Peggy, but I did not want to answer. I did not want to go back down there. One doctor said to the other, "Joe, you have done all you can." Joe Lawson, my OB/GYN, covered his face with his hands. One of the doctors (a Doctor Cowen) left the room and I could see right through the wall. He gave a negative shake of his head to my husband. The doctor remaining in the room leaned over the body and said, "You've got to make it." I wondered why. All of these people wanted me to come back and leave this wonderful place that I thought I alone had found.

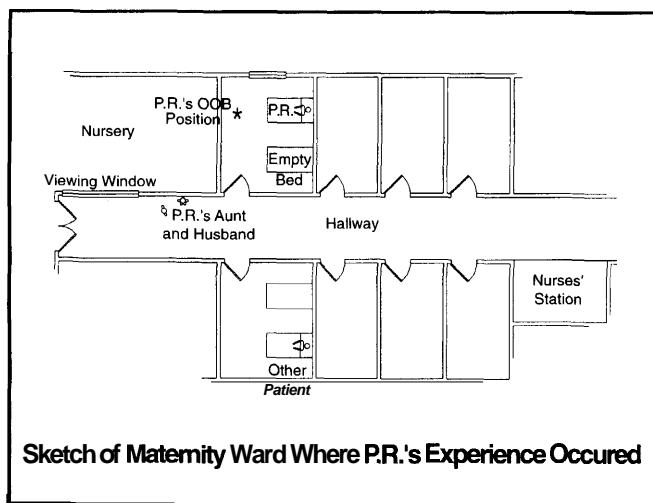


Fig. 1. Sketch of Maternity Ward Where P.R.'s Experience Occurred.

It seemed the room was now emptying as fast as it had filled up. I looked at my husband in the hall, [at] the nurses, and I thought I must go back to tell them all about this. I could hardly wait to tell them. (Little did I know how this news would be received in 1960.) I gave a wistful look at the beauty of this other existence and started down. I hovered over the body for a moment and thought, "I will go back up there at another time." I went back to the body and immediately felt all the pain.

As we mentioned, we subsequently obtained pertinent medical records from the hospital where Mrs. Raso had her experience. The medical records were meager regarding her condition when she collapsed, and they gave no information about how long she remained unconscious. Mrs. Raso herself realized that her husband could not have reached the hospital instantly, and she thought that she might have had a prolonged period of unconsciousness or perhaps even had two episodes of pulmonary emboli, which she later fused in her memories.

In subsequent correspondence with I.S., Mrs. Raso sent a sketch of the layout of the hospital ward where she had her experience. (The Figure is an artist's rendering of the sketch.) This sketch shows the relative positions of the nurses' station, Mrs. Raso's room, and the place where her husband and aunt talked in the hall outside her room. The door of her room was open during her experience, which suggests that she might have heard normally what her husband and aunt were saying. It is unlikely that she would have heard normally comments made at the nurses' station, which was 50 feet from her room.

In February 1990 Mrs. Raso's husband, Leno, answered in writing some questions that I.S. had put to him in a letter. He confirmed that Mrs. Raso's aunt, Judy, who was a nurse at the hospital at this time, had said: "She was such a good little mother." He remembered that he had said to Judy: "I do not

know what I will do now. I have three little children to take care of now." He gave no information about a conversation at the nurses' station.

In August 1990 I.S. met and had a long conversation with Peggy and Leno Raso. Leno Raso said that although the door to his wife's room was open he did not believe that she could have seen him normally or heard him crying or talking with Judy, Mrs. Raso's aunt.

12) The Case of Stefan von Jankovich. Stefan von Jankovich was born in Budapest, Hungary on January 26, 1920. In 1956, at the time of the uprising in Hungary and its suppression by Russian troops, he escaped to Switzerland, settled in Zurich, and established himself successfully there as an architect and town planner.

On September 16, 1964, he was traveling from Zurich towards Lugano in a small, open-roofed sports car driven by a colleague when they collided with an oncoming truck that was on their side of the road. (Its driver had been recklessly trying to pass trucks in a military convoy.) The impact of the crash catapulted Mr. von Jankovich from the car onto the pavement; he suffered multiple fractures and was knocked unconscious. Fortunately, a physician happened to be in the nearby traffic, and he immediately ran to Mr. von Jankovich, got his body moved from the pavement to the side of the road, examined him, and gave some first aid, including an injection of a drug not known to us, but apparently a cardiac stimulant. The first doctor was soon joined by another one. They judged the injured man to be dead and asked a nearby soldier (presumably from the military convoy) whether there was something with which to cover the body. Then one of the doctors decided to try the effect of an injection of adrenalin directly into the heart, which had stopped beating. This revived Mr. von Jankovich, who was then taken to the hospital in Bellinzona. His recovery was prolonged and never complete; but he was able to resume his professional work and live a normal life again.

We have taken the foregoing account from Stefan von Jankovich's autobiographical book about his experience (von Jankovich, 1984). This includes photographs of the scene of the accident in the police archives, portions of the police report, and a statement made at the subsequent inquiry by the doctor who first succored Mr. Jankovich. The official statements differ in inconsequential details from Mr. von Jankovich's account, but leave no doubt that he was extremely close to death. The physician's report noted that Mr. von Jankovich's heart had been arrested for more than 5 minutes.

We next give (in our English translation) extracts from Mr. von Jankovich's account of his experience:

I felt myself hovering; yes, I was really hovering. I was above the site of the accident and saw my badly injured lifeless body lying there in the place, as I later learned, where the doctors and police said it had been.... People gathered around me. I saw a small, stout man, looking about 55 years old, trying to bring me back to life. I could hear everything clearly. I do not mean that I literally "heard." I was up above, and my life-

less body lay on the ground. Nevertheless, I somehow perceived what people were saying and even what they were thinking — probably through some kind of thought transmission.... The man knelt down and gave me an injection in the left arm.... I realized as the doctor felt my body that my legs were broken.... Then I saw how the doctor tried to resuscitate me in a professional way, but then noticed that my ribs were also broken. He remarked: "I cannot massage his heart." After a few minutes he stood up and said: "Nothing is working. There is nothing more we can do. He is dead." He spoke Swiss German with a Bernese accent and a sort of amusing Italian.

It was extraordinary that I could perceive not only the words spoken aloud by the people around my body, but also their thoughts. For example, a woman from Tessin, accompanied by a daughter of about 7 years, was shocked when she saw my corpse. The young girl wanted to run away, but her mother caught her by the left hand and held her back while she silently prayed, first an "Our Father" and then a "Holy Mary," after which she asked forgiveness for the sins of this unfortunate man. This woman's unselfish prayer impressed me greatly, made me joyous, and I felt radiated with love.

On the other hand, there was an older man with a moustache [in the crowd of on-lookers], who had negative thoughts about me: "Well, he is done for. But it was certainly his own fault. He was just the sort of person who would rush thoughtlessly through this area in a sports car." I wanted to call down to him from "above": "Stop talking nonsense. I was not even driving. I was only a passenger." I somehow sensed the negative, even evil vibrations of this man....

Then one of the doctors turned to the other and said: "Look, unless you have some objection, I am going to...", and he gave me an injection of adrenalin right into my heart. The face of this man became fixed in my mind. A few days later, a man came into my hospital room dressed in ordinary clothes. I recognized his face immediately and deliberately greeted him by saying: "Hello, Doctor. Why did you give me that devilish injection?" I also recognized his clear distinct speech. [Mr. von Jankovich had noticed when he was "above" his body that this doctor had spoken a definite High German when he talked with the other doctor.] He was nonplussed and asked how I knew him. I told him how. We later became good friends.

As we mentioned, Mr. von Jankovich's accident occurred in 1964, and his book was published in 1984. Many years after that, in September 1992, one of us (I.S.) went to Zurich and spent 8 hours with him. (I.S. made notes of their conversations 2 days later, upon returning to Cambridge, where he was then on leave.) During their discussion, I.S. learned that after Mr. von Jankovich had sufficiently recovered from his injuries (3 years later), he had sought out both the man who had been censorious and the woman who had prayed for him. He somehow traced the man from the register of witnesses and their addresses that the police had made at the time of the accident. (He did not say exactly how he had traced this man, but he may have recognized him in police photographs taken at the scene of the accident.) Mr. von Jankovich said that he went to this man's office, recognized him as the man he had "heard" from above, but left without talking to him.

Mr. von Jankovich showed more interest in the woman who had prayed for him. She had been driving a red, commercial vehicle for a family-owned business, and it had the name and town from which they came written on its side. Mr. von Jankovich said that he had seen these names on the side of the truck during his experience and later remembered them, and that he traced the

woman with this information. When they met, they had the following exchange:

SvJ: Do you have a red vehicle?

Woman: Yes, I do.

SvJ: Do you have a 10-year old daughter? [This allowed for the 3 years that had elapsed since the accident.]

Woman: Yes, I do. [She called her daughter, who came to the room.]

SvJ: Do you remember an accident on the highway to Bellinzona about 3 years ago?

Woman: No, I do not.

SvJ: Please think again and try to remember. You got out of your vehicle perhaps to look at the body of a man who had been killed.

Woman: Yes. You are correct. Now I remember.

SvJ: And you prayed for the dead man.

Woman: Yes, that is right.

SvJ: I was that man.

At that Mr. von Jankovich and the woman both wept.

By the time I.S. learned about the verification of the apparent paranormal perceptions in this case, 28 years had elapsed since the accident. Nevertheless, he asked whether it might be possible for him to meet the censorious man and the prayerful woman with a view to making an independent verification of these details. Mr. von Jankovich said that he could no longer remember where they had lived.

Comment: Stefan von Jankovich's recognitions of the doctor who visited him in the hospital and of the man who had blaming thoughts about him were not necessarily paranormal. He might have seen the doctor's face normally after he received the injection that the doctor gave him; and he also might conceivably have seen normally the face of the critical man.

If Mr. von Jankovich's account of how he traced the woman from Tessin is accurate, this feature of the case would be paranormal. The woman's vehicle would probably have been parked some distance away from the place where Mr. von Jankovich's body was lying on the ground. If so, we think it unlikely, if not impossible, that from his supine position on the pavement he could have read the name and location of the family business painted on the side of the vehicle.

A second possibly paranormal feature in the experience occurred in relation to the prayers of the woman from Tessin. Mr. von Jankovich told I.S. that when this woman stopped her daughter from returning to their vehicle, she told the daughter that they "should pray for the man's soul and ask God to accept him into heaven with forgiveness of his sins, if he had any." (This quotation is from I.S.'s notes.) Mr. von Jankovich might have heard this statement normally. In his book, however, Mr. von Jankovich said that the woman prayed silently and that he nevertheless heard her praying an "Our Father," a "Holy Mary," and a "prayer for the forgiveness of the unfortunate man's sins." I.S. did not

learn whether Mr. von Jankovich verified that the woman had silently thought through these particular prayers.

13) The Case of Rose Heath. I.S. learned about the following case in 1970. Mrs. Heath, who was born in 1888, had been hospitalized during World War I (probably about 1915), seriously ill with scarlet fever. At one point, during an apparent crisis in her illness, Mrs. Heath suddenly found herself in a beautiful, "other-worldly" place. Among other things, her experience included the following details:

I then looked up and saw a young officer with a few soldiers approaching. The young officer was my favourite cousin, Alvin Adams. I knew him to be missing but I did not know that he was "dead," nor had I ever seen him in uniform, nor, being abroad when war broke out, did I know the type of uniform then worn, but what I saw of this was confirmed by a photograph of him I saw some years later. The only difference was that where the name of his regiment was, there was a cross instead.

Mrs. Heath's experience continued, but it finally ended in the following way:

My next vivid recollection after this was of looking down, from about ceiling height, onto a bed on which lay a very emaciated body. There were white coated doctors and nurses around it. In a few moments I was looking up at them, and feeling a sensation of intense disappointment. I had come back from something so lovely and so utterly satisfying.

Mrs. Heath's experience was of the "Peak in Darien" type that we described earlier, in that she saw her cousin during the experience and realized that he was dead, although she had had no normal knowledge of his death. The experience also included Mrs. Heath's perception of apparently veridical details of her cousin's uniform. In a later communication with I.S., she explained that "being in Italy all through the 1914-1918 War I had never seen the uniform then worn by British soldiers. I checked up later and found that what I had seen was correct — my cousin being a young subaltern."

Comment: The case is weakened because Mrs. Heath knew that her cousin was missing in action and because no death of a soldier during a war can be entirely unexpected; stronger cases of this type involve a death that the percipient had no reason to expect or fear. Moreover, before concluding that this case involved paranormal knowledge, we would need to know such details as whether Mrs. Heath had told anyone else about seeing her cousin and had described the specific, distinctive features of his uniform before seeing his photograph — testimony that is unavailable now. Nevertheless, the apparently paranormal knowledge, both of her cousin's death and of details about his uniform, together with the out-of-body experience at the end, make this a good

example of the kind of case that, if investigated earlier and corroborated, could contribute importantly to our assessment of NDEs as evidence for survival.

14) *The Case of Al Sullivan.* B.G. learned about this case when Al Sullivan first attended a meeting of a Connecticut chapter of the International Association for Near-Death Studies, in 1990, a couple of years after the surgery during which Mr. Sullivan's experience occurred. Mr. Sullivan had been a 56-year-old van driver at the time of his experience, which occurred on January 18, 1988, during an emergency coronary bypass operation at Hartford Hospital in Connecticut. His heart started to beat irregularly Monday morning at work, and he was admitted to the hospital. During diagnostic testing, one of his coronary arteries became blocked, and he was rushed into the operating room for what became quadruple bypass surgery. During the operation, he had a clear sensation of leaving his body; he described the rest of his experience in an account he wrote in 1990:

I began my journey in an upward direction and found myself in a very thick, black, billowy smoke like atmosphere. The smoke seemed to surround me no matter what way I turned, yet it was not going to deter me as far as I was concerned....

As I continued on my journey, I rose to an amphitheater like place. It had a wall directly in front of me to prevent me from going into it. Behind this wall, a very bright light shone. As I tried to get closer to this wall, I noticed three humanlike figures at my immediate left.... I was able to grasp the wall and look over it into the area the wall was blocking. To my amazement, at the lower left-hand side was, of all things, me. I was laying [sic] on a table covered with light blue sheets and I was cut open so as to expose my chest cavity. It was in this cavity that I was able to see my heart on what appeared to be a small glass table. I was able to see my surgeon, who just moments ago had explained to me what he was going to do during my operation. He appeared to be somewhat perplexed. I thought he was flapping his arms as if trying to fly.... It was at this point I noticed one of the three figures I saw on my arrival to the wall was that of my brother-in-law who had died almost two years before.... It was then that I turned my attention to the lower right-hand side of the place I was at. I saw the most brilliant yellow light coming from, what appeared to be, a very well lit tunnel.... The light that came from the tunnel was of a golden yellow hue and although the brightest I had ever looked into, it was of no discomfort to the eyes at all. Then, preceded by warmth, joy and peace and a feeling of being loved, a brown cloaked figure drifted out of the light toward me. As my euphoria rose still more, I, much to my delight, recognized it to be that of my mother. My mother had died at age thirty-seven when I was seven years old. I am now in my fifties and the first thought that came to my mind was how young my mother appeared. She smiled at me and appeared to be shaping words with her mouth and these was [sic] not audible to me. Through thought transfer we were soon able to communicate. All at once my mother's expression changed to that of concern. At this point she left my side and drifted down toward my surgeon. She placed the surgeon's hand on the left side of my heart and then returned to me. I recall the surgeon making a sweeping motion as if to rid the area of a flying insect. My mother then extended one of her hands to me, but try as I might I could not grasp it. She then smiled and drifted back toward the lit tunnel...

According to Mr. Sullivan, as soon as he regained consciousness and the tube was taken out of his throat so that he could speak, he told his cardiologist, Dr. Anthony LaSala, what he had observed during the operation. Dr. LaSala's first reaction was to attribute Mr. Sullivan's experience to the drugs he had been given. Mr. Sullivan then described seeing the cardiac surgeon, Dr. Hiroyoshi Takata, flapping his elbows as if he were trying to fly. According to Mr. Sullivan, at this point Dr. LaSala's eyes widened, and he asked who had told Mr. Sullivan about that. When Mr. Sullivan said that he had seen it himself, from above his body in the operating room, Dr. LaSala explained that this was a peculiar habit of Dr. Takata's. If he had not yet "scrubbed in" and did not want his ungloved hands to touch the sterile operating field, he would flatten his palms against his chest and give instructions to his assistants by pointing with his elbows.

Mr. Sullivan said that Dr. LaSala reported this experience to Dr. Takata, but that Dr. Takata's only response had been, rather defensively, to insist that Mr. Sullivan had never "died" during the surgery. Mr. Sullivan himself did not talk with Dr. Takata about the experience until a follow-up visit, probably a couple of years later. At that time, Dr. Takata said only: "Well, you're here, you're alive, so I must do something right!"

In the fall of 1997, one of us (B.G.) spoke with both Dr. LaSala and Dr. Takata. Dr. Takata could not confirm specifically that he had "flapped his elbows during Mr. Sullivan's surgery in particular, but he did confirm that this is a regular habit of his, done not because he has not yet scrubbed in (as reported by Mr. Sullivan), but because, after he has scrubbed in, he does not wish his hands to touch anything until he is actually ready to do the surgery. Dr. LaSala confirmed to B.G. that Mr. Sullivan had told him about the experience shortly after he regained consciousness following the surgery. He also confirmed that Dr. Takata has this habit of "flapping" his elbows, and he added that he has never seen any other surgeon do this.

Comment: Mr. Sullivan's medical records indicate that in the operating room he was first given a local anesthetic so that an intraaortic balloon could be inserted, and he was then given a general anesthetic so that the surgery itself could begin. It occurred to us that Mr. Sullivan might have seen Dr. Takata "flapping" his elbows when the balloon was being inserted but before he was given general anesthesia and lost consciousness, and that he had later confused the order of events. B.G. therefore asked Mr. Sullivan for further details about what he had seen at the time he saw Dr. Takata flapping his arms. Mr. Sullivan said that he saw Dr. Takata standing alone over his opened chest, which was being held open by metal clamps, and he also saw two other surgeons working over his leg. He recalls being puzzled at the time about why they were working on his leg when the problem was with his heart, but he now knows that at this point in the surgery the surgeons were stripping the vein out of his leg to create the bypass graft for his heart. These details seem clearly to confirm that Mr.

Sullivan's observation of Dr. Takata flapping his arms occurred when he was under general anesthesia and, at least to observers, unconscious.

Discussion

In all of the cases that we have described in this paper, the experiencer reported all three features that we discussed earlier as having the most relevance for the question of survival of consciousness: normal or enhanced mentation when the physical body is ostensibly unconscious, seeing the physical body from a different position in space, and perceiving events beyond the normal range of the physical senses. We believe that when these three features occur together, they provide convergent evidence that at least suggests that consciousness can function independently of the physical body and hence may survive the death of that body. We emphasize that such evidence is only suggestive. No matter how serious their condition, persons reporting NDEs were in fact still alive in some sense, since their bodies were still functioning sufficiently to be revived. NDEs can therefore never provide conclusive evidence concerning what may happen to consciousness when the brain and body are no longer revivable.

We also, however, emphasize the importance of the convergence of these three features. No one feature or type of NDE can decisively support the survival hypothesis. Blackmore (1982, 1983) correctly pointed out that seeing the physical body from a different position in space may be "imagination." This explanation is insufficient, however, if the experiencer also reports becoming aware of distant events while ostensibly out of the body; verified paranormal perceptions are not subjective imaginings. Yet even these two features taken together are inadequate to support the survival hypothesis. Paranormal perception of distant events occurs in conditions other than an OBE; it has been demonstrated, for example, in experimental studies of the Ganzfeld technique (*e.g.*, Bem & Honorton, 1994) and remote viewing (*e.g.*, Puthoff & Targ, 1976; Schlitz & Gruber, 1980, 1981). Psychological conditions conducive to producing the subjective sense of being out of the body may also be conducive to producing paranormal perceptions (Palmer, 1978); but this explanation is insufficient to account for those cases in which the physiological condition of the person would seem to preclude, or at least reduce the likelihood of, the complex cognitive processes associated with almost all NDEs.

The primary purpose of this paper, however, is to call attention to the need for studies better demonstrating that these three features do in fact provide convergent evidence for survival of consciousness after death, as suggested by cases such as the ones we have here described. The rarest of the three features by far is the phenomenon of veridical paranormal perception during an NDE. Veridical cases are important because they are the single most important kind of case that will enable us to decide whether normal physiological or psychological theories of NDEs (and OBEs) are sufficient. Whatever the physiological or psychological conditions that may precipitate an NDE or OBE, NDEs

and OBEs are not *solely* subjective hallucinations or imagery if they include verified paranormal awareness of distant events. Blackmore (1982) wrote of the Case of Dr. X (our Case No. 2): "If this is true it is of enormous significance... our usual models of man would be found to be limited and deficient" (p. 178). She then asked: "But is it true?" For her, it was not. She belittled the case because no preserved account of the experience had been written down until more than 40 years after the experience; also, in her view the medical qualifications of Dr. X, including his Fellowship in the Royal College of Physicians, made him no better an observer or rememberer than anyone else. These strictures could be made of nearly all the other cases we have described. Rose Heath's experience, for example, was probably not recorded until 55 years after it happened; Jean Morrow's was probably not recorded for 35 years; and M. Bertrand's experience was not recorded for 30 years.

The long lapse of time between the experience and the first written record of it would be of little consequence if memories did not tend to diminish and become modified with the passage of time. These modifications, however, vary greatly from one person to another. Some persons — perhaps they are not numerous — can preserve accurate memories over many years. One of us has cited elsewhere reports of remarkably accurate memories over 6 to 10 years (Stevenson, 1968). Additionally, modifications seem to occur less with memories of some events than with others. Memories of traumatic events, such as life-threatening conditions, injuries, and illnesses, tend to be better preserved than memories of events that are not stressful (Schacter, 1996). We should, however, distinguish preservation and accuracy. We want to know how accurate memories of traumatic experiences are. There is some evidence that when affect is engaged, as it is in traumatic experiences, the accuracy of memory becomes enhanced (Dutta & Kanungo, 1975). Moreover, inaccuracy of details does not invalidate a memory for the significant events of an experience (Rollo, 1967, pp. 54-55). Terr (1994) put this tersely: "False details distort a memory. But many real remembrances are distorted, although essentially true" (p. 164).

Although we do not agree with Blackmore that the reports of paranormal perceptions in NDEs have necessarily been seriously distorted by the long lapse of time between the experience and the first recording of it, we do agree, as we pointed out earlier in this paper, that most cases of this type have not been adequately investigated, corroborated, and documented. We have little sympathy, however, for persons such as Blackmore (1982, p. 243) who, confronted with these inadequate cases, suggest that researchers abandon the attempt to find similar cases that can be investigated more promptly and completely. The reports of these cases may be rare, but, as we hope this paper has demonstrated, their numbers are not insignificant. The more people — scientists as well as persons who may have or learn about these experiences — are aware of the occurrence and importance of such cases, the more likely it will be that the evidence they provide will improve.

Moreover, we believe that the case of Al Sullivan, reported in this paper, is a significant improvement of the evidence that during an NDE or OBE people can sometimes become aware of events not communicated to them through normal sensory processes. Two important witnesses corroborated to us an unusual event seen by Mr. Sullivan during his NDE, and one of them also corroborated to us that Mr. Sullivan told him about the event shortly after it occurred. Like any other case, the case of Al Sullivan does have potential weaknesses. In particular, the event in question occurred in the same room that Mr. Sullivan's body was located. Nevertheless, we are unaware of any normal sensory means by which the deeply anesthetized and unconscious Mr. Sullivan could have learned about the peculiar behavior of the surgeon.

In addition to better investigated and documented spontaneous cases of veridical perceptions, experimental studies of this feature would also be a significant contribution. Tart (1968) reported an experiment in which the subject, after experiencing an OBE, was able to give a 5-digit target number that had been placed out of sight near the ceiling of the room. Since then, several researchers have proposed a protocol of this type to study veridical perception in NDEs (*e.g.*, Holden, 1988). Perhaps the best one was designed by Madelaine Lawrence, former Director of Nursing Research at the Hartford (Connecticut) Hospital. In the hospital's Electrophysiology Clinic, an electric shock is administered to a heart that is beating arrhythmically. In this process, known as cardioversion, the associated disturbance of consciousness may induce a near-death experience. Lawrence proposed placing a light-emitting diode display near the ceiling of the clinic and facing upward; it would be programmed by someone outside the hospital with a different nonsense message each day. If patients undergoing this controlled near-death procedure could identify the message being displayed on the day of their procedure, there would be little likelihood that they could have obtained it through any normal means. Unfortunately, this and other such research attempts have met with unexpected difficulties, primarily in finding hospitals and staff willing to cooperate (Holden & Joesten, 1990); but they should not be abandoned.

Although not rare, perhaps the other NDE feature most needing attention by researchers is the normal, or even enhanced, cognition that occurs during an NDE; what particularly needs to be examined is the relationship between cognitive functioning and physiological state during an NDE. The persistence of complex cognitive processes in spite of diminished brain functioning would suggest that consciousness might not be wholly dependent on the brain — clearly a prerequisite to the survival hypothesis. Unfortunately, although many people have speculated about possible physiological mechanisms underlying NDEs (*e.g.*, Carr, 1982; Morse, Venecia, and Milstein, 1989; Saavedra-Aguilar & Gomez-Jeria, 1989), there has been no research adequately demonstrating the actual physiological conditions associated with NDEs. For several years we have been collecting medical records associated with NDEs, in an attempt to document better the medical condition of people at the

time they are experiencing an NDE (Owens *et al.*, 1990; Stevenson *et al.*, 1989-1990). Available medical records do not always provide all the information needed to make an adequate assessment of a patient's closeness to death. Moreover, we do not even know what physiological conditions are minimally required for organized, vivid cognition (see, *e.g.*, Baudoin, 1996; Duyff, Davies, and Vos, 1996; Lewin, 1980; Lorber, 1983). Nevertheless, the conditions under which some people have experienced NDEs do suggest that vivid, complex mental functioning can occur at a time when, given the person's loss of consciousness or of vital signs, we would not expect such functioning; and even a few well-documented cases of complex mentation occurring in conditions that are at variance with those predicted by a physiological model of consciousness may weaken that model.

The experiences that we have described in this paper convinced those who had them of the separability of mind from body and its likely survival of death. They are bound to seem less persuasive to other persons, particularly since the reports of most of them are flawed. One crucial step toward deciding whether NDEs provide evidence for survival is deciding whether alternative hypotheses are adequate for all features of the cases. Cases that include multiple, convergent features suggestive of survival may help us make that decision, if we can find and study them earlier and verify their details independently.

Acknowledgements

The research of the Division of Personality Studies is supported by the Bernstein Brothers Foundation, the Nagamasa Azuma Fund of the University of Virginia, the Fash Foundation, the Institut für Grenzgebiete der Psychologie und Psychohygiene, Freiburg i.Br., Germany, the Lifebridge Foundation, and several anonymous donors.

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Evidence that Anomalous Statistical Influence Depends on the Details of the Random Process

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Abstract — Within the field of anomalous statistical influence it has become widely accepted that the susceptibility to human influence of a (non-pseudo) random event generator (REG) is independent of the details of its construction. This view was formalized by Schmidt, after obtaining similar experimental results from very different REGs, in the Equivalence Hypothesis that all REGs are equally susceptible. Since then, a number of models of anomalous influence have built upon this hypothesis to predict a scaling of the anomalous statistical yield with other factors, assuming the REG details can be ignored. For example, "time-normalized," and Decision Augmentation Theory (DAT) models predict that the anomalous **Z-score** scales as the square-root of, respectively, the time invested by the human operator, and the number of operator initiations of the random process (button pushes).

This paper is a report of an experiment to test the equivalence hypothesis, and, by implication, the validity of any derivative model. Human operators were invited to affect "trials" formed from accumulations of binary random events wherein the method of accumulation was randomly switched between two different modes. In one mode, a trial equal to the sum of 200 bits was presented to the operator as the target of intention (to elevate or depress its value). In the other mode, the target of intention was a number distilled from the sum of 2,000,000 bits, having the same chance statistics as the 200 bit trial. By keeping the display and time between trials identical for both modes, both operator and experimenter were blind to the randomly alternating method of computing the trial value.

A surprising and important finding from our results ($p = 0.00037$) from 140,000 such trials is that anomalous influence of a random process does strongly depend on the method of generation. As a consequence, these results significantly refute the equivalence hypothesis, and therefore the time-normalized and DAT models. Instead, it must be concluded that "anomalous interaction" (Psychokinesis) is innately (partly or wholly) a property of the machine, and therefore its description lies partly or wholly in the domain of a (future) physics.

Keywords: anomalous influence — psychokinesis

Introduction

Earlier Work at PEAR

The original motivation for this experiment was to find out if statistically significant anomalous influence on random process could be achieved more quickly by gathering data at much higher rates than has been the custom. In an exploratory investigation of this question (Jahn et al., 1996), data were gathered at 20, 200, and 2000 bits per trial, where the time per trial — about 0.8 seconds — was the same for all three. In those pilot experiments, not enough data were gathered to come to achieve a significant difference in the susceptibility to intention of the different methods. Continuing on from that earlier work, this paper is a report of a more recent and conclusive effort to answer the same question using a much larger database and more sophisticated protocol.

Historical Background

Following the pioneering work of J. B. Rhine and others, it was natural that workers in the field of psychokinesis investigate the dependency of anomalous influence on the physical characteristics of the random process. Notable among these efforts was the work of Forwald (1976) and Cox (1971) who found that the susceptibility of dice to human influence did not seem to depend in a straight-forward way on their mass. From this, and subsequent failure to find a dependency on the spatial separation between the human operator and the source of the random process (Dale & Woodruff, 1947; Nash & Richards, 1947; Mitchell & Fisk, 1953; Dunne & Jahn, 1992), there arose the view that such anomalous behavior could not be the result of a physical force. It has since become widely accepted that human intention correlated with anomalous statistics (anomalous statistical influence) is an irreducibly statistical phenomenon. However, this still leaves undecided the scaling of the effect with the number and psychological state of the human operators, the time and effort invested, and the statistical (temporal) characteristics of the random process.

In early experiments, the temporal characteristics of the random process as a significant factor were explored by subjecting variable numbers of dice per throw to human intention (*e.g.* Rhine & Humphrey, 1944). These studies found no significant differences in the statistical yield (the anomalous *Z*-score) per die. However, as pointed out by Stanford (1977) these experiments confound the variance of the random process with the interval between events, since it is to be expected that the time required to record the results depended on the number of dice per throw. This difficulty has since been overcome with the adoption of the electronic random event generator and computerized recording. Schmidt (1973) found that if binary trials were presented at two different rates, operators performed significantly better (per trial) at the lower rate. Clearly, however, there remains a possible psychological confound; operators could not be blind to the two different rates of presentation,

and therefore one cannot discount a possible inequality of effort due to psychological factors. A later study by Schmidt (1974) endeavored to overcome the possibility of such psychological confound. Since our work is a refinement of that experiment, it is fruitful to review Schmidt's experimental design and findings in some detail.

Schmidt's 1974 Experiment

Operators were presented with binary trials randomly alternated from one of two different REGs under conditions such that they were blind to which source was responsible for the presented trial. One of these sources produced a single binary trial once every three seconds by a single digitization of an analog noise source (the "simple" generator). The other ("complex") generator also produced a trial once every three seconds, but this was derived from the majority vote of 100 digitization events of a *different* source in the three second period. Both REGs were run in parallel; which REG was responsible for the trial displayed to the operator was decided by a pre-recorded random binary sequence (decision variable). The time interval between trials was fixed at three seconds, independently of the value of the decision variable.

In a pilot experiment of 1,011 trials, originating approximately equally from each of the two REGs, operators achieved positive Z-scores (*i.e.* in the direction of intention) of 3.7 and 0.5 on the simple and complex generators respectively. In the subsequent formal experiment of 3,304 trials, again originating approximately equally from each of the two REGs, operators achieved positive Z-scores of 4.4 and 3.0 respectively. On the basis of the formal results, Schmidt concluded that operator performance did not depend on the complexity of the REG.

Stanford (1977) claims that if Schmidt's pilot and formal data are pooled, then the differential Z for the two generators is significant. Our calculations indicate a differential Z on the pooled data of 1.83, and a Stouffer (aggregate) differential Z of 2.3, the positive signs indicating a better performance on the simple generator. However, without an in-going hypothesis preferring either generator, these Zs should be subjected to a two-tailed test, which yields a two-tailed probability on the pooled data ($Z = 1.83$) of 0.067, which is not significant. We conclude that Stanford's claim is based either on a one-tailed test, or on an un-weighted Stouffer differential Z.

Although Schmidt's conclusion that the data do not show a dependence of operator performance on the complexity of the REG is formally correct, the pooled data do at least suggest that there may be a difference for the two generators, which could become significant in a larger database.

Comparison with this Experiment

The putative independence of induced statistical anomalies with respect to the random generator is of crucial import. Its confirmation, or more precisely,

its lack of refutation, severely confines the domain of a successful theoretical model to, and downstream from, the observed data. In contrast, a single example of an unambiguous demonstration of non-independence would refute the equivalence hypothesis, and thereby demand that a successful model encompass events upstream from the observed data.

Against this background, our experiment is a further test of the equivalence hypothesis, but with two major differences from the experiment of Schmidt. In our experiment we use the same noise source and same digitized random bit stream for both types of trial. This has the effect of narrowing the field of possible sources of divergence to the algorithm for computation of the trial values from the random bit stream. The other major difference is that we can draw on a much larger database, and so give any possible divergence a greater opportunity to manifest. The important differences are summarized in Table 1.

TABLE 1
Comparison of this and Schmidt's 1974 Experiment

Experiment	Formal Trials	Summed Bits per Trial	ratio:(complex/simple) Digitized Bits per Trial	Time per Trial (secs.)	Total Time Invested(hours)
Schmidt 1974	3,304	1	100	3.0	2.75
Ibison 1997	140,000	200	10,000	0.8	31.11

Design

Overview

A wide bandwidth Elgenco micro-electronic analogue noise source is digitized to give a bit stream of random binary events (Figure 1 and 2). A contiguous block of bits from the stream is processed in two very different ways (see

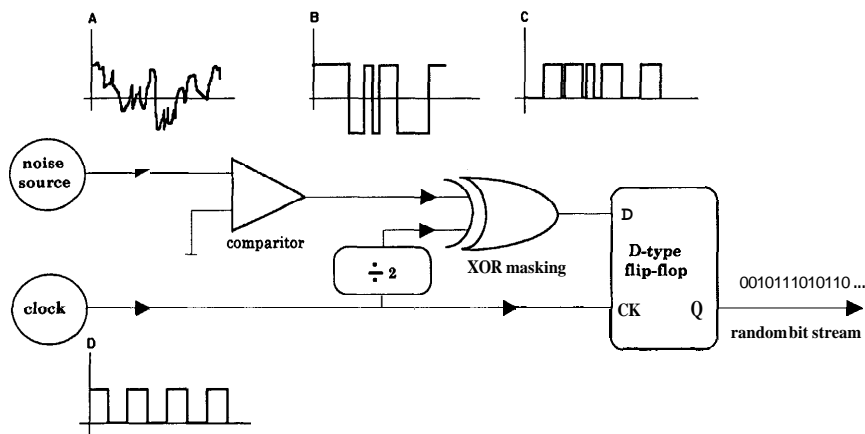


Fig. 1. Schematic of random event generator.

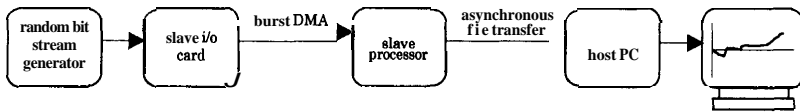


Fig. 2. Hardware Schematic.

below) to give two numbers with the same chance distribution. At a rate of around once per second, just one of these two numbers is presented as a "trial" in digital or graphical form to a human operator. Which of the two is presented is decided by a single random bit; the other number is neither presented nor recorded. The noise source delivering the random bit-stream is described in detail in Appendix 1 and the slave processor used to capture and process the random bit-stream to give the trial values in Appendix 2.

The Two Methods

To avoid controversy on the characterization of complexity employed by Schmidt, our two types of trial are designated low and high density, corresponding very closely to his simple and complex trials. In the "low-density" method, a trial value is constructed by summing 200 of these bits. It follows that these trials have mean 100 and variance 50. In the "high-density" method, trials are constructed by summing a second set of 2,000,000 bits, and then re-scaling and truncating the value so obtained, to give a trial value with the same chance distribution as that of the low-density method. Which trial value is displayed — *i.e.* from the high or low density method — is decided by another pre-recorded random process.

Protocol

Both operator and experimenter are unaware of the origin of the trial value being displayed, and so are constrained to treat all trials similarly. A record is kept of the trial value and its generation method, the latter made available for subsequent analysis only upon completion of the entire experiment. With the operator blind to the origin of the trials presented, he/she attempts to influence their values in accord with a standard tri-polar protocol, details of which can

be found in Jahn et al., (1996). Briefly, the protocol demands an equal number of trials subjected to an effort, in "runs" of 100 or 1000 trials, to elevate, depress, or leave unaltered, the trial values. These efforts we will refer to as "high," "low" and "baseline" intentions respectively. On average, by virtue of the randomization, there are an equal number of trials, regardless of the intention, generated by the two methods.

Following collection of both operator data and a large volume of control data generated with no operator present, the experimental design calls for a subsequent statistical analysis to determine if there exists a dependency on the method of data generation of the operators' ability to influence the trial values according to the tri-polar protocol. To minimize the risk of experimenter influence on the outcome on the differential test, the un-blinded results for the high and low density trials were first observed by a disinterested, but statistically knowledgeable, third party.

Results

70 series totaling 210,000 trials, of which 140,000 were subjected to intention, were collected from 13 operators. Figure 3 shows, chronologically, the combined high and low density results for the high, baseline, and low intentions. These data, summarized in the fourth row of Table 2, show a negative going Z-score of -1.7259 ("psi-missing") for the difference between the high and low intentions. However, no formal significance can be attached to this

TABLE 2
Summary of Results

Density	Intention	Trials	Z	Probability	Tails
combined	high	70,000	-1.5893	0.94400	1
combined	low	70,000	0.8515	0.80275	1
combined	baseline	70,000	0.3418	0.73250	2
combined	high-low	140,000	-1.7259	0.95782	1
low	high	35,012	0.6906	0.24491	1
low	low	35,032	-1.1432	0.12648	1
low	baseline	35,047	0.8951	0.37076	2
low	high-low	70,044	1.2967	0.09736	1
high	high	34,988	-2.9388	0.99835	1
high	low	34,968	2.3490	0.99059	1
high	baseline	34,953	-0.4126	0.67992	2
high	high-low	69,956	-3.7391	0.99991	1
high-low	high	70,000	-2.5661	0.01028	2
high-low	low	70,000	2.4689	0.01355	2
high-low	baseline	70,000	-0.9249	0.35504	2
high-low	high-low	140,000	-3.5603	0.00037	2

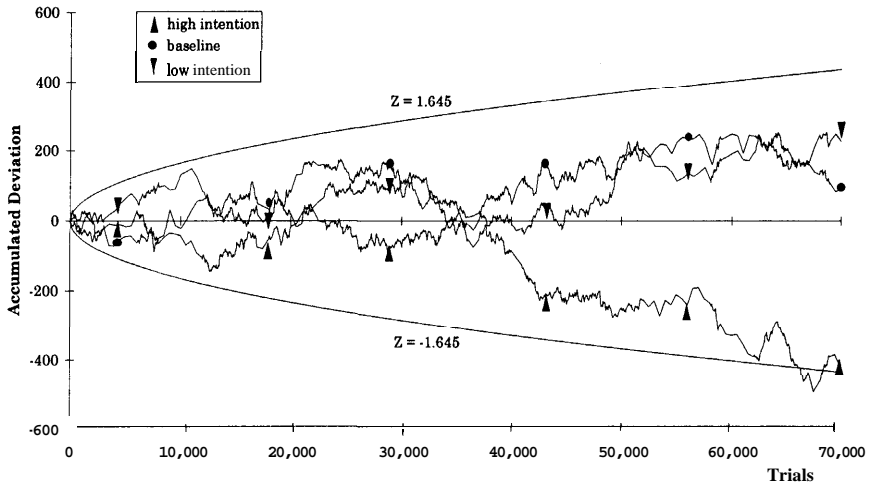


Fig. 3. Effect of intention on combined high and low density noise.

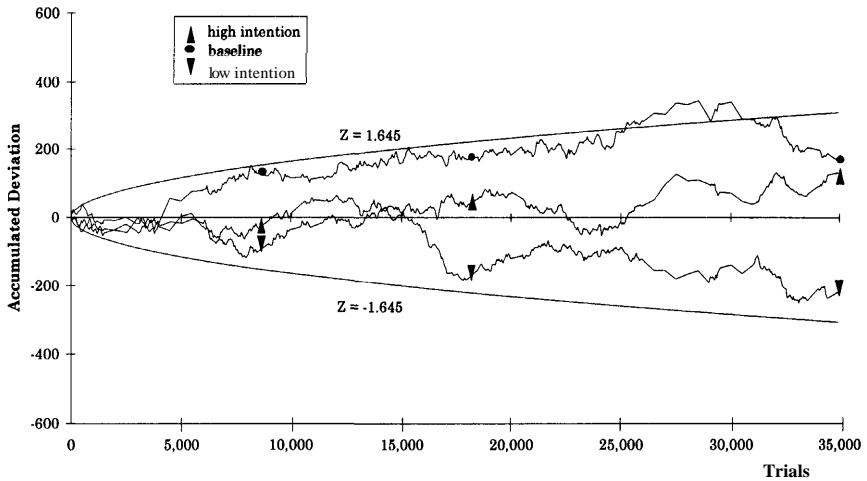


Fig. 4. Effect of intention on low density noise only.

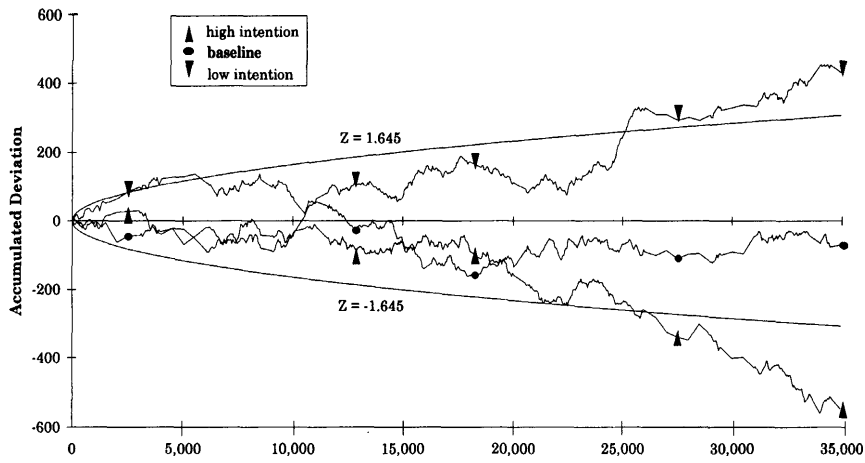


Fig. 5. Effect of intention on high density noise only.

result because the design calls only for a differential test between the high and low density data.

With reference to Figures 4 and 5, it is readily apparent that the combined data negative Z-score is a result of a mild positive response to intention in the low density data (high-low $Z=1.2967$), and strongly negative response to intention in the high density data (high-low $Z=-3.7391$) as summarized in Table 2.

The two traces in Figure 6 show chronologically, for the high and low densities separately, the accumulated deviation from expectation of the high - low

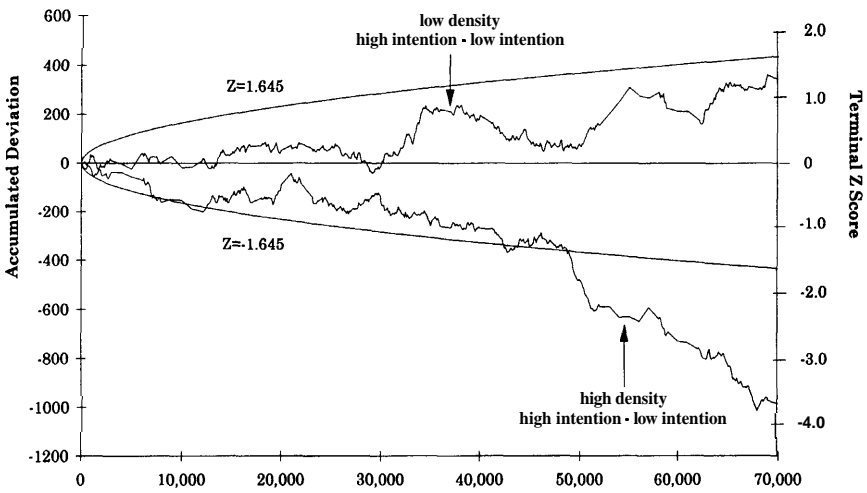


Fig. 6. Effect of noise density on susceptibility to intention

intention difference. Clearly there is a significant dependence on the density. Formally, from the last row of Table 2, the null hypothesis that there is no difference between the methods is refuted with $Z=-3.5603$, $p=3.7 \times 10^{-4}$ (two-tailed).

Positive Z indicates a positive mean shift (independent of the direction of intention). The one-tailed probability for the high intention accumulates over values greater than the observed Z . The one-tailed probability for the low intention accumulates over values less than the observed Z .

Discussion

These results are indisputably anomalous; the protocol precludes an explanation based on systematic bias. The high density trace in Figure 6 establishes that two data sets may diverge when the only change is a human intention to score high or low. The significant difference between the two traces in Figure 6 derives from the difference (high-low density) of the difference (high-low intention) of two data sets, and is therefore (doubly) immune to systematic bias.

There are essentially two possible explanations of this result. One is that not only is intentional anomalous influence from operators acting to affect the trial values, but there is also an unintentional anomalous influence acting to affect the outcome of the whole experiment; *i.e.* is acting at the level of the hypothesis being tested. The other explanation is that given two different random processes with equal efforts of operators toward both, they do not respond equally to intention (though it may be that this differential response may only emerge when the two processes are randomly juxtaposed). These two explanations are discussed in more detail below.

Possible Influence of Bias at the Level of the Hypothesis Under Test

These results can be explained without attributing a difference in susceptibility to intention in the random process methods by supposing that anomalous human influence is acting not only at the level of trials, but also at the level of the hypothesis under test (*i.e.* specifically to distinguish between the two data sets). However, there are severe constraints to be satisfied by such a proposed influence:

- It must be effective despite originating from an *unconscious bias*, since there could be no conscious bias from operators and experimenters towards the data sets from either random process.
- The influence must be effective *without feedback* at least until the time the double-blind is broken and the data are analyzed.
- The influence must be able to *override* the effects of a *first observation* by a disinterested party.

This explanation seems far less parsimonious than simply assuming a differential susceptibility of the random processes.

An additional argument against this explanation is the difficulty in establishing any *consistent and falsifiable* theory. First, note that one would have to admit that a test of such a theory would itself be vulnerable to "observers" other than the operator. If these observers were biased toward refutation and capable of affecting the results of the test, the theory could be falsified by the very mechanism it proposes.

Nonetheless, an explanation of our results based on the influence from biased observers is *verifiable*. Imagine an experiment exactly as described in this report except that there is only one method of trial computation (e.g. high density). But suppose that the randomized binary decision variable is retained so that the data can be partitioned for subsequent differential analysis (even though there should be no difference). Then if a significant difference between the two data sets is discovered, the explanation can only be that anomalous influence is acting at the level of the hypothesis under test. (But note: absence of a significant difference between the two data sets does not indicate the explanation is invalid, for the reason given above.)

The Role of Setting

In rejecting the above explanation one must conclude there must be some difference in the response of the two random process methods to intention, and therefore that the equivalence hypothesis is invalid. However, this does not mean that two electrically and/or mechanically different REGs *must* have different susceptibilities, or even that the two REGs used in this experiment will respond differently to intention in all settings. Rather, it means that in some settings, differently constructed REGs can respond differently to human intention. An important role for the experimental setting is thus suggested by the finding of this experiment, in contrast to the apparent uniformity of susceptibility to intention of dissimilar REGs reported in the literature.

The Role of Juxtaposition

Consider for example the possibility that anomalous influence is adaptive to the target in a manner analogous to that of human vision. A consequence of adaptation at the front end of the vision system is a poor ability to distinguish between different shades of gray unless they are juxtaposed (in space or time). By analogy it is conceivable that the differential susceptibility demonstrated in this experiment is a consequence of the close juxtaposition of the two random process methods.

As a second example, consider a mechanical oscillator formed from a mass and spring subjected to (manual) impulses from a human operator with the goal of maximizing the amplitude. An intelligently adaptive operator will apply impulses at the correct phase and at the natural resonant frequency of

the oscillator (or a sub-harmonic thereof). Now let the spring constant be randomly switched between two values at most once in a period, and to which the operator is blind. The optimal impulse strategy is now unclear. It is conceivable that the operator may decide to persist as if the oscillator had a single fixed resonance, so that on average he or she was successful in increasing the amplitude only when one of the spring constants was in place. Further, this strategy can result in a reduced amplitude when the other spring is present, thus explaining the psi-missing on one of the data sets.

For both of these models, a testable implication is that operators will achieve similar yields on the two densities when they are not juxtaposed. Efforts are underway to test this prediction, and we hope to report in the near future the results of an experiment using only the high density random process.

Status of DAT and Time-Normalization Models

Any model claiming that anomalous susceptibility depends *only* on a factor other than the inner workings of the REG and its setting is categorically refuted by these results. This applies to the DAT model because it claims that the anomalous yield (2-score) scales as the square root of the number of operator interventions and depends on nothing else. Likewise the time-normalization model is refuted because it claims that the anomalous yield scales as the square root of the time invested by the operator in exerting his/her intention and depends on nothing else. This is true quite apart from the relative standing of these scaling predictions on *identical* REGs. Either of these models can be modified to survive refutation if its claim to exclusivity is dropped. Thus, it may be that the anomalous yield scales in the particular manner predicted by one of these models provided the REG is "held fixed." It follows from our result that tests of the scaling laws predicted by these models (hypotheses) should be conducted with the REG held fixed.

Status of the Bit-Wise Influence Model

The bit-wise influence hypothesis claims that the a shift in the binary probabilities of the digitized bit-stream is a constant of the anomalous human-machine interaction (see for example Dobyns, 1996). It implies that the anomalous yield measured as a Z-score scales as the square-root of the number of digitized bits subjected to intention. Since this model predicts that the anomalous yield *does* depend on the inner workings of the REG, the bit-wise hypothesis opposes the equivalence hypothesis and therefore is not automatically refuted by our results.

To investigate the impact of our results on the bit-wise hypothesis, we compute the bit-wise effect-size ϵ , defined as $Z / \text{square root of the number of bits}$. From Table 2 we find

$$\begin{aligned}\epsilon_{\text{high-density}} &= -9.996 \times 10^{-6} \pm 2.673 \times 10^{-6} \\ \epsilon_{\text{low-density}} &= 3.464 \times 10^{-4} \pm 2.672 \times 10^{-4}.\end{aligned}\tag{1}$$

According to bit-wise model, these two should be equal. The 2-score associated with their difference denoted by Z_{bwh} is given by

$$Z_{bwh} = \frac{\epsilon_{\text{high-density}} - \epsilon_{\text{low-density}}}{\sqrt{(\delta\epsilon_{\text{high-density}})^2 + (\delta\epsilon_{\text{low-density}})^2}} = -1.334\tag{2}$$

which should be subjected to a two-tailed test, and is clearly not significant. This result is dominated by the relatively large values of effect-size and uncertainty of the low-density process as can be seen from the following

$$\begin{aligned}Z_{bwh} &= \left(\frac{Z_{\text{high-density}}}{\sqrt{n_{\text{high-density}}}} - \frac{Z_{\text{low-density}}}{\sqrt{n_{\text{low-density}}}} \right) \bigg/ \sqrt{\frac{1}{n_{\text{high-density}}} + \frac{1}{n_{\text{low-density}}}} \\ &= \frac{Z_{\text{high-density}}\sqrt{n_{\text{low-density}}} - Z_{\text{low-density}}\sqrt{n_{\text{high-density}}}}{\sqrt{n_{\text{high-density}} + n_{\text{low-density}}}} \\ &\Rightarrow Z_{bwh} \approx -Z_{\text{low-density}} \text{ since } n_{\text{high-density}} \gg n_{\text{low-density}}\end{aligned}\tag{3}$$

where the n are total the number of bits collected at each density. From this we conclude that despite the significantly different susceptibilities of the two densities, our results do not disqualify the bit-wise hypothesis, though an implication of Equation (3) is that the bit-wise hypothesis would be refuted in the event that the low-density results alone achieve statistical significance.

Conclusion

Our results provide strong evidence ($p = 0.00037$) against the hypothesis that all REGs are equally susceptible to intention. In other words: though two REGs may be constructed to provide identical displays and may be subjected to identical efforts to perturb their output, if their inner construction differs, then their response to anomalous influence may also differ. However, we do not know to what degree the manifestation of unequal yields from differently constructed REGs depends on the experimental setting, and in particular on the temporal juxtaposition of their output to the human operator.

Appendix 1 - REG Design Details

The REG is a stand-alone unit comprising a digital noise source, clock, XOR filter, and latch. The digital noise source is itself comprised of an analog noise source, amplifier, and comparator (Figure 1). The output (Q) of the latch delivers the raw bit-stream to a slave processor, the operation of which is described in Appendix 2.

The Digital Noise Source

The source of randomness is a modular 70 MHz bandwidth 1 mV RMS Elgenco analog noise-source. The noise is amplified to the order of 1 Volt RMS with zero mean and then digitized using a high-speed comparator with reference zero (Figure 1 traces).

Clock and Latch Sampling

The digitized signal is XOR gated (see below) and then clocked into a flip-flop (*i.e.*: latched) at a fixed frequency of 40 MHz supplied by a quartz oscillator. The output (Q) of the flip-flop is then the source of the raw bit stream.

Hardware XOR Filter

Ideally, the output of the comparator should spend as much time at positive saturation as at negative saturation, and therefore the raw bit-stream should have as many 1's as 0's. In practice, various sources of asymmetry cause the behavior to depart from the ideal, including, for example, a non-zero comparator input offset, and asymmetry in the power consumption of bipolar semiconductor logic which impacts the comparator reference voltage. For this reason, as with previous PEAR designs of similar REG equipment, following digitization by the comparator, but prior to latching, the bit-stream is subject to an exclusive OR (XOR) with an alternating template which is just the digitizing clock (frequency) divided by 2. In the absence of any anomalous behavior, this should force the latch Q to have as many 1's as 0's, regardless of the statistics of the bits leaving the comparator.

Symbolically, let $d_k^{(0)}$ be the k th data bit following digitization, and let the hardware template be c_k where

$$\begin{aligned} c_k &\equiv \frac{1 + (-1)^k}{2} \\ &= 1 \text{ if } k \text{ even,} \\ &= 0 \text{ if } k \text{ odd} \end{aligned} \tag{A1.1}$$

then the data following the hardware XOR masking is

$$d_k^{(1)} = d_k^{(0)} \oplus c_k$$

where

$$\begin{aligned} x \oplus y &\equiv \bar{x}y + x\bar{y} \\ &= 1 \text{ if } x \neq y \\ &= 0 \text{ if } x = y. \end{aligned} \tag{A1.2}$$

Appendix A2 — Slave Processor Functionality

Due to the high data rates involved, it was necessary to employ dedicated hardware for the acquisition and processing of the bit stream. We used an Alacron Digital Interface board (i/o board) directly connected to an Alacron Intel i860-based motherboard hosted by a PC (Figure 2). Let the high and low density trial values be denoted T_{HD} and T_{LD} , and the trial value delivered to the operator be denoted T_{op} . The sequence of events in the slave processor is:

- I. high density acquisition
- II. software XOR
- III. sum and re-scaling $\rightarrow T_{HD}$
- IV. low density acquisition
- V. software XOR
- VI. sum $\rightarrow T_{LD}$
- VII. randomly choose $T_{op} = T_{HD}$ or T_{LD}

Each of these stages is described below.

High Density Acquisition

The i/o board buffers blocks of 32,768 bits from the REG. Once full, the buffer is emptied into the motherboard RAM via interrupt-driven DMA. Construction of the high density trial commences with 62 acquisition cycles to give 2,031,616 bits in i860 RAM, which takes in total around 100 ms. The first 2,000,000 bits of these constitutes the raw data from which the high density trial value is constructed. During DMA time (around 2.5 μ s), bits generated by the REG are ignored. Therefore each block of 32,768 bits within the 2,000,000 bits in RAM is a contiguous sub-string of bits delivered by the REG, but contiguity is not maintained across the block boundaries.

High Density Software XOR

It was discovered that the acquired bit stream was still biased after the hard-

ware XOR with the alternating template. We speculate that this may be the result of capacitively coupled feedback from the output to the comparator reference and supply, rendered more potent because of the higher frequencies in this, as compared to PEAR benchmark, REG designs. To counter the bias, the random bits in i860 RAM are subjected to further XOR filters in software to ensure symmetric (50:50) bit probabilities.

We use two successive stages of XOR alternating template filtering at different frequencies. The first template is at half the frequency of the hardware XOR alternating template. *i.e.*: the data following the first software XOR stage is:

$$d_k^{(\text{HD},2)} = d_k^{(\text{HD},1)} \oplus c_{k/2}. \quad (\text{A2.1})$$

The second template is at a frequency of 111024 times the hardware XOR template, so the data following the second software XOR stage is:

$$d_k^{(\text{HD},3)} = d_k^{(\text{HD},2)} \oplus c_{k/1024}. \quad (\text{A2.2})$$

High Density Sum and Re-scaling

To construct the high density trial score T_{HD} , 2,000,000 bits are summed and then re-scaled with the aim of achieving a trial value having the same distribution as that of T_{LD} . The latter, though binomial, is very nearly normally distributed, with mean 100 and variance 50. The sum of 2,000,000 random bits is also normally distributed, with mean 1,000,000 and variance 500,000. The re-scaling must therefore adjust the mean and variance of the latter, whilst generating an integer having a normal distribution consistent with the low density binomial distribution.

Let:

$$S_{\text{HD}} \equiv \sum_{k=1}^{2,000,000} d_k^{(\text{HD},3)} \quad (\text{A2.3})$$

then the requirements described above are satisfied by the procedure

$$\begin{aligned} T_{\text{HD}} &= \left[\frac{S_{\text{HD}} - 1,000,000}{100} + 100 \right] \\ &= \left[\frac{S_{\text{HD}}}{100} - 9,9000 \right] \end{aligned} \quad (\text{A2.4})$$

where here $[x]$ stands for "the nearest integer to x ."

Low Density Acquisition

For construction of the low density trial just one block of 32,768 contiguous random bits is loaded into i860 RAM. Only the first 200 bits of this block are used.

Low Density Software XOR

The same XOR procedure is applied to both the high and low density data sets. Clearly however, the final XOR process at 1024 times the period of the hardware XOR plays no role in the construction of the low density trial since the period is longer than the number of bits used.

Low Density Sum

The low density sum is just the sum of the first 200 bits:

$$S_{LD} \equiv \sum_{k=1}^{200} d_k^{(LD,2)} \quad (A2.5)$$

where the superscript (LD,2) refers to the low density data set following the second XOR process (*i.e.* the first software XOR process).

Random Switching Between the Two Methods

It should be emphasized that during the period allotted to each trial — around 0.8 sec. — there are two data sets loaded into i860 RAM from which high *and* low density trial values are respectively computed. However, only one of these trial values is displayed and recorded. Which value is decided by a random binary variable obtained from a 1000 element pre-recorded table which is constant for the whole experiment. At the initiation of a run, an initial table index (effectively the seed) is obtained from the system clock. Subsequent table values are decision variables for the trial methods. The table index is "wrapped around" at 1000 so that all 1000 values are used, regardless of the initial index. By design, the table has exactly 500 each of 1's and 0's, so in a run of 1000 trials, there will be 500 each of low and high density origin.

A property of this design is that there is just one statement (a conditional assignment) in the whole computer program which is "sensitive" to the value of the decision variable. As a result, the computation time for each trial does not depend on the value of the decision variable, so there is no opportunity for the operator, consciously or unconsciously, to become aware of the origin of the trial value from the interval between trials. Less obviously relevant, but conceivably of importance, is that the internal electrical spatio-temporal dynam-

ics of the slave and host computers are, apart from the conditional statement, identical for trial values of either origin. Internal activities associated with the conditional statement occupy less than 1 part in 10^7 of the trial time.

Acknowledgments

M. I. gratefully acknowledges the financial support of the **McDonnell** Foundation. Princeton Engineering Anomalies Research gratefully acknowledges the tireless contributions of its volunteer operators, and the financial support of the IGPP Mind-Machine Interaction Consortium, Lawrence Rockefeller, D. C. Webster, and several other philanthropic organizations and individuals.

Credit goes especially to Roger Nelson whose idea it was to blind the operators to the trial method, and John **Bradish**, who spent considerable time building and refining the high frequency digitized noise source. Credit also goes to Robert Jahn whose made an important design decision concerning the different methods of trial value computation.

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FieldREG II: Consciousness Field Effects: Replications and Explorations

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Abstract — Based on formal analysis of 18 exploratory applications, 12 of which have been reported previously, a testable general hypothesis for FieldREG experiments has been postulated, namely that data taken in environments fostering relatively intense or profound subjective resonance will show larger deviations of the mean relative to chance expectation than those generated in more pragmatic assemblies. The 61 subsequent FieldREG applications reported here comprise 21 hypothesis-based formal replications, along with 40 further explorations designed to learn more about the circumstances that favor anomalous deviations. The results of the formal replications strongly confirm the general hypothesis, yielding a composite probability against chance for the resonant subset of 2.2×10^{-6} compared to 0.91 for the mundane subset. The exploratory work suggests other venues in which anomalous effects of group consciousness can be expected, and also identifies a number of situations that do not appear to be conducive to such responses.

Keywords: human/machine interactions — engineering anomalies research — group consciousness — resonance — random event generator — information-fields

1. Introduction

This paper summarizes the status as of June, 1997, of an ongoing investigation of random event generator (REG) anomalies associated with human consciousness that may be indicative of something like a "consciousness field," whereby particular states of group consciousness may be manifested in small but significant changes in sensitive physical systems. Earlier experimental evidence for direct influence of individual intention on the statistical distributions of physical random events has been documented in numerous research articles and meta-analyses (Radin & Nelson, 1989; Jahn *et al.*, 1997; Dobyns & Nelson, 1997; Jahn, Dunne, and Nelson, 1987; Nelson *et al.*, 1991). While the effects in these experiments are statistically robust, they resist explanation via canonical scientific models, and have lead us to propose broader interpretations that explicitly acknowledge the involvement of subjective aspects of consciousness in objective physical processes (Jahn & Dunne, 1997).

These experiments also indicated that some environmental factors and subjective reactions apparently were reflected in unusual trends in the data. To pursue such correlations further, a laboratory-based experiment called

"ContREG" was developed to record an indexed, continuously running data sequence, with a facility to mark the beginning of events such as visitor demonstrations, or small meetings in the immediate environment of the device. This in turn led to the development of fully portable "FieldREG" equipment allowing acquisition of data in a broader range of environments. Using similar equipment and protocols, the experiments were then extended to address the question whether, under certain circumstances, groups of people may also exert anomalous influences on the behavior of REG devices, even in the absence of directed conscious attention. As described in a prior article (Nelson *et al.*, 1996), this speculation was supported empirically, thereby broadening the range of possible theoretical interpretations, and impelling further basic experimentation. In that paper it was noted that the name "FieldREG" is a double entendre: *i.e.*, the device is deployed in "field" experiments, but also appears to respond to changes in a "consciousness field" of the sort that has been proposed in a variety of different contexts by scholars from several disciplines (Basham, 1959; Durkheim, 1961; James, 1977; Sheldrake, 1981). The concept of such a consciousness field is also consistent with the informal testimony of several of our laboratory operators, who speak of achieving a state of "resonance" with the device during successful operation. It also may be related to the larger effect sizes found in laboratory-based experiments using bonded co-operator pairs (Dunne, 1991). Conceptually similar, independent work by Radin and others also has indicated that the nominally random output of well-calibrated REGs may be affected by group consciousness (Radin *et al.*, 1996; Bierman, 1996; Radin, 1997).

Our prior FieldREG data can be divided into two categories: one that displays consistent statistical evidence for anomalous effects, and another that produces few significant deviations. On the basis of this empirical division, a discriminating hypothesis for replication experiments can be proposed. In this paper we will review the earlier experiments leading to that hypothesis, and describe a set of confirmatory experiments, as well as a new set of exploratory studies that suggest further hypothesis-driven applications in the future.

2. Equipment and Procedure

The FieldREG systems consist of either a portable REG and a notebook computer with appropriate software, or a micro-portable REG interfacing with a palmtop computer. More detailed descriptions of these are available in previous reports (Nelson *et al.*, 1996; Nelson, Bradish, and Dobyns, 1992). The data consist of 200-bit trials generated and accumulated continuously at approximately one trial per second, with a time-stamped index identifying scheduled or unscheduled periods of particular interest.

The protocol for FieldREG experiments requires specification of a venue of interest and a predefined criterion for selection of temporal segments to serve as samples wherein the hypothesized or predicted anomalous deviations are to be sought. For example, if an academic convention were the venue, the indi-

vidual presentations in plenary sessions might be specified as the data set of interest. In a small group meeting with no readily identified presentations, sessions or meeting days might be used as the temporal unit for data acquisition. Obviously these specifications must be made prior to the data acquisition or analysis. (In a number of the early exploratory applications this prior specification was not made, and an *a posteriori* statistical adjustment for multiple analysis possibilities was required.) Given the specifications, the data segments are identified using time-stamped index marks registered *via* the computer's appropriately programmed F-keys, in conjunction with onsite notes taken by the experimenter or operator of the equipment. For example, at football games, individual keys may be set to indicate the beginning of a home team drive, a first down, a touchdown, *etc.*, thus allowing precise identification of those segments of the data stream corresponding to time periods of interest in the application. In other cases, simple "begin" and "end" marks suffice to identify the appropriate data.

The analysis begins with the identification and extraction of those data segments corresponding to the marked times of interest. The mean deviations of all segments then are calculated and normalized as *Z*-scores. The analysis for most of the data is based on a sum of the squared *Z*-scores across all the segments, which is a χ^2 distributed quantity. This is formally a variance measure; it quantifies the variability of the means of the active data segments. It should not be confused with the distribution variance for raw data or for arbitrarily defined runs of data; these measures are similar but not equivalent to our segment variance measure. Since the segment lengths are represented in the *Z*-scores, this sum is not otherwise weighted. The number of segments defines the degrees of freedom, and a probability for the accumulated deviation within the application is calculated from the corresponding distribution. Since χ^2 distributed quantities are additive, the results for separate applications can be summed within and across categories to yield an overall statistic representing the data subset of interest.

For some of the early applications, the analysis was done prior to the development of the χ^2 -based procedures, and an "extreme score" assessment was used. In this approach, the identified segments are examined to find the most extreme deviation, and its intrinsic probability is adjusted using the Bonferroni inequality. This results in a probability (p_B) that is typically conservative because it does not include contributions from other deviant, but less extreme segments. To incorporate these older results into the present analysis, the equivalent χ^2 is calculated as $\Sigma -2 \ln p$, which has two degrees of freedom.

Although our primary analysis of FieldREG data is based on a comparison of empirical results against theoretical expectation, a kind of "control" data can be derived in many cases from segments acquired before, after, and interspersed between the active portions. These on-line control data are assessed using a resampling procedure that computes χ^2 values from randomly placed segments corresponding in number and size to those of the active data. Our

standard analysis repeats this resampling process 1000 times to establish a distribution of variations from chance expectation. To check and confirm the probability associated with the primary χ^2 calculated for the active experimental data, it is compared with the proportion of the resampled χ^2 values that exceed it. Another check is made by calculating a Bonferroni-corrected probability for the most extreme individual active data segment. Both of these methods yield values that typically are in good agreement with the primary calculation. The resampling process also enables the computation of an adjusted χ^2 that reflects the parameters of the resampling distribution. These adjusted values are found to vary around the theoretically based calculations as expected, indicating that the fluctuations in overall control segment variance are random. Given the conformance of the control data to chance expectation, we report only the χ^2 and probabilities for the active data referred to theoretical predictions (cf. Appendix for details).

3. Venues for Original FieldREG Applications

A. Venues Showing FieldREG Effects (cf. Table 1a)

1. *Small Groups*

The earliest FieldREG applications were in small, intimate meetings of the Direct Mental and Healing Interactions (DMHI) group and the International Consciousness Research Laboratory (ICRL) ensemble. Both of these groups hold regular meetings of professional researchers who know each other well and who enjoy intense, ongoing discussions of consciousness-related research issues. These first applications were analyzed using the Bonferroni-adjusted extreme value procedure, while later meetings of the groups were assessed with the χ^2 algorithm. The data segments chosen for the latter analyses consisted of individual presentations by the participants, although since both groups have a highly flexible and dynamic character, some other segmentation rule, for example, by sessions or days, might have been more appropriate.

2. *Group Rituals*

A member of a Covenant of Unitarian Universalist Pagans (CUUPS) expressed interest in the FieldREG work and the possibility that their group meetings, devoted to participatory rituals, might be a promising venue. A battery-powered portable system was taken to a series of meetings and the beginning and ending of the actual ritual noted, along with some indication of the ritual's meaning or intent, *e.g.*, a Sabbat, a Beltane, the Full Moon, *etc.* Two groups of such data were included in the original FieldREG database and both showed significant indications of anomalous deviation.

TABLE 1a
Original FieldREG Applications Showing Anomalous Results

Venue	Date	N-Trials	χ^2	df	P	Effect
Small Groups						
DMHI*	Dec 93	100000	7.224	2	.027	.0061
DMHI*	Dec 94	100000	5.838	2	.054	.0051
ICRL*	Mar 94	30000	3.653	2	.161	.0057
ICRL*	Dec 94	30000	2.315	2	.315	.0028
ICRL	May 95	29320	5.209	4	.267	.0036
All Small Groups		289320	24.239	12	.019	.0039
Group Rituals						
CUUPS Pagan Circle*	93, 94	25000	12.604	6	.050	.0104
CUUPS Pagan Circle*	94, 95	35000	20.901	9	.013	.0119
Shaman, Devils Tower	Oct 94	1258	7.701	1	.0055	.0717
All Group Rituals		61258	41.206	16	.00052	.0132
Sacred Sites						
Devils Tower Tour	Oct 94	4310	14.792	7	.039	.0268
Wounded Knee	Oct 94	9985	9.730	6	.137	.0109
All Sacred Sites		14295	24.522	13	.027	.0161
Music/Theater						
Humor Convention*	Apr 95	25000	38.995	20	.007	.0491
Charismatic Event						
Academy, on Ritual*	July 94	60000	10.370	2	.0060	.0103
Predict Effect, Total		449873	139.332	63	1.08×10^{-7}	.0077

* Included in previously published FieldREG database. The number of trials is an estimate of the full database size.

In another context, a Shoshone medicine man met one experimenter and three other people at the Devils (sic) Tower monument in Wyoming to visit the sacred site and to perform a ritual healing ceremony. His special interest is in the preservation of places considered sacred by the Native American tribes, and he designed the ritual to serve that end. Although he was aware of the FieldREG research project, he regarded it as peripheral to the primary purposes of his interaction with us and the sacred site.

3. Sacred Sites

The role of the physical place itself was assessed more directly subsequent to the analysis of the original FieldREG data, but these applications were consonant in some important respects with other predictor categories, especially that of Group Rituals. For example, data were taken in the course of one traverse around the Devils Tower monument that was intended solely for direct enjoyment and appreciation of the remarkable site, subsequent to an intensive experimental project related to dowsing which is included in category B.3, Special Investigations, and is detailed elsewhere (Nelson & Apostol, 1996). This tour was focused by the intention to make photographs of various special perspectives, including the site of the medicine ceremony and some "favorite"

spots which were noted during the dowsing experiments but could be given little attention at the time.

Wounded Knee in South Dakota is the location of a massacre of an entire tribe of Sioux in one of the saddest chapters of the "Indian wars" in the course of which the tribal lands were progressively taken by the surging white population. It is a desolate place, dominated by a cemetery and a monument with explanatory and descriptive signs. It is considered sacred by the Indians, and engenders in the visitor a feeling of deep quiet.

4. Music and Theater

This category is represented in the predictor set only by a highly theatrical humor conference, which was designed for professionals who use humor in their work, but also for the purpose of enjoying humor. The full program, including even the coffee breaks, was designed to engage and entertain, and to be exemplary of humor. Although this "conference" might seem to be an unusual example for a music and theater category, its thematic structure and intent were characteristic of that genre, and the strong indication of anomalous deviation here supports the prediction of an effect in theatrical and musical venues that deeply engage the audience.

5. Charismatic Events

At the two-week Academy of Consciousness Studies held at Princeton in 1994, data were recorded for most sessions. Although this was a special gathering with some aspects of an academic conference, it entailed qualities associated with small, thematically oriented working groups. One session among 60 showed a persistent deviation that was sufficiently extreme to produce a significant Bonferroni-corrected overall deviation for the Academy as a whole. The topic of the session was ritual in day-to-day life and the importance this natural manifestation of consciousness may hold for its own deeper understanding. This application is thus related to the Ritual category, but it was not designed or conducted as a ritual. The topic and the presentations were deeply engaging, and several individuals independently reported shared reactions that were subjectively very intense and coherent, suggesting that this may be properly characterized as a charismatic event that powerfully focused attention and integrated the attending individuals into a group. At present there are no confirmatory applications in this category.

B. Venues Showing No Anomalous FieldREG Effects (cf. Table 1b)

In the original FieldREG applications, priority was given to situations that seemed on intuitive grounds likely to produce the group coherence and engagement that we suspected might foster anomalous FieldREG deviations. Data also were taken at academic conferences, business meetings, and a number of other environments which seemed less propitious, and indeed none of

Table 1b
Summary of Early FieldREG Applications Showing Null Effects

Venue	Date	N-Trials	χ^2	df	P	Effect
Academic Meetings						
SSE Meeting	Jun 95	42897	15.943	19	.700	-.0025
PA Meeting	Aug 95	77534	44.812	55	.835	-.0035
All Academic		120431	60.755	74	.866	-.0032
Business Meetings						
SSE Council*	Dec 94	25838	10.175	12	.601	-.0016
Special Investigations						
Marfa, Texas*	Mar 94	12194	2.957	2	.228	.0068
Dowsing, Devils Tower	Oct 94	6777	3.351	10	.972	-.0232
All Investigations		18971	6.308	12	.900	-.0093
Control Conditions						
Devils Tower Control	Oct 94	518	0.125	1	.723	-.0260
Total		165758	77.363	99	.947	-.0040

* Included in previously published FieldREG database.

these venues showed any tendency toward unusual deviations. In fact, these situations appeared to suppress segment variance to a suggestive degree ($\chi^2 = 77.363$, 99 df, $p = 0.053$). The following brief descriptions pertain to Table 1b, which summarizes the data gathered in these and other categories for which null effects prevailed.

1. Academic Meetings

FieldREG data were taken at annual meetings of the Society of Scientific Exploration (SSE) and the Parapsychological Association (PA), with the beginning and end of presentations marked for segment analysis. Such conferences are characterized by varied themes and individualized patterns of attention that do not lend themselves to group coherence.

2. Business Meetings

The original FieldREG database included a meeting of the SSE governing council, which meets with an agenda of typically businesslike matters. While discussions are amicable and cooperative, there is usually little emotional engagement.

3. Special Investigations

A variety of otherwise unclassified original applications included an investigation of the "Marfa Lights" in Texas, in which data were taken in the low mountains near Marfa where many reports of strange lights in the night sky have been made. Some observers have suggested a connection with natural

phenomena, while others link the lights to UFO speculations. The researchers took a FieldREG system as part of an array of electronic and other monitoring devices, and recordings were made over several evenings of the project. No strong deviations associated with the light phenomena were observed.

Another project investigated the possibility that FieldREG recordings might show deviations corresponding to the indications generated by dowsing. This consisted of ten replications of a circuit around the Devils Tower monument accompanying a dowser, with the data segments marked corresponding to the dowsing responses. Although the dowser hoped for an "objective" indicator, the results showed no consistent trends (Nelson & Apostol, 1996).

4. Control Conditions

Other than the undesignated data taken during periods of time surrounding the active data segments, one of the original applications was designed as an explicit control condition. This was a ceremony performed at Devils Tower by the Shoshone shaman in a "control" site selected by one of the other members of the group, rather than by the shaman, who considered the "sacred" site to be an important component of the ceremony.

4. Results of Original FieldREG Applications

Tables 1a and 1b detail the results obtained in the various venues described above for the anomalous and null effect categories, respectively. Columns summarize the number of REG trials, the segment-based χ^2 s with their degrees of freedom and corresponding probabilities, and the trial-based effect sizes, calculated as $\frac{Z}{\sqrt{N}}$ where Z is obtained as the normal distribution quantile of the p-value, and N is the number of trials in the active data taken during the application. As noted before, some of the early data were assessed by finding the segment with the most extreme deviation and correcting for multiple analysis, so that the actual numbers of trials for those applications are not available without a major re-analysis. Therefore, to allow effect size computations that can be compared to the later replications, a rough but adequate estimate of N for the full dataset has been made from the number of days or sessions.

As a graphical example of the anomalous effects that may occur in these applications, Figure 1 shows the cumulative deviation of the REG trace during the Shoshone shaman's healing ritual at the Devils Tower sacred site.

Figure 2 provides an example of relatively modest cumulative deviations of the REG trace during sessions of the 1995 meeting of the Parapsychological Association, which showed, overall, no significant anomalous effect. Although this is a large dataset, with many opportunities for an impressive deviation such as that shown in Figure 1, none appear.

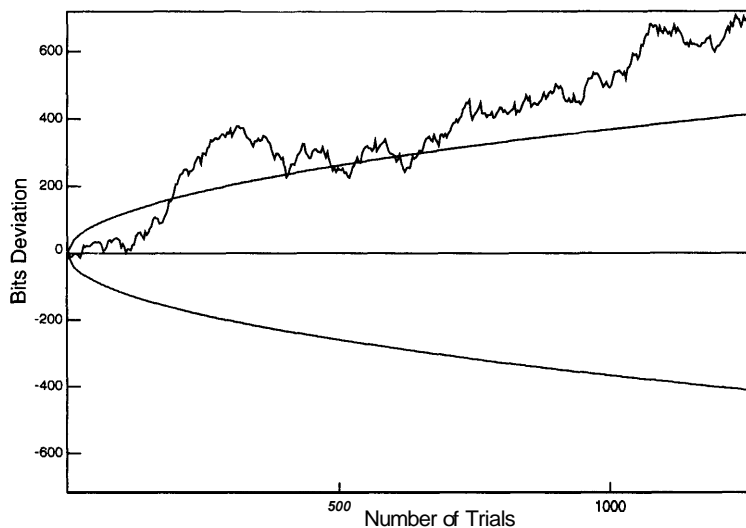


Fig. 1. Cumulative deviation of FieldREG trace during a 20-minute healing ceremony performed by a Shoshone shaman at Devils Tower. The horizontal line shows the expectation for the random walk described by the accumulating deviations, and the parabolic envelope shows the locus of the 0.05 probability for so large a deviation as the database increases.

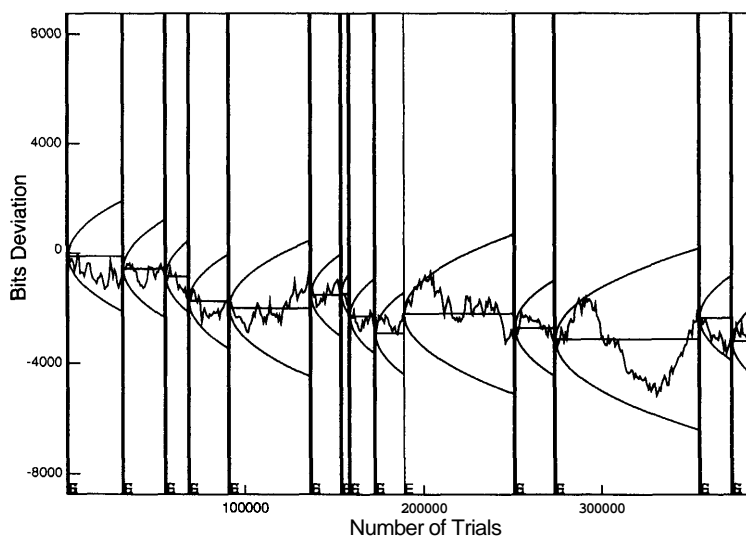


Fig. 2. Cumulative deviation of FieldREG trace during the Annual Convention of the Parapsychological Association, 1995. Vertical lines indicate the beginnings and ends of sessions, each of which contained several presentations of 15 minutes duration or more. The horizontal lines in each segment show the expectation, and the parabolic envelopes show the locus of the 0.05 probability for so large a deviation as the database increases within that segment.

Hypothesis

On the basis of both these sets of results, we now erect the hypothesis that future trials performed in environments closely resembling those in category 1a, or otherwise *fostering a high degree of subjective resonance within the group*, should continue to display anomalous segments of FieldREG response. Conversely, trials conducted in environments similar to category 1b or others *involving little subjective resonance within the group*, should show little anomalous character. The next part of this paper describes a series of experiments designed to test this hypothesis.

5. Confirmatory Experiments

A. Venues Favoring Anomalous Effects (cf. Table 2a)

1. Small Groups

In this category are further meetings of the DMHI and ICRL groups described in Section 3.A.1, supplemented by data from two other very similar situations. One of these (designated Egypt C in Table 2a) is a subset of the data gathered during a trip to Egypt with a group of 19 people interested in ancient Egyptian religion and culture (Nelson, 1997a). This group gathered on several occasions during the trip to discuss plans and share ideas and practices that were of interest to everyone in the group. The second new venue in this category is a meeting of the PEAR staff for a retreat (Dunwalke) to share impressions and ideas on the current and future work of the laboratory group.

2. Group Rituals

A third dataset from the CUUPS group described in Section 3.A.2 falls properly in this category, along with a series of visits to Egyptian sacred sites (designated Egypt A in Table 2a) by the group mentioned in the previous paragraph. The participants engaged in meditation and chanting in the temples and the interior chambers of the pyramids, to honor the ancient traditions and to attempt to create a spiritual connection to the places in which the rituals of the ancient Egyptians had been conducted.

3. Sacred Sites

Crater Lake is an unspoiled natural park of extraordinary beauty, and a place that has been regarded as sacred by the Native Americans. It was visited in late summer by two of the authors and two compatible guests, all of whom immersed themselves meditatively in the scenic and mystical ambience of the site.

Table 2a
Confirmatory FieldREG Applications Predicted to Display Anomalies

Venue	Date	N-Trials	χ^2	df	p	Effect
Small Groups						
DMHI	Nov 95	153292	18.289	14	.194	.0022
DMHI	Dec 96	136704	22.186	14	.075	.0039
ICRL	Jan 96	30459	7.766	6	.256	.0038
ICRL	Aug 96	8286	9.068	10	.526	-.0007
ICRL	Apr 97	18446	8.337	9	.501	-.0000
Egypt C	Oct 96	26935	17.157	14	.248	.0041
Dunwalke	May 97	57515	7.544	6	.274	.0025
All Small Groups		431639	90.347	73	.082	.0021
Group Rituals						
CUUPS Pagan Circle	95, 96	82404	16.481	16	.420	.0007
Egypt A, chanting	Oct 96	29660	51.468	22	.0004	.0195
All Group Rituals		112064	67.949	38	.0020	.0086
Sacred Sites						
Crater Lake	Aug 96	85742	6.999	6	.321	.0016
Egypt B, Casual	Oct 96	27367	56.324	27	.0008	.0191
All Sacred Sites		113109	63.323	33	.0012	.0090
Music/Theater						
Revels 95	Dec 95	14640	77.014	50	.008	.0199
Revels 96	Dec 96	72078	287.746	246	.034	.0068
Bayreuth Opera	Jul 96	61140	13.704	7	.057	.0064
Met/NYC Opera	96, 97	75091	16.063	19	.653	-.0014
All Music/Theater		222949	394.527	322	.0031	.0058
Total		879761	616.146	466	2.20×10^{-6}	.0049

The Egypt B dataset was gathered in various sites important to the ancient Egyptian sacred view, including the temples and pyramids. These sites were of the same nature as those in Egypt A, but in these cases the group was casually present and did not undertake meditation, chanting, or other activities intended to foster group resonance.

4. Music and Theater

The confirmatory work here includes a large-scale music and theater production called "The Revels" that is mounted annually in eight or more cities around the United States. The artistic director in San Francisco proposed that the participatory nature of the production, and its basis in various cultural rituals celebrating the passage of the old year into the new, would make it a likely candidate for anomalous FieldREG effects. (The Revels might also be included in the "Group Rituals" subset based on its content and on its community and celebratory nature.) Five especially engaging pieces from the show were predicted to yield anomalous deviations. Ten shows in two cities were recorded in 1995, and an even larger replication in 1996 included eight cities

presenting similar programs, each with multiple performances. This dataset is described in greater detail in a separate report (Nelson & Mayer, 1997).

Two datasets were accumulated at operas, one set in Bayreuth, taken by a German colleague, the other in New York at the Metropolitan and New York City Operas. The Bayreuth operas were portions of the Wagner Ring cycle, and the separate acts were designated as the temporal segments for the experiment. (The Wagner festival could also be included in "group ritual" or the "sacred site" categories since it constitutes a yearly pilgrimage by devotees to the Festspielhaus, a theater designed by the composer for optimal resonance with his work.) For formal analysis, the same act-based prediction was made for the New York data, but informal ratings also were made of especially "powerful" acts, allowing a subset to be drawn for which the prediction of an effect might be linked to a specific subjective reaction of the experimenter to the situation.

B. Venues Favoring Null Effects (cf. Table 2b)

1. Academic Meetings

Included in the confirmation work where a null deviation is predicted are two more SSE meetings, a multidisciplinary conference, "Toward a Science of Consciousness" (Tucson 11), and an SSE symposium on alternative archaeology called "Return to the Source." In most cases all presentations were included in the analysis, except for the Consciousness conference where there were many parallel sessions and only the plenary presentations could be recorded.

2. Business Meetings

Two confirmatory databases were acquired in subsequent meetings of the SSE Council.

Table 2b
Confirmatory FieldREG Data With Predicted Null Deviation

Venue	Date	N-Trials	χ^2	df	P	Effect
Academic Meetings						
SSE Meeting	Jun 97	58057	27.250	27	.450	.0005
Tucson II Meeting	Apr 96	50846	6.333	6	.387	.0013
EuroSSE Meeting	Oct 96	99188	24.891	42	.983	-.0067
Return to Source Symp.	Sep 96	65154	8.574	14	.857	-.0042
All Academic		273245	67.048	89	.960	-.0033
Business Meetings						
SSE Council	Nov 95	32599	22.221	17	.176	.0052
SSE Council	Jun 97	25924	10.532	14	.722	-.0037
All Business		58523	32.753	31	.381	.0013
Total		331768	99.801	120	.908	-.0023

6. Results of Confirmatory Experiments

Table 2a details the results for the hypothesis-based experiments testing the prediction that venues conceptually similar to those of the corresponding predictor set (Table 1a) will display similar tendencies toward anomalous deviations.

Compared to the bottom line for the early applications, which had a chance probability of about one in ten million, that of the confirmatory set is about two in one million. The mean 2-scores in the two cases, 1.656 ± 0.209 and 1.118 ± 0.297 , respectively, both differ significantly from theoretical expectation, but not from each other, constituting a strong replication of the anomalous effects. The trial-based effect size calculated from the unweighted 2-scores in the confirmatory dataset is somewhat smaller than in the original set ($E_s = 0.0077$ compared with $E_s = 0.0049$), but again not significantly so ($Z = 1.531$). Figure 3 shows the accumulation of χ^2 in the anomalous effect category, combined across the predictor and confirmation datasets.

Table 2b details the confirmation experiments in venues predicted to yield null effects, in circumstances that are primarily intellectual and businesslike. As predicted, deviations tend to be relatively small, and the χ^2 is smaller than chance expectation to a suggestive degree ($\chi^2 = 99.80$, 120 df, $p = 0.09$). If the data for the predictor and confirmatory subsets are combined, there is a

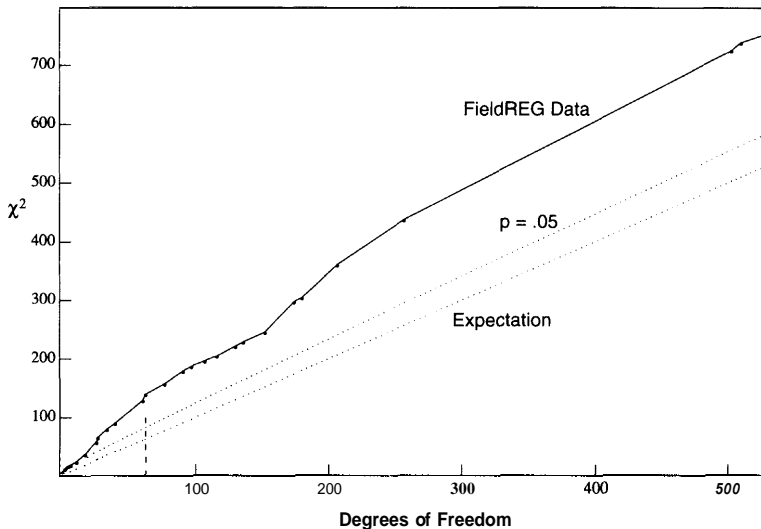


Fig. 3. Anomalous effect. The solid line shows the cumulative χ^2 over the applications in the predictor set detailed in Table 1a (the first 63 degrees of freedom, marked by a dashed line) and the applications in the confirmatory dataset detailed in Table 2a. The dotted lines show the expectation and the locus of the 0.05 probability for so large a deviation as the database increases.

significant indication that there may actually be a suppression of segment variance in applications of this genre ($\chi^2 = 177.164$, 219 df, $p = 0.019$). This aspect of the FieldREG data will require further effort to clarify. Figure 4 shows the accumulation of χ^2 in the null effect category, over both the predictor and confirmation datasets.

7. New Exploratory Experiments (cf. Table 3)

The early experiments and the replications described above cover only a limited span of possible FieldREG applications, and although the patterns of success and failure suggest and then confirm the general discriminating concept embodied in the hypothesis of Section 4, it seems desirable to expand the environmental range of exploratory experiments in order to extend and refine the relevant criteria. For this purpose, new formal data have been collected in about 40 applications where no specific predictions could be made directly from the earlier work. These are subdivided into ten groups within each of which the applications are either repetitions of a venue or closely related situations. The range is fairly broad, and the data collection is often "opportunistic" in the sense that it depends upon the experimenters' interests and access to particular field situations.

In addition, a variety of informal, but potentially instructive small data-

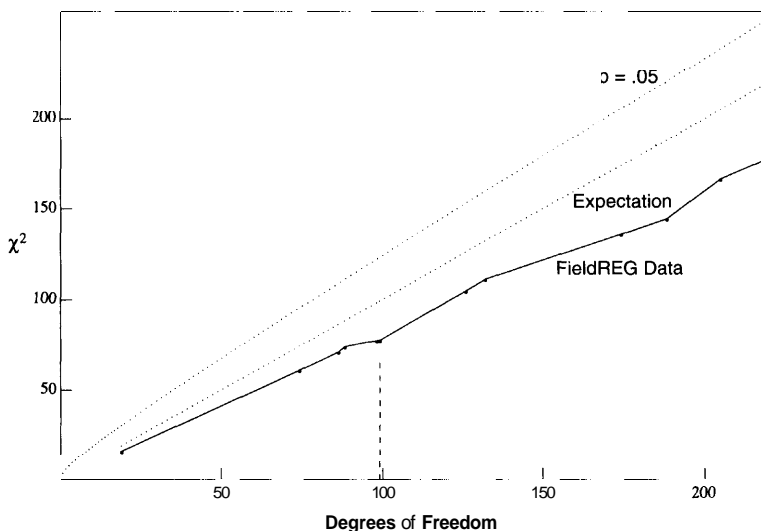


Fig. 4. Null effect. The solid line shows the cumulative χ^2 over the applications in the predictor set detailed in Table 1b (the first 99 degrees of freedom, marked by a dashed line) and the applications in the confirmatory dataset detailed in Table 2b. The dotted lines show the expectation and the locus of the 0.05 probability for so large a deviation as the database increases.

Table 3
Summary of Exploratory FieldREG Applications

Venue	Date	N-Trials	χ^2	df	P	Effect
Religious Rites						
Stokes Memorial Service	Feb 97	3183	0.016	1	.899	-.0226
Ludtke Rosenkranz	Apr 97	4467	1.037	4	.904	-.0195
Ludtke Funeral	Apr 97	21750	2.218	5	.818	-.0062
All Religious Rites		29400	3.271	10	.974	-.0113
Personal Rituals						
Moon	25 Oct 96	6212	2.202	1	.138	.0138
Winter Solstice	21 Dec 96	3944	2.005	1	.157	.0160
Moon eclipse	26 Sep 96	4473	3.943	2	.139	.0162
Moon eclipse	26 Sep 96	4453	1.600	2	.449	.0019
Moon eclipse	26 Sep 96	4470	1.523	2	.467	.0012
Egypt E	Oct 96	10440	9.255	9	.414	.0021
All Personal Rituals		33992	20.596	18	.300	.0037
Sharing Party						
Halloween Party	Oct 96	13136	7.873	4	.096	.0114
Mom's Birthday	Oct 94	13235	3.265	1	.071	.0128
All Sharing Party		26371	11.138	5	.049	.0102
Invited Talks						
RGJ Old Guard	Oct 95	7490	2.378	1	.123	.0134
RGJ Rockefeller U.	Oct 95	12670	0.042	1	.838	-.0088
RGJ Colgate	Apr 97	2800	0.303	1	.582	-.0039
RDN NCAS	Mar 94	12232	5.312	7	.622	-.0028
RDN Freiburg	Nov 95	6049	9.853	5	.080	.0181
RDN Nassau Club	Nov 96	3627	2.112	3	.550	-.0021
RDN New Dimensions	Nov 96	7811	0.835	2	.659	-.0046
ALL Mt. Sinai	May 97	5669	3.896	3	.273	.0080
All Invited Talks		58348	24.731	23	.364	.0014
Visits to Special Sites						
Black Hills	Oct 94	22791	12.992	10	.224	.0050
Dakota Badlands	Oct 94	13677	17.112	18	.515	-.0003
Egypt D, Tour Sites	Oct 96	18235	16.858	8	.032	.0137
Yosemite Park	Jun 97	20398	1.763	3	.623	-.0022
All Special Sites		75101	48.725	39	.137	.0040
Spirit Channeling						
Channeling Session	23 Nov 96	13367	20.391	6	.002	.0249
Channeling Session	22 Dec 96	4754	2.993	5	.701	-.0076
Channeling Session	31 May 97	13146	9.960	16	.869	-.0098
Channeling Session	01 Jun 97	5122	0.159	3	.984	-.0300
All Channeling		36389	33.503	30	.301	.0027
Global Events						
Rabin Shot, \pm 5 min.	04 Nov 95	690	6.875	1	.009	.0905
Gaiamind Meditation	23 Jan 97	4900	23.883	14	.047	.0239
All Global Events		5590	30.750	15	.010	.0311
Spiritual Training						
Jin Shin Do Classes	Nov 95	142311	19.607	26	.810	-.0023

Table 3 (Continued)
Continued: Summary of Exploratory FieldREG Applications

Venue	Date	N-Trials	χ^2	df	p	Effect
Group Celebrations						
Princeton P-Rade	Jun 96	19653	11.810	8	.160	.0071
BaselerMorgestraich	Feb 97	2709	4.913	5	.427	.0035
Bummel Sonntag (offtime)	Mar 97	12600	4.076	1	.043	.0153
All Group Celebrations		34962	20.799	14	.107	.0066
Sports						
Princeton Football	23 Sep 95	2457	8.522	6	.202	.0168
Princeton Football	14 Oct 95	940	2.903	5	.715	-.0185
Princeton Football	11 Nov 95	5773	8.508	12	.744	-.0086
Princeton Football	26 Oct 95	4047	29.255	20	.083	.0218
Princeton Football	23 Nov 95	5739	4.116	13	.990	-.0307
Superbowl TV RGJ	28 Jan 96	17795	14.627	12	.262	.0048
Superbowl TV RDN	28 Jan 96	18919	15.438	13	.281	.0042
All Sports		55670	83.369	81	.406	.0010
Total Table 3		498134	296.429	260	.059	.0022

bases have been recorded in the laboratory and at various meetings and talks given by the lab staff members. Although many of these situations have an identifiable relationship to other work, the data were not taken under specific hypotheses that allow incisive analysis and inclusion in the formal database. A number of attempts have been made in venues that proved infeasible for practical reasons. For example, meetings of a mens' group and of a Buddhist Sangha were thought to be good candidate venues, but it proved impossible to make suitable notations without interfering with the groups' processes.

1. Religious Rites

This comprises a small group of recordings taken at memorial services and a funeral. One service was for a highly regarded Dean at Princeton University who died suddenly after a short illness. The others were for an experimenter's mother-in-law in Germany and consisted of an evening church service and the funeral on the following day. This is a small database, but it is worth noting that the results show suppressed variance akin to that observed in the venues favoring null effects.

2. Personal Rituals

Some of these are simple, individual ceremonies that are intended to manifest respect for various ancient traditions in which phases of the moon and the changing of seasons are honored. They differ from the Group Ritual category in having only one or two people in attendance. The recording and analysis is also relatively simple, typically consisting of a single segment covering the period of the ritual. Noting that eclipses tend to draw the attention of large num-

bers of people, independent datasets were taken by three experimenters during a moon eclipse to assess possible correlations. Though one of these showed a fairly strong deviation, the combined results showed no evidence of an anomalous effect, and there was no significant correlation across the three datasets.

The Egypt E subset is a designed collection of data taken in personally engaging situations, including several that involved rituals, recorded during the aforementioned Egypt tour. The intent was to provide a sample of segments that were otherwise similar to those involving the tour group, but with only the experimenter actively engaged.

3. *Convivial Parties*

Two examples of gatherings of family and friends at parties both show promise as sources of anomalous deviation. As an indicator of the subjective impact the consciousness field research may have, we note that a graphic representation of the data from the Halloween party reveals a remarkably apt though surely coincidental configuration, with sharp peaks that (given the context) are strongly reminiscent of a classic "witch" hat (see Figure 5). In both cases, the interpersonal or group activity was relaxed, familiar, and fun, all qualities that help to create a natural unity and resonance.

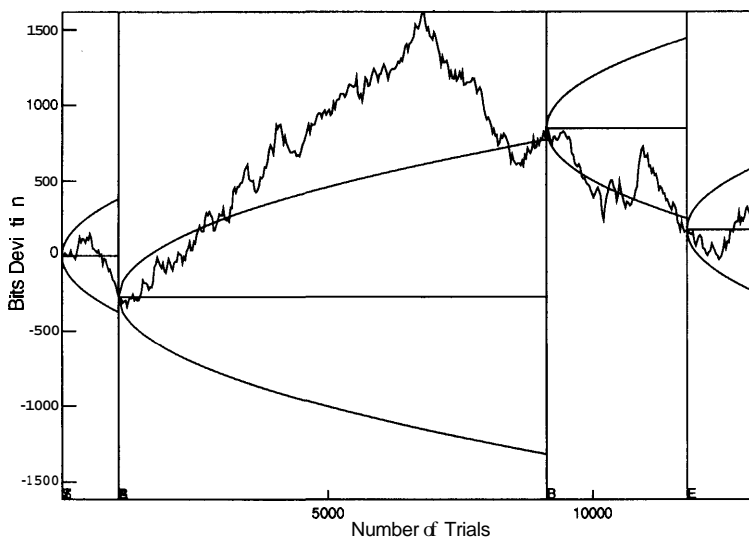


Fig. 5. Cumulative deviation of FieldREG trace during a convivial Halloween party in 1996. Vertical lines indicate index entries made at times that seemed to mark different phases of the party. The horizontal line shows the expectation, and the parabolic envelope shows the locus of the 0.05 probability for so large a deviation as the database increases.

4. Professional Talks

Several recordings of professional talks given by the PEAR staff indicate that this type of activity tends to yield a null outcome similar to that found in academic or business meetings. Overall, the eight examples show essentially undistorted data distributions. Most of the recordings are single units covering the entire talk, thus precluding any analysis that might be sensitive to temporary achievement of a group coherence.

5. Tourist Sites

This is a varied group, but the common theme is a location that attracts people through some form of natural or cultural interest, including scenic beauty and unique character. Several are well-known national parks or monuments, and in each case the data were recorded with only one or two people in attendance. The Egypt D dataset was recorded at several major tourist stops of the Egyptian visit that were not sacred sites as defined for the project. These included the remarkable Cairo museum with its Tutankhamun exhibit, tombs in the Valley of the Kings, and the beautifully preserved tomb of Nefertari, nearby. In all cases there were no group activities or efforts to foster any sort of group resonance. Except for the Egypt D subset, none of the tourist sites produced anomalous yields.

6. Channeling Sessions

An opportunity was presented to attend occasional channeling sessions where a "spirit entity" named Samuel was imputed to give information and comments to a small group. The group members held a variety of different levels of belief in the process and varied also in their interpretations, but all were interested participants with a respectful attitude. The first of four sessions showed a strong FieldREG result, while later sessions did not; hence no clear prediction about future applications in this venue can be made.

7. Spiritual Training

An eight-day course of training in Jin Shin Do was attended by a colleague, providing an opportunity to do FieldREG recordings in a structured environment with a spiritual tone. The classes consisted of physical and mental exercises (pal dan gum), meditation, and work sessions in which participants practiced healing techniques with each other and with the teaching master. Data segments corresponding with these three activities were defined as the formal analysis subset. The results showed no strong trends toward either anomalous deviation or variance suppression.

8. Sporting Events

Several home games of the Princeton varsity football team were recorded.

Analysis of the early applications focused on home team touchdowns while ball possession by the home team defined the analytical segments in later games. The results show little indication of an anomalous effect in either mode, despite the expectation that sports activities often are powerfully engaging and would seem to be a likely source of a group consciousness effect. It may be relevant that most of the games were somewhat lackluster, according to the experimenter's subjective criteria, and elicited relatively little crowd enthusiasm.

Two independent recordings of the 1996 Superbowl were made via television broadcast, with a ball-possession segment protocol. Although there was only modest evidence for corresponding anomalous deviations, the effect size was comparable to the average across the confirmatory applications in Table 2a. A similar study conducted at European soccer games focusing on the relatively rare goal plays, found a significant increase in data variance (Bierman, 1996), suggesting that the question regarding sports venues should remain open.

9. Global Events

Specific occasions with very widespread interest present an opportunity to ascertain whether a global event might create an extended consciousness field that could be detected using the FieldREG technology and protocols. When the assassination of Prime Minister Rabin was announced in November, 1995, the continually running **ContREG** sequence in the PEAR lab was examined retrospectively for any deviation at the time of the murder. The period of five minutes surrounding the event does indeed show a powerful, low-probability meanshift, and an extraordinary effect size (see Figure 6). Because there was no pre-planned definition of the analytical segment boundaries, this application must be regarded as exploratory only, but it may be useful in forming assessment strategies for other singular events.

A more positive occasion was the Gaiamind Meditation, during which several researchers around the world took data to correspond with a widely promoted meditation for world health and peace that took place in January, 1997. This project, documented more fully in a separate report (Nelson, 1997b), also indicated a significant composite effect. The survey of this category is at present too small for reliable prediction but together with related work (Radin, 1997), suggests that this is a potentially instructive venue; further applications are ongoing.

All of these data were acquired in a necessarily "remote" protocol, *i.e.*, the FieldREG units were not proximate to the venues, but geographically far removed. Further discussion of the implications of this variant follows in Section 9.

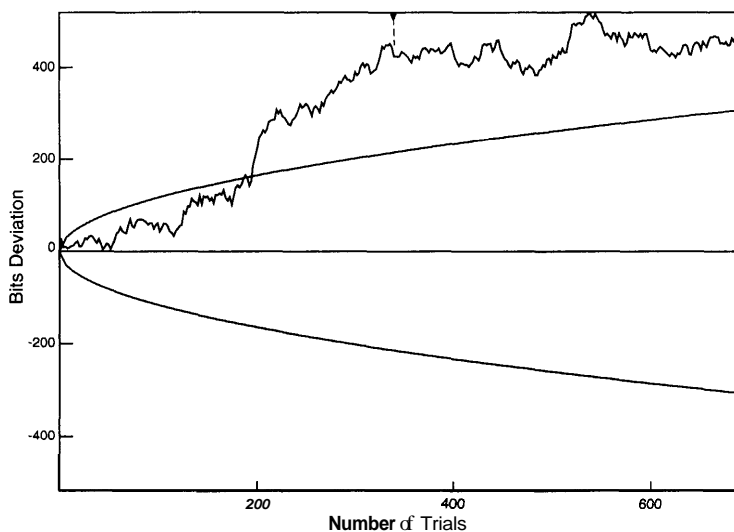


Fig. 6. Cumulative deviation of ContREG data recorded in Princeton at the time of the assassination of Prime Minister Rabin. The graph shows a ten-minute period of time exactly centered on the time of the shooting. The horizontal line shows the expectation, and the parabolic envelope shows the locus of the 0.05 probability for so large a deviation as the database increases.

10. Group Celebrations

The Princeton P-Rade is part of a yearly reunion of Princeton University alumni. A high proportion of alumni return, and the celebrations are rewarding, high-spirited, and somewhat complicated, in the sense that many different activities are in process and compete for attention. The culminating parade, however, does bring the participants together as a large attentive group, and FieldREG data segments taken during especially engaging parts were marked for analysis. The results were equivocal at best.

The Baseler Morgestraich is an annual celebration of ancient traditions in Basel, Switzerland, where a major proportion of the citizenry and a large number of "pilgrims" from across Europe converge in the city center at 4:00 am to partake. All electric lights are turned off and candles illuminate the procession of marchers wearing gigantic masks, interspersed with numerous floats bearing cartoons and satiric text with political and social themes. The marchers play eerie drum and piccolo music that is drawn from ancient ritual sources. A "reminder" version of the Morgestraich, called "Bummel Sonntag," occurs on each of the following four Sunday evenings, with the marchers and musicians repeating their wandering path through the city, minus the costumes, but again with the music, and the fascinated attention of many of their fellow citizens. The data in this case were taken in both a "remote" and an "offtime" mode; the

first author serendipitously discovered the event while in **Basel** for another purpose, and since he did not have a FieldREG system available, made the decision to take data upon his return to Freiburg. The offset time and the amount of data were pre-specified, and notes made to document the **offtime** protocol. The results show a significant deviation.

8. Results of Exploratory Applications

In Table 3, as in the earlier tables, the venue and date of the application are given, and the results are summarized as a segment-based χ^2 with its degrees of freedom and corresponding probability, and a trial-based effect size.

The data indicate that some of the subgroups could be promising venues for additional replications in the future. Others show consistent indications of null effects. Because the selection of particular applications in this exploratory category is somewhat arbitrary and dependent on opportunity, the composite statistical evaluation is not likely to be an incisive indicator. Nevertheless, the bottom line across the ten subgroups comprising a total of 40 applications is marginally significant, with a χ^2 of 296.429 on 260 degrees of freedom, and a corresponding probability of 0.059. Figure 7 shows the accumulated χ^2 for the exploratory category.

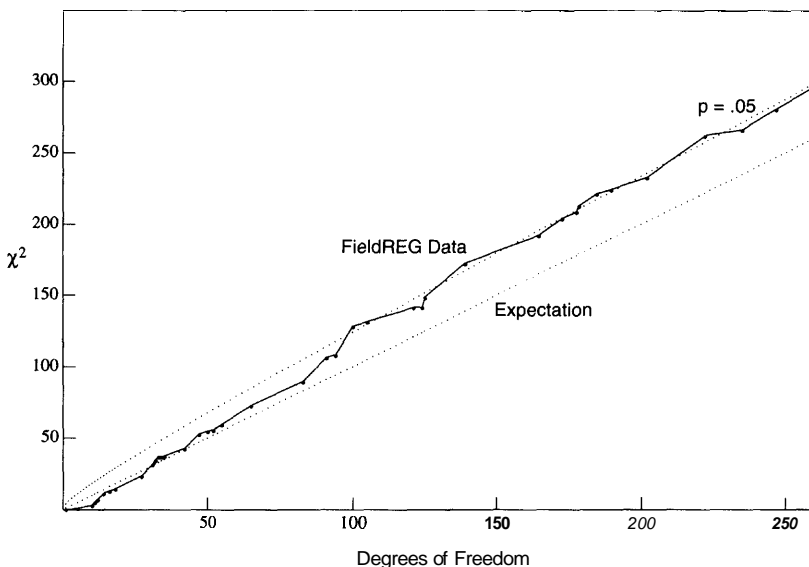


Fig. 7. Exploratory data. The solid line shows the cumulative χ^2 over all the applications in the exploratory database detailed in Table 3. The dotted lines show the expectation and the locus of the 0.05 probability for so large a deviation as the database increases.

9. Discussion

Beyond confirming the primary hypothesis posed in Section 4, the replication data listed in Table 2, along with the original data of Table 1 and the exploratory results listed in Table 3, also display several indicators of subsidiary structure in the FieldREG databases that could bear on the formulation of theoretical models of the phenomenon, and thence on its eventual comprehension. Unfortunately, the data in hand are insufficient in scope and incisiveness to allow detailed assessment of any of these at this time. Rather, we can simply acknowledge these tendencies and remain alert to them in future work.

A. Differences in Z-scores and Effect Sizes

Many of the replications, while vigorously substantiating the primary hypothesis, tend toward somewhat smaller Z-scores and effect sizes as the number of applications in a given venue increases. This may well be another manifestation of the serial position profiles found in our laboratory-based REG studies (Dunne *et al.*, 1994), which in turn may indicate the importance of various subjective factors, such as novelty, confidence, or expectation, to operator performance in such experiments. Theoretical inclusion of such factors in the FieldREG genre of human/machine interactions, where the role of the "operator" clearly is more indirect, diffuse, and subtle, will not be straightforward, and ultimately may require revisitation of the role of the experimenters in this and other classes of anomalies research. On the other hand, since an experimenter is perforce included in all venues, the significant differences in effects across application categories are more likely attributable to other factors associated with the group *per se*.

B. Reductions of Variance

As mentioned briefly in Section 6, the data acquired in applications predicted to have small yields, *i.e.*, in prosaic or businesslike venues, individually and collectively display variances well below those of the higher yield categories and even below chance expectation. There is a suggestion, as noted earlier, that variance may be suppressed in other situations, such as the religious funeral ceremonies described in Section 7.1. Once again this is reminiscent of similar effects noted in our laboratory REG experiments (Jahn *et al.*, 1985) and elsewhere (Bierman, 1996), and if confirmed in further research, may constitute another mode of anomalous response of the FieldREG system to the prevailing consciousness environment.

C. Displacements in Space and Time

As noted briefly in the sections describing the venues of application, a few situations necessarily entailed substantial physical separation of the FieldREG units from the groups being assessed. One of these even required opera-

tion of the equipment at times other than that of the actual assembly. These radical departures from nominal protocol have precedents in large bodies of laboratory-based REG experimentation wherein the operators were physically far displaced from the machines, and in some cases directed their attention to them at times other than those of the data collection. Yet, the scale and character of these "remote" and "offtime" results bear striking similarities to those achieved under local, *realtime* conditions (Dunne & Jahn, 1992; Nelson *et al.*, 1991). Although the remote and *offtime* FieldREG data are very sparse at this point, indications of the viability of such protocols can be found, notably in the Global Event category. If substantiated by future applications, such results must have huge impact on the modeling of such phenomena by severely restricting the modalities of influence that can be posed. In particular, the roles of such objective parameters as physical distance and time would need to be diminished, while those of appropriate subjective parameters, such as attention, commitment, and emotional resonance would need to be enhanced.

D. Directions of Anomalous Deviations

We have as yet no answer to the question whether the direction of deviations relative to expectation has any meaningful implication. Our analysis explicitly ignores direction by considering only the variability (or variance) of the deviations of the segment means. Most applications show both positive and negative excursions, but there are some exceptions. The CUUPS database has a number of "Full Moon" ceremonies; among these are the four most extreme *datasets* and all four have negative deviations. The Egypt C database has a consistent negative *meanshift* across its 14 segments (mean $Z = -0.604$, standard deviation = 0.963), and the Egypt A database has a marginally significant positive *meanshift* (mean $Z = 0.449$, standard deviation = 1.497). Among the exploratory applications, the eight Invited Talks stand out, with all deviations positive. However, given the number of analyses from which these examples are selected, as well as their lack of overall consistency, these suggestive results actually may be chance fluctuations. The design of the experiment, where we specify the variance measure as our criterion for anomalous results, and the total symmetry of the FieldREG electronics to positive and negative outputs (Nelson *et al.*, 1996), may make it both impossible and inappropriate to infer meaning from the direction of deviations.

E. Alternative Segmentations

In describing the small groups we observed that there might be better ways to specify the active data segments in some cases, especially those where the group dynamics were not well represented in terms of individual presentations. Alternatives such as sessions or days might better capture the interpersonal dynamics of deep engagement and broad interaction that characterize such meetings. In the ICRL case, for example, such an alternative analysis was

done in an exploratory mode prior to the formal assessment based on participant presentations. In this preliminary analysis, the three meetings showed individual probabilities of 0.256, 0.152, and 0.031, and a combined probability of 0.046. Comparison of this with the combined probability of 0.453 for the formal analysis indicates the importance of careful, experience-based design of the experimental protocol and statistical analysis. Simply put, we are still learning how to ask appropriate questions in the FieldREG research.

F. Future Course

The empirical success of our hypothesis, limited as it may be, points to a progressively more comprehensive examination of other subjective factors that may bear on these anomalous effects. We are attempting now to extend such understanding by more detailed evaluation of the subjective qualities characterizing the original, confirmatory, and new exploratory applications described above. While it is difficult to specify such qualities with precision since they are by their nature defined in personal terms, it nevertheless is possible to list some concepts that generally seem to characterize conditions or situations in which we may expect an anomalous effect:

1. Group resonance, particularly in emotionally meaningful contexts;
2. High ratios of subjective to objective, or emotional to intellectual contents;
3. Relatively profound personal involvement, especially if shared in a group;
4. Deeply engrossing, fully interactive communication;
5. Situations or sites that are spiritually engaging;
6. Circumstances that evoke a sense of fun and humor;
7. Activities that are intensely creative, and
8. Freshness or novelty for participants.

It is important also to consider the null deviation venues, which regularly show reduced variance of segment scores. These typically do not have a global structure or a unifying theme, and possess few of the characteristics listed above. Rather, they tend to be highly analytical or designed to transmit specific, well-defined, objective information. While they may engage participants intellectually, they tend to exclude personal and emotional reactions and interactions. In fact, there is an implicit presumption that objective considerations will take precedence over subjective experience.

Ultimately, of course, it will be necessary to seek an explanatory model and theoretical structure to accommodate these results (Jahn & Dunne, 1988). An adequate model must help us to understand both the intention-driven laboratory experiments, and the field studies where little or no attention is given to the REG and there is no explicit intention. It also must address the obvious relevance of numerous subjective factors, and acknowledge the apparent insensi-

tivity of the anomalous effects to recognized physical variables, including spatial or temporal separations, or the type of random source involved.

As a very crude initiative, we postulate the existence of a pervasive "consciousness information field" that may, under certain circumstances, exhibit detectable modulations generated by individuals or groups. More specifically, it is proposed that via this field, human consciousness can act as a radiating source of information, capable of affecting otherwise random processes by inserting some degree of order and making them slightly more predictable. Since the environmental aspects that seem to correlate most strongly with such anomalous effects are subjective in character, this structuring influence, which might be labeled "subjective information," involves the attribution of meaning to situations or events. In the field experiments reported here, as in the intention-based laboratory experiments, this modification of the consciousness information field appears to manifest through alterations of statistical distributions generated by suitably prepared physical systems that have random or undetermined components. In the laboratory experiments, these alterations appear to be driven by operator intention, wishing, or purpose, and seem to be amplified by some form of emotional or spiritual resonance. In the field experiments, resonance seems to play the primary role, supplemented by some less conscious state of intention.

Although, by their nature, subjective properties are particularly difficult to specify or monitor, let alone to quantify, we are persuaded that their inclusion is essential for understanding the anomalous interactions of consciousness with its environment (Jahn & Dunne, 1997). The FieldREG experiments comprise a promising empirical vehicle for technical assessment of natural, operational situations where people are engaged in activities employing the full range of their capabilities. Among these, apparently, are heretofore undetected direct interactions of consciousness with random physical systems, that can reflect important characteristics of both.

Acknowledgments

We are grateful for the help and interest of many individuals, and for the major contributions of time to these studies by several colleagues, including Dr. Mary Kuhner, Dr. Arnold Lettieri, Dr. Elisabeth Mayer, Mr. Charles Overby, and Prof. Dieter Vaitl.

The Princeton Engineering Anomalies Research program is supported by a number of foundations and individuals, including the Institut für Grenzgebiete der Psychologie und Psychohygiene, the Lifebridge Foundation, the Ohrstrom Foundation, Mr. Richard Adams, Mr. Alexander Imich, Mr. Laurence S. Rockefeller, and Mr. Donald Webster.

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Appendix: Control Data and Theoretical Comparison Standards

The generation of appropriate control data in FieldREG experiments is necessarily complicated by the variable temporal and spatial aspects of the disparate venues. The only uniform standard of comparison for "active" data is the normal approximation to the appropriate theoretical binomial distributions. Thus, although specific comparisons against empirical controls often can be made in the course of our analyses, the summary presentation of results refers in all cases to the theoretical standard. The analytical justification for this strategy derives from three perspectives:

1. Calibration data show very good correspondence with theoretical expectations.
2. Resampled, non-active data taken in the same context with the experimental data differ little from theoretical expectation.
3. Comparisons of active data against the parameters of the resampled, non-active data yield essentially the same results as comparisons with theory.

Calibrations

All PEAR random event generators incorporate three special measures to ensure nominal performance. First, only high quality components are deployed in sophisticated hardware designs. Second, an XOR of the raw bit-stream with an alternating or balancing template eliminates secular bias of the mean. Third, the actual experimental data are sums of 200 bits, mitigating all residual short-lag autocorrelations and other potential time-series aberrations. All REG devices are subjected to extensive calibrations prior to and during their experimental applications. For the FieldREG experiments, most data are taken with a third-generation "micro-REG" designed for use with a palmtop computer. Typical calibration results are given in Table A.1, which summarizes the

Table A.1:
Standard Calibration Analysis for Typical Micro-REG Calibration Data

Source	N-Trials	Mean	Std. Dev	Skew	Kurtosis*
Theory		100.0000	7.0711	0.0000	-0.0100
Batch 1	152541	99.9984	7.0727	-0.0079	-0.0280
Batch 2	202574	99.9891	7.0858	0.0077	-0.0122
Batch 3	425036	100.0040	7.0679	0.0030	-0.0121
Batch 4	423422	99.9946	7.0724	-0.0000	-0.0200

* The expected value for kurtosis is normalized to zero for the normal distribution, and calculated as $-2/N$ where N is the number of binomial samples.

distribution parameters for four independent calibration datasets, none of which is significantly deviant in any parameter.

In addition, the standard calibration analysis includes comparisons against theoretical predictions for the frequency of counts, statistics for blocks of 100 and 1000 trials, runs between consecutive high trials, runs between consecutive low trials, the *arcsine* distribution for proportion of 50 trial runs above the mean, and autocorrelation functions for raw data and 50-trial blocks. All together, the analysis suite comprises 12 separate (though not necessarily independent) tests for each batch of calibrations. In the full battery of test scores for the data summarized in Table A.1, there are a total of 48 tests, two of which are "significant" at $p = 0.05$ or less, differing little from what would be expected by chance. The Bonferroni-adjusted p -value for the most extreme outcome of the 48 different tests also is non-significant. Thus, according to this broad spectrum of canonical calibration tests, the random event generator performance is statistically indistinguishable from theoretical expectations.

Resampling

In FieldREG applications, it is not always feasible to collect matching "control" data because many potentially important situational factors cannot be maintained. Usually the best that can be done is to take data in non-active time periods prior to or after the active data segments. For example, control data for a theater performance can be taken only before or after the performance, or between its acts, when the prevailing ambience is quite different. When it is feasible to take data in a given environment before and after the designated experimental segments, some of the surrounding time periods themselves may be subject to the same influences as the active segments. (Indeed, even in laboratory experiments there is evidence that traditional "control" data may not be immune to anomalous effects of consciousness.)

Nevertheless, our standard analysis of FieldREG data includes a resampling procedure whenever the data file contains as much or more data in non-active segments as in those defined as active for the application. A pseudorandom process is used to identify and extract segments matching in number and size those designated as active data from the surrounding undesigned data. This resampling process is repeated 1000 times, allowing the construction of a distribution of outcomes against which the results for the pre-defined, active experimental segments may be compared.

To provide a specific example, we show the outcome of the protocol-based resampling analysis followed by that for an arbitrary resampling of the same data, using a dataset from a strongly deviant portion of the Egypt database (cf. Table 2a, "Egypt A"). Table A.2 shows the original output from the analysis program with data taken from the file for October 17, which includes about 2.5 hours of active data in nine segments taken in the Mycerinus and Khufu pyramids, surrounded by several hours of non-active data. (We should note that the non-active designation is relative to the specified analysis category — the

Table A.2
Egypt, Giza2, Mycerinus and Khufu (Oct 17)
Report of Resampling Analysis

Found field.dat with file size 75611. Data group (chant):				
Range	Z	$p(Z)$	T	$p(T)$
14741–15881	0.3770	0.3531	0.3724	0.3548
15881–16667	1.9673	0.0246	2.0209	0.0216
41466–41973	0.0377	0.4850	0.0358	0.4857
41979–43464	1.9414	0.0261	2.0306	0.0211
43464–44479	2.6589	0.0039	2.6861	0.0036
44483–45230	–1.3453	0.0893	–1.3554	0.0876
45230–46112	–2.1333	0.0164	–2.1601	0.0154
46679–48913	–0.4279	0.3344	–0.4272	0.3346
48913–52798	–0.6103	0.2708	–0.6014	0.2738
Active data 12681 of 75611 (0.1677)				

Bonferroni-adjusted p -value of greatest deviation: 0.0683766

9 df, $\chi(Z) = 21.769$ (0.0096), $\chi(T) = 22.610$ (0.0071)

Performed 1000 resamplings for group (chant).

Distribution of Z-scores: $M = -0.155244$, $SD = 0.965097$

Maximum χ^2 is 24.5014

A total of 2 out of 1000 resamples exceed the test value.

Average resampled χ^2 :

8.59869 \pm 3.55155 on 9 df

Resampling-Corrected $\chi(Z)$: 22.785 on 9 df, $p = 0.0067$

day's recording may include active segments from other analysis categories. This increases the conservatism of the analysis in proportion to the extent that deviant data are included by chance in the comparison distribution.)

Table A.3 shows a "calibration" analysis for this same database. In this case, a set of arbitrary offsets was defined by taking segments of 1000 trials spaced at 10000-trial intervals instead of using the segment definitions of the actual field application.

In both cases, the χ^2 , noted as $\chi(Z)$, is associated with a probability that is similar to the proportion of the 1000 resamples that exceed the test value. A Resampling-Corrected $\chi(Z)$ based on the parameters of the distribution of Z-scores differs little from the theoretically based value, and the average resampled χ^2 does not differ from its expectation or degrees of freedom. Thus, in this example where a large composite anomalous deviation is found in the active data, both the original, experiment-based resampling and an arbitrary calibration resampling yield results consonant with theoretical expectation.

Combining the calibration and resampling perspectives, the same sort of calibration resampling as was done for Table A.3 was performed on all the Egypt datasets. There are ten of these, with amounts of data varying from about 60000 to 190000 trials. The resampling was based on arbitrary

Table A.3
 Arbitrary "Calibration" from Egypt, Giza2 (Oct 17)
 Report of Resampling Analysis

Found field.dat with file size 75611. Data group (arbcsl):				
Range	Z	$p(Z)$	T	$p(T)$
10000 – 11000	–0.7916	0.2143	–0.7909	0.2145
20000 – 21000	0.2012	0.4203	0.1968	0.4220
30000 – 31000	1.4445	0.0743	1.3954	0.0815
40000 – 41000	–0.7155	0.2371	–0.7102	0.2388
50000 – 51000	–0.5545	0.2896	–0.5430	0.2936
60000 – 61000	–0.6842	0.2469	–0.6846	0.2468
70000 – 71000	–0.7737	0.2196	–0.7682	0.2212
Active data 7000 of 75611 (0.0926)				
Bonferroni-adjusted p-value of greatest deviation: 0.675705				
7 df, $\chi(Z) = 4.640$ (0.7038), $\chi(T) = 4.469$ (0.7244)				
Performed 1000 resamplings for group (arbcsl). Distribution of Z-scores: $M = -0.00127839$, $SD = 1.07619$ Maximum χ^2 is 28.1562 A total of 815 out of 1000 resamples exceed the test value. Average resampled chisquare: 8.10615 \pm 3.88071 on 7 df Resampling-Corrected $\chi(Z)$: 4.007 on 7 df, $p = 0.7790$				

specification of 1000-trial (15-minute) segments at 10000-trial intervals. Only one of the 10 datasets showed a significant χ^2 , at $p = 0.031$ (Bonferroni-adjusted $p = 0.31$), despite that the random placement certainly often would have included by chance parts of the active data segments. The composite χ^2 for all these

resampled data from the Egypt application is 85.012, with 81 degrees of freedom and an associated probability of 0.359. Thus, again, the data indicate a well-behaved random source when arbitrarily sampled; only when those data segments specified by the FieldREG protocol are considered does the data sequence exhibit anomalous deviations.

These examples demonstrate the complex structure of the FieldREG databases and illustrate the issues associated with adequate controls. The calibration and resampling results shown here clearly indicate that comparison of FieldREG data against theoretical standards is appropriate.

Biological Effects of Very Low Frequency (VLF) Atmospherics in Humans: A Review

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Abstract — The living organism is constantly affected by natural electromagnetic influences covering a wide range of frequencies and amplitudes. One of these influences, with frequencies in the very low frequency (VLF) range, (1-100 kHz) is represented by a phenomenon called VLF-atmospherics or VLF-sferics. Sferics are very short, weak, and dampened electromagnetic impulses generated by atmospheric discharges (lightning). Due to this fact, they can be used to study the characteristics of lightning, as well as the lower ionosphere. Besides their significance as indicators of thunderstorm activity, it has been hypothesized that sferics are able to affect the functioning of living organisms and physico-chemical systems. More specifically, this atmospheric parameter has been considered a possible trigger for changes in the somatic and emotional well-being of humans, sometimes referred to as weather sensitivity symptoms or meteoropathy. The following review attempts to summarize present knowledge of biological significance of VLF-sferics in humans.

Keywords: sferics — pulsed electromagnetic signals — biological effects

1. What are VLF-Sferics?

The living organism is constantly affected by natural electromagnetic influences covering a wide range of frequencies and amplitudes. One of these influences with frequencies in the very low frequency (VLF) range (1-100 kHz) is represented by a phenomenon called VLF-atmospherics or VLF-sferics. Sferics are electromagnetic impulses that are emitted during thunderstorms. Generated by lightning discharges, they propagate with approximately the speed of light through the atmospheric waveguide which is formed by the earth's surface and the lower ionosphere. During their propagation, sferics undergo pronounced changes with regard to their amplitude and frequency composition, due to dispersion and dampening effects. With increasing distance from their place of origin, both the higher and the lower frequency components decrease. Since the atmospheric waveguide functions similar to that of a band pass filter for frequencies around 10 kHz, this component undergoes minimal attenuation during the signal's propagation. For distances beyond 1000 km, mainly frequencies around 10 kHz can be observed (Betz, et al., 1996).

Atmospherics are characterized by very low amplitudes and short durations. Their electric and their magnetic field strength does not exceed values of a few volts per meter and some microTesla, respectively (Reiter, 1995). Common signal intensities are in the nanoTesla range. The duration of a VLF-sferics impulse is on average 0.5 ms (Betz *et al.*, 1996). The signal features such as amplitude, frequency composition, waveform and duration primarily depend upon the kind of discharge, the distance between source and detector, and the conditions of transmission within the atmosphere.

Due to their origin in atmospheric discharges, sferics can be used for detection of lightning and localization of thunderstorm areas. The number of recorded impulses per time unit is an indicator of thunderstorm activity, which shows typical daily as well as seasonal variations. The highest pulse frequencies in mid-European countries can be registered during summer afternoons. A second peak occurs around midnight, which is present for most of the year (see Figure 1).

2. Biological Effects of VLF-Sferics in Humans

Besides their significance as indicators of thunderstorm activity, biological effects of VLF-atmospherics in humans have been reported. In general, these studies were characterized by two different approaches. The majority of studies was based on a descriptive-correlational approach, where attributes of the natural sferics activity were correlated with physiological parameters, indices of somatic and emotional well-being or behavioral measures. Here, sferics ac-

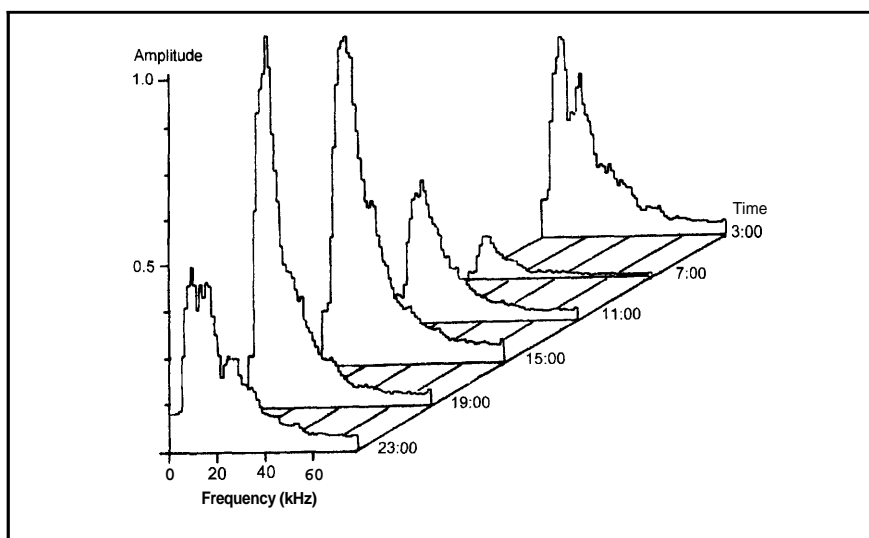


Fig. 1. Time dynamics of natural sferics activity for a day. Amplitude spectra of single sferics signals were combined for a duration of four hours each. The spectral maximum of the single spectra was standardized to 1.

tivity was usually described by impulse rates (number of sferics per time unit), which were registered within different frequency bands and intensity ranges. Only rarely were simulation studies performed in order to investigate sferics effects on humans under controlled experimental conditions.

2.1 Correlational Studies

One of the first observations of an association between biological processes in humans and natural sferics activity was mentioned by Dorno (1934), who described the case of Major Holtzei. The Major suffered from tinnitus after having been wounded in the First World War. In order to identify the triggers for his unbearable ear noises, he started to record the intensity of his symptoms every day, which showed a noticeable covariation with the impulse rate of sferics.

It was Reiter (1960) who did the first specific investigations concerning the biological effects of atmospherics in humans. Between 1948 and 1954 he assessed variations in pain perception within various patient groups over periods of several months. At the same time he registered sferics rates within two frequency bands (4-12 kHz and 10-50 kHz) and correlated both the atmospheric and biological parameters with one another. By using this method, he found significantly positive correlations between the impulse rate of atmospherics and the pain intensity reported by patients suffering from brain injuries, damaged tissue (operation wounds, scars), or internal illnesses (asthma, angina pectoris, migraine). Besides that, he observed higher rates of criminal offenses, suicides, car accidents, and prolonged reaction times during enhanced natural sferics activity (Reiter, 1950; 1951; 1960).

Investigations by Ruhenstroth-Bauer et al. (1984; 1985; 1987) revealed connections between different pathological symptoms and the impulse rate of VLF-atmospherics. This research group used a registration method developed by Baumer and Eichmeier (1980), who describe atmospherics as having clearly separated spectral maxima at 6, 8, 10, 12, and 28 kHz. The impulse rates at these frequencies were associated with the occurrence of epileptic seizures, sudden deafness, and myocardial infarctions. In the group of patients suffering from epilepsy ($n = 6$), who had been monitored over a period of 7 months, the onset of seizures was positively correlated ($r_s = .30$) with the 28 kHz sferics rate and negatively correlated ($r_s = -.20$) with the 10 kHz rate (Ruhenstroth-Bauer et al., 1984). In instances of sudden deafness, which had been analyzed for a sample of 203 patients over a period of one year, an elevated incidence of the illness showed up for a specific day, when the impulse rate in the 8 kHz range was low, and the 12 kHz sferics rate of the day before had been high. The correlation with this combined sferics measure was $R = .23$ (Ruhenstroth-Bauer et al., 1987). Furthermore, a positive association ($r = .15$) between the number of patients admitted to hospitals because of myocardial infarctions and sferics activity in the 28 kHz band was observed by studying 162 clinic admissions due to this diagnosis (Ruhenstroth-Bauer et al., 1985). A connection

between atmospherics and the occurrence of heart attacks had been noticed before by Brezowsky and Rantscht-Froemsdorff (1966), and by Klein (1968). However, in these studies low impulse rates (amplitude ≥ 0.02 V/m) were coupled with an enhanced incidence of myocardial infarctions.

An investigation by Sulman, Levy and Lunkan (1976) showed that during enhanced sferics rates in the 10 kHz range subjects experienced symptoms such as migraine, sleep disorders or tension more often. Pelz and Swantes (1986) collected daily pain reports from patients with amputated legs ($n = 178$) over a period of four years and put them into relation with the 5 kHz-sferics activity (amplitude $> 14 \mu\text{V}/[\text{Hz} \times \text{m}]$). Both parameters were positively associated with each other ($r = .68$). In addition, the number of thunderstorms registered within the residential areas of the patients was also correlated with the number of phantom limb complaints ($r = .47$). A relationship between VLF-atmospherics and pain symptoms had also been detected by Ludwig (1973). Here, patients suffering from rheumatism indicated feeling more pain during nights which had been characterized by a marked increase in sferics activity (amplitude ≥ 0.02 V/m). Finally, Laaber (1987) observed that pupils ($n = 23$) made more mistakes on a concentration task when sferics rates in the 10 kHz range had increased on the night before the test ($r = .35$).

Negative results were obtained in the studies by Ungeheuer (1952), Ließ (1959), and Harlfinger (1991). Stimulated by the work of Reiter (1950), Ließ (1959) had analyzed the relationship between the somatic and psychical condition of hospitalized patients ($n = 30$) and the sferics activity in the range between 3 and 50 kHz. None of the three analyzed symptom groups (cardiac/circulatory, scar/fracture and psychical complaints) was connected to the atmospherics rate, which had been recorded daily over a period of 6 months. In the same vein, Ungeheuer (1952) observed no increase of pathological incidences in 64 Bavarian clinics during a night (2.7. – 3.7. 1952) with markedly enhanced sferics activity in the 28 kHz band. Finally, Harlfinger (1991) monitored 8 subjects over a period of 4 weeks. On a daily basis, the beta-endorphin concentration in the venous blood as well as natural sferics rates (< 100 kHz) had been determined and put into relation with each other. No correlation could be revealed.

Looking at the amount of data gathered in these correlational studies, the predominance of positive results seems to support the assumption that sferics are biologically effective. However, correlational studies cannot detect causal connections and the possibility that other environmental parameters associated with sferics activity are responsible for the observed biological changes cannot be excluded.

Besides that, another problem present through the whole history of sferics research relates to the registration and analysis methods used to assess atmospherics. The applied signal descriptors are heterogeneous between different research groups and vary with regard to the applied amplitude and frequency ranges. Therefore, results are difficult to compare. Furthermore, critics of the

Baumer-Eichmeier-System (Baumer & Eichmeier, 1980) interpret the distinct sferics frequency maxima reported by the authors as artifacts due to errors within the analysis method. Thus, the dominating sferics frequencies which were found by Baumer and colleagues only partially reflect the natural sferics characteristics. Consequently, the outcomes of their biological studies, which make up a big part of recent sferics research concerning humans, have to be viewed with skepticism (for details concerning this problem see König *et al.*, 1990).

2.2 Sferics Simulation Studies

In order to detect biological effects of sferics, simulation studies have to be conducted where the signals can be presented under controlled experimental conditions. A first attempt to demonstrate such an effect in humans was executed by Ludwig and Mecke (1968). In their pilot study, the authors exposed subjects to various "sferics programs" characterized by different electric and magnetic field amplitudes (1 V/m, 10 mV/m; 26.5 μ A/m, 2.65 mA/m). The square impulses with frequencies of 10 and 100 kHz were presented with pulse repetition frequencies of 2.5, 5, 10 or 20 Hz. The simulation provoked complaints of dizziness in some of the subjects who had been diagnosed as "labile vagotonics," which implies an overresponsivity of the parasympathetic nervous system.

Ranscht-Froemsdorff and Rink (1972) investigated the influence of sferics on blood coagulation. Within a shielded climate chamber, subjects were exposed for several weeks to either a narrow banded 10 kHz-impulse with an amplitude of 10 mV/m and a repetition frequency varying between 3 and 10 Hz, or to a broad-banded (10-100 kHz) signal with an amplitude of 100 mV/m and an impulse rate ranging between 30 and 100 Hz. Both sferics programs aiming at simulating "good" and "bad" weather provoked a slowing in blood coagulation when the room temperature was between 17-22°C.

Jacobi *et al.* (1981) also demonstrated an effect of VLF-sferics on blood composition. After a 3 hour-exposure to a 10 kHz-sferics impulse with an amplitude of 0.4 V/m, which was repeated with a frequency of 10 Hz, the platelet adhesiveness significantly increased. This response was most pronounced in anxious and depressed subjects, who had attained high scores on the psychasthenia scale of the MMPI (Minnesota Multiphasic Personality Inventory; Hathaway & McKinley, 1963).

Electrocortical effects were observed in a pilot study executed by Tirsch *et al.* (1994). The application of 10 kHz sferics with a magnetic field strength of 50 nT for only ten minutes led to a peak frequency shift within the EEG alpha band (8-13 Hz) in occipital regions by increasing the power of faster oscillations within this frequency range.

Similar to the correlational studies, the simulation experiments were also affected by different methodological problems. The artificially produced sferics signals varied greatly with regard to their amplitude and stimulus shape. Often

square or sinusoidal impulses were used which are very different from the shape of natural sferics (see Figure 2). For the majority of experiments, only electric fields were applied, which cannot be considered to accurately represent the natural environment in which sferics are experienced, as most people spend the majority of time indoors, where the electrical component cannot penetrate. Therefore, it seems more likely that the magnetic field of atmospherics is biologically effective, which has hardly been studied.

Therefore, our research group conducted a series of experiments to examine whether the magnetic component of a sferics impulse is able to affect the human organism (Schienle *et al.*, 1996; Schienle *et al.*, 1997; Schienle *et al.*, 1998). For the simulation, a 10 kHz sferics signal with a duration of 500 μ s was chosen (see Figure 2) and applied with a newly constructed atmospherics impulse generator with which previously recorded natural sferics can be precisely reproduced (Kulzer, 1994). The magnetic component of the applied signal had an amplitude of 50 nT (peak value), which is typical for a thunderstorm in close vicinity (< 100 km). The stimulus was applied with a pulse repetition frequency varying randomly between 7 and 20 Hz, representing intense thunderstorm activity. The electrical component of the sferics impulse was shielded, and therefore had no effect on the subjects.

As a dependent physiological variable to examine the biological effectiveness of VLF-atmospherics, the EEG was selected because in other investigations sferics activity had been associated with changes in complex behavior (Laaber, 1987), pain perception (Ludwig, 1973; Pelz & Swantes, 1986; Reiter, 1960), and the arousal level of organisms (Ludwig & Mecke, 1968), which would indicate that this signal possibly acts upon the central nervous system,

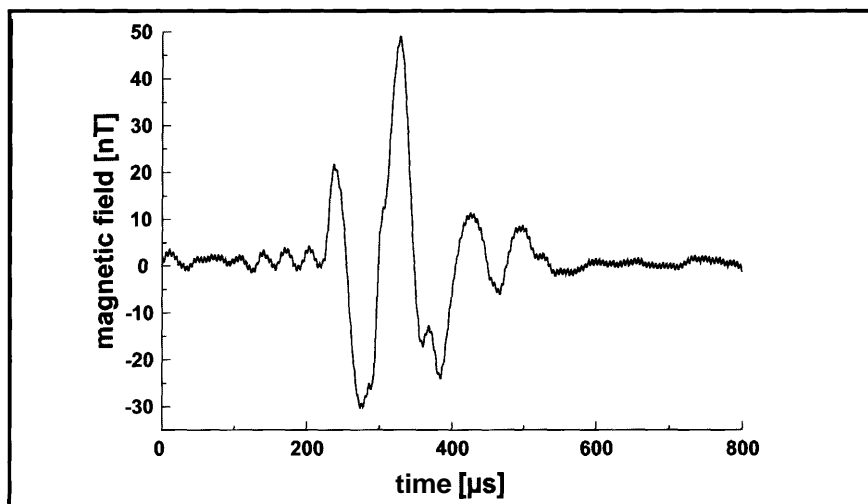


Fig. 2. Simulated 10 kHz-sferics impulse with a duration of 500 μ s and a magnetic flux density of 50 nT (peak value).

on cortical or subcortical structures. Furthermore, brain electrical processes had been influenced by the application of 10 kHz sferics impulses as in the study by Tirsch *et al.* (1994).

In our first study (Schienle *et al.*, 1996), 52 subjects were exposed to the described 10 kHz-sferics signal for 10 minutes. Their electrocortical background activity within this time interval **was** compared to a 10-minute control period without sferics simulation. This was done at six electrode sites in right and left frontal, parietal and occipital regions (F3/F4; P3/P4; O1/O2). The exposure provoked a significant decrease in EEG alpha power (8-13 Hz) in parietal and occipital regions compared with the control condition. However, response differences were found between subjects who underwent the sferics condition first in comparison to subjects who had started the experiment with the control condition. Whereas the first group displayed a decrease in alpha power under treatment, the second group showed a tendency in the opposite direction. As a possible explanation for this sequence effect, it was hypothesized that a delayed or prolonged sferics effect could have caused the different response patterns. Assuming that after the termination of the treatment, sferics influence continued to be present in the form of a further power increase, this response would have been incorrectly interpreted as a sferics-induced power reduction.

This hypothesis was examined in a second experiment (Schienle *et al.*, 1997). Here, the EEG registration was continued after the end of exposure in order to detect possible prolonged effects. The 40 subjects participating in the experiment had been divided into two groups. The experimental group underwent a 10-minute baseline period, followed by 10 minutes of sferics stimulation, and subsequently, 20 minutes without sferics application. The control group underwent 40 minutes without sferics stimulation. As in the first experiment, groups were compared with regard to their spectral power in the different frequency bands of the EEG at six electrode sites (F3/F4; P3/P4; O1/O2).

The results showed that sferics exposure provoked increases in alpha power at all registered electrode sites with the exception of the left parietal region. Furthermore, an enhancement in beta power (14-30 Hz) was demonstrated, which was restricted to the right hemisphere. The effect was present during simulation and continued to be present until 10 minutes after the end of treatment.

In order to replicate this finding, a third experiment was conducted (Schienle *et al.*, 1998). Thirty-two women suffering from migraine attacks or tension-type headaches, who characterized themselves as weather-sensitive, underwent the same procedure as the subjects in the previous study. Half of the females were exposed to sferics, whereas the other half formed the control group. Again, the exposure provoked increases in alpha power at all electrodes (F3/F4; P3/P4; O1/O2) as well as enhancements in beta power, which were restricted to parietal and occipital regions. Once more, a prolonged sferics effect could be identified. Subjects of the experimental group were still on an increased alpha power level at parietal regions 20 minutes after the end of

exposure. However, the stimulation did not induce headache symptoms, which is in line with previous results (Schienle *et al.*, 1996), demonstrating that the short-term sferics exposure was not consciously perceivable or able to elicit changes in the emotional and somatic well-being of the subjects.

2.3 Individual Differences in Sferics Responsivity

In addition to the concern within sferics research to describe biological effects induced by this stimulus, a further approach aimed at demonstrating individual differences in sferics responsivity. This differential approach was based on the hypothesis that certain constitutional factors are connected with an increased or decreased sensitivity towards sferics and therefore can act as mediators of sferics effectiveness. A concept often referred to in this context but hardly investigated is weather sensitivity. It is defined as the enhanced reactivity toward variations in atmospheric parameters such as humidity, pressure, temperature, *etc.* (Pschyrembel, 1990). Common symptoms are fatigue, negative mood, decreased work motivation and headaches. The high prevalence of weather sensitivity, which has been estimated at 30 per cent in mid-European countries (Faust, 1973), underlines the importance of studying the still unknown origin of this syndrome.

It was Reiter (1960) who hypothesized that the organisms' sensitivity to sferics could be the basis for weather sensitivity. He had observed that different patient groups displayed pain symptoms one or two days *before* an upcoming weather change when there were no visible signs for this change but sferics activity had already increased. In accordance with this hypothesis are the observations by Sulman *et al.* (1976), who noticed an increased occurrence of weather sensitivity symptoms during enhanced sferics activity in the 10 kHz band (unfortunately no statistical analyses are reported). Besides that, a further indication for a differential sferics effectiveness can be deduced from the results of Jacobi *et al.* (1981), and Ludwig and Mecke (1968), who discovered that subjects responded more strongly to the simulation of sferics-similar signals when they were emotionally or vegetatively labile.

Since these results are not sufficient to judge the significance of the weather sensitivity concept for sferics reactivity, this aspect was also covered within our series of experiments. In all studies, subjects filled in a weather symptom list (WSL). This measure was formed by data reported by Faust (1973), who had asked 778 adults for common emotional and somatic weather reactivity symptoms. The most frequently named 25 complaints were included in the WSL.

It could be shown (Schienle *et al.*, 1997), that subjects' electrocortical response towards sferics was dependent upon their degree of weather sensitivity. High scorers on the WSL displayed an alpha power increase that exceeded the stimulation period by 20 minutes until the end of registration, whereas low scorers displayed only minor power changes throughout the experiment (Figure 3). This process was most pronounced in a specific sub-band of the alpha

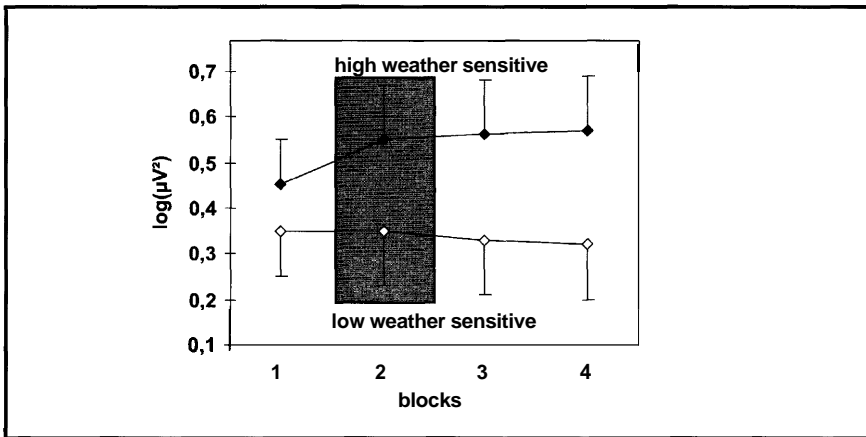


Fig. 3. Means and standard errors for log-transformed alpha power (11-13 Hz) in the four 10-minute blocks of the experiment comparing high and low scorers on the weather sensitivity questionnaire (upper and lower third) at electrode 02 (note: the gray block indicates sferics exposure).

band with frequencies between 11 and 13 Hz. Similar sferics-induced changes in alpha power were displayed by subjects with a high degree of neuroticism and somatic complaints. These traits showed highly positive correlations ($r \approx .70$) with the weather sensitivity dimension.

Comparable responses to the sferics simulation were displayed by women suffering from migraine attacks and tension-type headaches, who had characterized themselves as being weather sensitive (Schienle *et al.*, 1998). This group which reported that specific weather conditions (*e.g.* sudden temperature changes, upcoming thunderstorms) act as triggers for their pain also showed a prolonged alpha power enhancement to the exposure, which was present in parietal regions.

3. Explanatory Approaches and Future Research

In the majority of studies analyzing the biological effectiveness of VLF-atmospherics in humans, positive results have been obtained. Although some of the investigations were not free of methodological flaws, the amount of data gathered within this area strongly supports the idea that sferics indeed can influence the human body. The repeated demonstration of electrocortical effects induced by an accurately reproduced magnetic component of a 10 kHz-sferics impulse further underlines the physiological significance of this atmospheric parameter.

Considering the extremely low amplitude and short duration of sferics impulses, the ability of this signal to evoke changes in living organisms is surprising and remarkable at the same time, as we are exposed to electromagnetic fields of much higher intensities on a daily basis, *e.g.* from technological

sources. Electric appliances and tools such as computers and TV-screens, heating blankets, or soldering irons produce magnetic field strengths of some **microTeslas** when we touch them or are in proximity. In comparison, the amplitudes of typical VLF-atmospherics are in the **nanoTesla** range and thus, only a fraction of the described technically generated fields which are considered to have no significant bioeffects (Polk & Postow, 1995).

Thus, questions are provoked as to why sferics could be biologically effective despite their low amplitude and how this influence could be transmitted to the organism. A possible explanation is provided by the concept of "biological windows," which states that organisms are characterized by different sensitivities to specific frequencies as well amplitudes within the electromagnetic spectrum. With regard to frequency windows, it could be shown that organisms are susceptible to ELF-fields or ELF-pulsed fields (1-300 Hz), especially when the signal frequencies correspond to brain wave frequencies (Postow & Swicord, 1995).

With regard to investigations on humans, it was demonstrated that these types of stimuli were able to change the electrocortical activity in a way very similar to the effects observed in the sferics simulation studies. In an experiment by von Klitzing (1993), subjects were exposed to a 150 MHz signal of low amplitude ($1 \mu\text{W}/\text{cm}^2$) which was pulsed with a frequency varying between 8 and 10 Hz. A stimulation for 15 minutes provoked an increase in EEG alpha activity. By using a 150 MHz signal with an intensity of 100 nT and a pulse frequency of 217 Hz, 10 Hz oscillations were also enhanced (von Klitzing, 1995). In both cases, the effect extended the stimulation period for some minutes. Increases in alpha activity were also observed in a study by Caccia and Castelpietra (1985), who applied a 2.2 mT field for 20 minutes. The signal repetition frequency was variable with an average at 50 Hz. Lyskov *et al.* (1993) revealed a significant increase in alpha as well as beta power by exposing subjects to an intermittent (1s on/off) sinusoidal 45 Hz signal with an amplitude of 1.26 mT for 15 minutes. A single case study by Sandyk and Derpapas (1993) showed that minimal field intensities can be sufficient to induce changes in electrocortical activity. A patient suffering from Parkinson's disease was exposed to a 7.5 **picoTesla-field** pulsed with 5 Hz. The repeated stimulation for 10 minutes led to an increase in alpha and beta power.

As these investigations illustrate, humans are able to respond to weak ELF- and ELF-pulsed magnetic fields with changes in brain electrical activity. The exposure provoked temporary alpha and beta power enhancements, a result that is in line with the observed electrocortical effects induced by VLF-sferics, which also can be viewed as ELF-pulsed signals.

But why should living organisms including humans display an increased sensitivity towards signals within the ELF-frequency range? Konig *et al.* (1981) take an evolutionary approach in their review of biological effects of environmental electromagnetism. The authors point out that organisms have been exposed to a variety of electromagnetic energies during evolution. The

period when life began to evolve on earth was characterized by severe thunderstorm activity, when atmospheric occurred in great frequency and with great intensity. Consequently, the organism may have adapted to this type of electromagnetic phenomenon as it did to other electromagnetic energies such as visible light.

An indication for such an adaptation could be seen in the existence of brain-electrical activity. As König *et al.* (1981) point out, ELF-sferics such as the 10 Hz-Schumann oscillations are phenotypically very similar to the spontaneous alpha rhythm within the EEG of humans. The authors even go further in stating that the conditions under which both signals typically occur are also alike. Schumann resonances are observed primarily during fair weather conditions, a state that corresponds to the relaxed mental state associated with the presence of alpha waves in the EEG. Although this comparison seems to be oversimplified, there are other findings which could support the idea that Schumann resonances act as internal rhythm generators. Wever (1968) exposed subjects who stayed in a shielded underground bunker for at least one week to 10 Hz square impulses with an electric field intensity of 2.5 V/m, which should resemble ELF-sferics. In comparison to a control period without stimulation, the circadian body temperature rhythm was significantly shorter under the field condition (25.1 vs. 26.4 h). Wever (1968) concluded that ELF-sferics could act as a pacemaker that stabilizes circadian physiological rhythms.

VLF-sferics on the other hand could have a different biological meaning since their occurrence is more irregular and indicates thunderstorm activity at a closer distance. An increased rate of this signal type supplies information that within the next day or within the next hours the weather will change. By taking up an evolutionary point of view again, it can be speculated that in earlier times, this information was of critical importance for survival. The recognition of sferics as a warning stimulus for storms could have made it possible to foresee, and subsequently seek shelter from dangerous weather conditions.

Following this hypothesis, sferics could have a twofold biological significance. ELF-sferics, which indicate global thunderstorm activity, have a stabilizing influence on physiological rhythms, whereas VLF-sferics provoke startle or preparatory responses. It is not clear yet if the observed electrocortical changes under the influence of VLF-sferics can be considered as such a response. However, temporary alpha power enhancements have been found to be associated with states of emotional distress (Andresen, 1993) and preparation for motor actions (Shaw, 1996).

Although the described models and approaches trying to explain the biological changes induced by sferics are plausible, they are too non-specific regarding the underlying mechanisms for such an influence. In order to obtain more information concerning this point it is interesting to look at results obtained through *in vitro* studies analyzing the bioeffects of ELF and ELF-pulsed fields. The findings of these investigations point to the cell membrane and ionic control mechanisms as interfaces for the transmission of electromagnetic signals.

Here, it was demonstrated that such fields are able to affect calcium-ion fluxes across cell membranes (*e.g.* Bawin & Adey, 1976). Again, the observed changes were most pronounced when the applied frequencies were in the EEG range (5-20 Hz).

In order to explain the induced ion movements under the influence of weak magnetic fields in the low frequency range, which cannot be traced back to thermal effects or the induction of biologically effective currents, a model such as the cyclotron resonance model (Liboff, 1985) can help us to understand the observed effects. This approach states that an ELF magnetic field can provoke an ion movement when its frequency corresponds to the resonance frequency of the ion. Under the presence of a static magnetic field with an amplitude similar to that of the geomagnetic field ($= 50 \mu\text{T}$), the resonance frequencies of physiologically important ions such as Na^+ , K^+ , Mg^{++} and Ca^{++} are in the ELF-frequency range. Since ion exchange processes through cell membranes play a crucial role for the signal transmission in the central nervous system, these observations could be also useful for the understanding of the observed electrocortical sferics effects.

Nonetheless, many questions still remain unanswered, *e.g.* the question concerning the signal components of sferics which hold the biological information. Besides the pulse repetition rate that could affect physiological processes, other signal characteristics such as waveform, amplitude, frequency, and duration of exposure are possible mediators of bioeffects. Further, models need to be developed that can explain why some subjects are more sensitive to VLF-sferics than others. Up until now, we cannot say if the prolonged alpha power increase displayed by emotionally and somatically labile individuals is a component or an initial phase leading to weather sensitivity complaints, since the stimulation did not induce immediate changes in the subjects' well-being. Nevertheless, the results imply a possible somatic basis for weather sensitivity, which should no longer be subsumed under the heading hypochondria.

In summary, the findings of biologically oriented sferics investigations imply that the human organism is more sensitive toward weak magnetic influences in the low frequency range than was previously assumed. This encourages further research within the field in order to identify the extent of inducible bioeffects as well as their underlying mechanisms.

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LETTERS TO THE EDITOR

Comments on Dean I. Radin's "Unconscious Perception of Future Emotions: An Experiment in Presentiment"

Dean Radin (1997) claims to have found evidence for what he calls presentiment (a term coined by analogy with precognition), where electrodermal activity (EDA) is observed indicating emotional arousal one to two seconds before emotion-arousing pictures are presented.

Four experiments are reported. The target pool of stimuli consisted of emotional photos scattered among calm photos, the number of calm photos being about twice the number of emotional photos.

There were three main variables: (1) How long each photo was viewed, namely three seconds in experiments 1, 3, and 4 vs. one second in experiment 2. (2) When the target photo was randomly selected, namely before the subject pressed the button in experiments 1-3 vs. after in experiment 4. (3) Minor technicalities of the procedure, namely fully computerized in experiment 4 vs. picture presentation not computerized in experiments 1-3.

In addition, the number of subjects was quite variable (8, 3, 16, and 4 in experiments 1-4), as was the mean number of trials per subject (30, 13.3, 40, and 40).

In accordance with the author's presentiment hypothesis, an orienting pre-response was observed under all experimental conditions.

In the discussion section of his article, Radin rejects six alternative interpretations of his results. His reasoning regarding the first five (pp. 175-177) I agree with, but his grounds for rejecting the sixth (p. 177) seem unconvincing. The interpretation he rejects is as follows:

One might object, Radin says, that the effect can be due to anticipatory effects because "the participants' arousal levels [might have been] progressively increased on each successive trial until an extreme target occurred, then it... [might have been] reset to a baseline level."

Such an anticipatory strategy, Radin says, would create slightly higher arousal levels for emotional pictures as compared with calm pictures. Radin simulated the presence of this strategy by applying a Monte Carlo method "where a simulated participant used an optimal anticipatory strategy to raise arousal levels uniformly on each successive calm trial until an extreme [= emotional] trial occurred." The differences in average arousal levels were "far too small to account for the observed physiological effects."

Thus the differences were apparently in the doubt rejecting direction. But were they really "too small?" By which criterion could we safely conclude that an interpretation in terms of "strategy" does not hold?

In addition, the simulated strategy of uniformly raising arousal levels might not mirror the real process. The "anticipatory" reactions observed by Radin might be due less to strategies implying some conscious activity but more to classical conditioning, possibly without the subject's awareness. In that case arousal would show a gradual increase across a sequence of calm trials. Consider the 1:2 difference in the frequency of emotional *vs.* calm picture presentations. This might have played the role of unconditioned stimuli comparable to the role of the bell in Pavlov's famous experiments on dogs' salivation.

The conditioning process in Radin's setting might, if present, be too complicated to generate a transparent model; nevertheless it deserves investigation. One of Radin's own findings seems to already point in that direction: The anticipatory reaction was apparently much smaller with fewer trials (experiment 2 in his Figure 6) than with many trials (experiment 1 in Figure 4), even though the duration of picture presentation was shorter (one second *vs.* three seconds), which should have increased, not decreased, the anticipatory reaction. The latter expectation is Bierman & Radin's (1977), who, according to Radin, found stronger anticipatory effects for shorter display times.

The classical conditioning hypothesis might be tested straightforwardly using existing data. If Radin's anticipatory effect is due to precognition/presentiment, then it would be present already during the first few trials. But if the effect is due to classical conditioning it would gradually emerge across repeated trials as a learned response. Radin's EDA data can easily be divided into, say, three consecutive periods of measurement (beginning, middle, end). A presentiment interpretation of his finding would gain strong support if the differences between emotional and calm EDA before stimulus presentation were already present at the beginning, and if they did not increase in subsequent testing periods. On the other hand, the presentiment interpretation would have to be abandoned if a learning effect is discovered.

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Response to Ertel

I thank Prof. Ertel for his comments about possible artifacts that might produce an apparent presentiment effect. Prof. Bierman and I have explored this effect in several new ways. One way, studied by Prof. Bierman, was to run an experiment that had only one, unexpected display of an emotional target within a larger sequence of calm targets. This study showed the presentiment effect only for the one emotional target.

Another approach that I took was to study the average autonomic arousal levels for sequences of stimuli such as <calm, calm, calm, calm, emotional, calm> to see if arousal levels progressively increased up to the emotional stimulus, and then decreased. This did not occur. Arousal levels are roughly equal prior to the calm stimuli, and only increase immediately before the emotional stimulus. In a third approach, I've partitioned the emotional targets according to arousal levels assigned by independent judges to create a "high-contrast" subset of targets. If subjects are actually responding to the degree of emotionality of the future stimuli, as the presentiment hypothesis would predict, then this high-contrast subset ought to produce a larger presentiment effect, and it does. Finally, both Prof. Bierman and I have seen the presentiment effect decline with repeated trials in a single session, not increase, which counters the statistical learning hypothesis. The decline we see is probably due to participants' accommodation to the task, or to boredom or fatigue. In sum, the presentiment hypothesis still appears to be a fairly robust precognitive indicator of an individual's future emotional state, as reflected by their level of autonomic arousal.

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Comments on Michael D. Swords' "A Different View of 'Roswell — Anatomy of a Myth'"

Michael Swords makes two claims (Swords, 1998) concerning the Army Air Force and UFOs in the summer of 1947 that would seem to be incorrect.

1. Concerning Air Materiel Commander General Nathan F. Twining's Sept. 23, 1947 letter regarding flying saucers, Swords states "The letter was written for Twining by Wright Paterson's Director of T-2, Col. Howard (Mack) McCoy." (The base did not actually become WPAFB until January 1948.) He provides no evidence to substantiate this claim while, indeed, there is evidence that it is not true. At the bottom of a copy of the memo found in the National Archives during the 1980s, is the following handwritten note. "This letter was coordinated by Col. Moore, Ch. Aircraft Lab; Mr. D. A. Dicky, Ch. Propeller Lab; Gen. D. L. Putt, Engr. Div; Col. Minty, Ch. Power Plant Lab; General Brentnall, T-3." There is no mention of McCoy. Pretty high-powered group with two generals and two colonels, (Ch. Means Chief).

2. Swords claims, with no basis being given, "Very early in the summer of the 1947 UFO wave, Wright Patterson AFB was not particularly involved, but became more and more so as the summer wore on and turned to September"... It must be noted that many evening newspapers of July 8, 1947 (*Roswell Daily Record*, *Sacramento Bee*, etc.) carried portions of a telephone interview that the Portland *Oregonian* did with General Twining who was reached at Kirtland

Air Force Base in Albuquerque, New Mexico. He stated "Neither the AAF nor any other component of the armed forces had any plane, guided missile, or other aerial device under aircraft development which could possibly be mistaken for a saucer or formation of flying discs..." "Some of these witnesses evidently saw something, but we do not know what. We are investigating." Clearly Twining had already been tasked to determine whether there was any developmental aircraft that could explain the sightings of flying saucers or flying discs being made all over the USA. Presumably the "we" is AMC, his organization at Wright Field. The quote is on p. 44 of *TOP SECRET/MAJIC* (Friedman, 1996).

While the *Oregonian* was one of the first papers to carry the Kenneth Arnold story, they had to have been referred to Twining at his temporary New Mexico location by somebody at the Pentagon or Wright Field. Twining's, flight log (which I found in a box of Twining's papers that had been declassified for me) and that of his pilot, William McVey, prove that Twining went to New Mexico on July 7th and left on July 11th, having made appearances at White Sands Missile Range, Alamogordo Army Air Field, Kirtland and Sandia. It was Twining's people of the AMC Watson Labs at AAAF who staged the July 9th launch of a radar reflector and weather balloon combination for the press, to dismiss the Roswell and other flying disc stories as a follow up to General Ramey's explanation in Fort Worth on July 8th. The headline of the July 10th front page story with three photos was "Fantasy of Flying Disc Explained Here." He also made what was referred to as a "Routine" Inspection of the Facility on July 11th (see *Alamogordo News*, July 14th). Accompanying Twining were several high-powered Air Force people including General Brentnall. If it had been a routine inspection, there would have been pictures taken. There were no pictures.

It should further be noted that Wright Field was the place to which tons of German Technical papers about all aspects of their WW 2 rocket and aeronautics research and development had been sent. Their focus was technology. Twining had been on NACA. Obviously, engineers familiar with advanced technology would be required to try to analyze data obtained from eyewitnesses as opposed to Intelligence types at the Pentagon.

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Response to Friedman

Regarding Stanton Friedman's two points: 1) "Who wrote General Twining's letter of Sept. 23, 1947." I am afraid that Stanton is wrong about that, Colonel McCoy did write the letter. The way that you can tell this is to look in the upper right-hand corner where the office and author of the letter is indicated (in this case: TSDIN/ HMM: Director of Intelligence of T2/ Howard M. McCoy). I have no idea why Friedman cares who wrote this letter for Twining, as he can generate his speculations about Roswell and MJ12 either way.

2) "How early was Wright-Patterson's complex involved?" Well who knows? My view is that they were not much involved "very early" in the wave. I meant what the words said: very early (June 24-July 4 or thereabouts). At the earliest portions of the wave, it was the Pentagon (George Garrett, George Schulgen, et al.) who were primarily concerned, then they began (apparently) to call in the Dayton complex for technical advice. By mid-July, the Pentagon seemed to be communicating regularly to the base. By the end of August, it had been decided to shift the UFO focus from Garrett's Pentagon office to McCoy's operation. Friedman seems desirous of a very early date of Wright-Patterson involvement to buttress his opinions about Roswell and MJ-12. I do not see how my commentary affects his view either way. My historical analysis is based upon the available known legitimate documents, and I have deliberately left both Roswell and the alleged MJ-12 analysis organization out of the solid historical mix. Those two issues will hopefully solve themselves as time goes on, and I would be happy with positive verdicts on both.

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Comments on James Houran and Stephen Porter's "Statement Validity Analysis of 'The Jim Ragsdale Story'"

In their recent article "Statement Validity Analysis of 'The Jim Ragsdale Story,'" Houran and Porter (*Journal of Scientific Exploration*, 12, 1, 1998) use Statement Validity Analysis to investigate the credibility of Ragsdale's testimony about the Roswell UFO crash. We applaud the authors for their use of innovative techniques of screening witness accounts when direct corroborative

testimony is lacking. Nevertheless, we are concerned that the authors analyzed two accounts by Ragsdale that are *prima facie* likely to be deliberate hoaxes motivated by financial gain. What's more, the original affidavit and statements by Ragsdale, more restrained and consistent with other testimony, are ignored by Houran and Porter with no explanation.

As briefly noted (p. 65), Ragsdale gave his first statement (actually several interviews) to Randle and Schmitt (Randle & Schmitt, 1994; Randle, 1997). The first full interview with Ragsdale was conducted on January 26, 1993, by Schmitt. Given Ragsdale's poor health, it was immediately decided that it was important to get the barest details in an affidavit that Ragsdale could sign. Information in the interview was used by Mark Chesney, a Center for UFO Studies investigator working with Randle and Schmitt, to prepare a very abbreviated account, and Max Littell, from the International UFO Museum in Roswell, typed the affidavit. The next day Ragsdale signed this original affidavit. The affidavit from more than two years later used by Houran and Porter is simply not the *original* affidavit completed by Ragsdale (nor, it appears, was it signed in front of a notary; see Randle, 1997 for details).

Although it is not obvious from this January, 1993, affidavit, Ragsdale's interview at the time made it clear that he placed the crash site slightly northwest of Roswell, in a location that is corroborated by other witness testimony (see Randle & Schmitt, 1994). Ragsdale did not place the crash site in the Pine Lodge area, as stated in the two accounts used by Houran and Porter. This is only one of the key differences between the original and subsequent statements.

Why would Ragsdale's testimony change so dramatically? Why would he add so many details to his second account? There are two main possibilities, as outlined by Houran and Porter (p. 66): "the story represents either a deliberate fabrication or false memories of imagined experience." The authors suggest that direct evidence is lacking for either hypothesis, but there is crucial evidence available that argues strongly for the first possibility.

As outlined by Randle (1997), sometime in 1994 Ragsdale developed a close working relationship with Max Littell, who is on the board of directors of the International UFO Museum in Roswell. The museum has become a tourist mecca in New Mexico in the past few years. A letter dated September 10, 1994, from Littell, on behalf of the museum, to Ragsdale, states that "The Museum will prepare the information [the Ragsdale account analyzed by Houran and Porter] and will dispense (sic) the same in various ways. From this date, any net proceeds realized by the museum will be divided with you, for your lifetime, on the basis of 25% of any gross amounts to Jim Ragsdale, and 75% to the Museum."

Money did eventually change hands. In a recent interview with Vennie Scott, the former wife of Ragsdale, one of us (Randle) was told that she had directly seen one check of \$8,000 to Ragsdale from the museum, and that she knew of another check for about \$35,000.

When witness stories change significantly, and money has been paid for this "testimony," common sense and experience dictate that the altered story should be viewed with great suspicion. This is especially true because no corroborating evidence exists to support Ragsdale's altered account, but some evidence does support the first Ragsdale version. (For example, one of us [Rodeghier] was told in June 1993 by Ragsdale's son [also named James] that his father had been telling the basic story outlined in the January 1993 affidavit to the family for at least 20 years.)

In summary, while we cannot comment on Statement Validity Analysis, we are not surprised that the later Ragsdale accounts were found to be untrue when analyzed with this technique, since there is strong evidence that they are a hoax done for money. The truth of Ragsdale's original testimony still remains an open question.

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Response to Rodeghier and Randle

The two main goals for writing our article were: [1] to publicize Statement Validity Analysis (SVA) as a useful technique to the field at large, and [2] to put on record that SVA showed the Jim Ragsdale affidavit and conversational account that we analyzed to be not credible. Rodeghier and Randle agree with these two main conclusions, and we thank them for writing. If the material we used was demonstrably fraudulent, then our analyses validate SVA for evaluating reports of anomalous experience. But Rodeghier and Randle's charge of a deliberate hoax motivated by financial gain is questionable, because their "crucial evidence" is ambiguous, largely anecdotal (*i.e.*, hearsay), and internally inconsistent.

We clearly mentioned in our article the possibility of financial motivations and its relation to the hypothesis of deliberate fraud (p. 65), but personally we would not publicly accuse anyone of fraud and risk slander without *definitive* evidence. Moreover, the circumstances and significance of the original affidavit they mentioned, their accusations of fraud and financial gain, and the version of the Roswell events as published in Randle and Schmitt (1994) are

not universally agreed upon by experts in the field who have both an extensive knowledge of the Roswell Incident and the Ragsdale case. In particular, one of us [Houran] has maintained written and telephone correspondence with Max Littell of the International UFO Museum and Research Center (IUFOMRC) in Roswell, New Mexico. He is also the man behind Ragsdale Productions, Inc. In a letter to Houran dated April 20, 1998, Littell addressed concerns we voiced in our article about the credibility of the "Jim Ragsdale Story."

After receiving a copy of Rodeghier and Randle's letter, we contacted Littell again so he could answer their specific charges as well. Littell faxed a letter to Houran, dated July 18, 1998, in which he categorically refutes the arguments of fraud and financial gain put forth by Rodeghier and Randle. Copies of this correspondence were also sent to Rodeghier and Randle by Littell, and we have made copies available to the editors of the JSE. In essence, Littell affirms that Ragsdale never changed the location of the alleged crash site, but rather that Randle chose to place it in a location other than the Pine Lodge area in order to make the Ragsdale testimony consistent with his version of events presented in Randle and Schmitt (1994). Furthermore, Littell maintains that Randle and Schmitt were confronted with this information but to no effect. Littell also addressed Rodeghier and Randle's allegations that "money has been paid for this [Ragsdale's] testimony" and Littell (1998c) provided a current accounting of the Ragsdale Productions, Inc. He stated that 50% of the net from proceeds of the Ragsdale book and video will go to a trust for Ragsdale's grandchildren as "royalty" and 50% would go to the IUFOMRC. Lastly, Littell asserted that checks seen in the amounts of \$8,000 and \$35,000 are a total fabrication, perhaps related to divorce proceedings between Ragsdale and his former wife. Of course, we cannot vouch for Littell's position, but he has been very forthcoming with information not in the public domain and has repeatedly made himself available for clarification and elaboration. Likewise, we respect Randle's well-known research on Roswell and Rodeghier's status in ufology. Unfortunately, during the course of our research we have unwittingly stumbled onto this serious dispute and important questions are pointed at both Ragsdale's advocates and opponents.

Other major problems exist with Rodeghier and Randle's claims. For example, they stated that Ragsdale did not place the crash site in the Pine Lodge area. However, Randle and Schmitt (1994) reported in the beginning of their book that "It was Friday, the Fourth of July... They [Ragsdale and his female companion] had driven north from Roswell, New Mexico, using old Highway 48 (now Pine Lodge Road), turned off, and continued on the back roads until they were far from the city and civilization" (p. 3). Other statements in Randle and Schmitt (1994) seem to corroborate the Pine Lodge area as the alleged crash site, e.g. "The Roswell Fire Department... makes a run along Pine Lodge Road northwest of Roswell... among the first civilians to stumble across the impact site" (p. 197). All of the Ragsdale's sources in question identify the same general *direction* for the crash site: [1] The original affidavit stated that

"I, James Ragsdale, was in the company of a woman in an area approximately forty (40) miles northwest of Roswell, New Mexico, during a severe lightning storm;" [2] the affidavit analyzed in our article (Houran & Porter, 1998, pp. 70-71) stated that "Over the long July 4th weekend... my friend and I spent several days in the Pine Lodge area, west of Roswell;" and finally [3] the conversational account from Ragsdale (see Houran & Porter, 1998, pp.68-69) stated that "We decided to go to the perfect place near Boy Scout Mountain in a campsite where we would have solitude. We went up Pine Lodge Road and turned onto a gravel road heading toward the campsite." This aspect of Ragsdale's story was related at different times to several well-respected ufologists and lay-researchers, including Max Littell, Karl Pflock, Stanton Friedman, and William Haut. Actually, the Pine Lodge Road area identified by Ragsdale as the crash site is approximately 51 miles *northwest* of Roswell (Ragsdale Productions, 1996, p. 42), so all three sources are roughly consistent with one another but are not consistent with Rodeghier and Randle's statements.

Randle and Rodeghier also maintain that Ragsdale's "original location" for the crash site is corroborated by other witness testimony and that some evidence supports Ragsdale's first version of events. Other authorities disagree. In Ragsdale Productions (1996) Karl T. Pflock stated that "My investigation of Jim Ragsdale's story as originally reported by Roswell-Incident researchers Kevin Randle and Don Schmitt showed it to be highly suspect at best. Key "facts" did not jibe with the historical record... none of it squared with other credible testimony about what is known today as the Roswell Incident" (p. 29). In the same source, Stanton Friedman wrote "I was dubious about the Jim Ragsdale story as reported in Randle and Schmitt (1994), because I could not find other support for the new scenario" (p. 31). Further, an affidavit from Jim McKnight (reproduced in Ragsdale Production, 1996) clearly denounces any likelihood that Ragsdale or anyone else was camping out in the general area identified by Randle and Schmitt (1994) — and further — that Roswell-related events never occurred on his family's property. Also, note in Section 4 of McKnight's affidavit that it is improbable geographically to reach his family's property via the Pine Lodge Road, and this point is repeated by Littell (1998b).

We have seen Ragsdale's original affidavit but do not agree there are significant differences in the basic *elements* of the two accounts. By contrast, Littell (1998b) had first-hand knowledge of the initial and subsequent interviews with Ragsdale and admitted that Ragsdale's later affidavit "was not the same information that was vaguely covered in that first one Don [Schmitt] received on January 26th 1993." Littell also added that Don Schmitt said it was important to continue to contact Ragsdale as "there is more to his story" than Schmitt found that night. However, any meaningful comparisons between the two documents are difficult because only the "barest details" were included in the original affidavit. Since the original affidavit was selectively constructed, Rodeghier and Randle's claim that this accounting is "more restrained and consistent with other testimony" is without merit.

To the best of our knowledge, Randle and Rodeghier do not have any documents or tape-recorded confessions from Jim Ragsdale, his family, or his associates that clearly implicate Ragsdale in deliberate fraud. Despite their suspicions and innuendoes of impropriety on the part of Ragsdale, we maintain now as we did in our article (p. 66) that *direct* evidence for the hypothesis of fraud is lacking. In sum, there are serious questions raised by Littell (personal communication, 1998a, 1998b) concerning Randle and Schmitt's (1994) handling of the "Jim Ragsdale Story," and there are demonstrable contradictions in Rodeghier and Randle's claims. Therefore, the later Ragsdale accounts needed to be considered and we feel justified in our analysis of them. We do agree that the truthfulness of the original affidavit remains an open question, so we will conduct a statement validity analysis on this document and report the results in a subsequent edition of the JSE.

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Weather UFOs

As a UFO investigator for the Mutual UFO Network (MUFON) and the International Society for UFO Research (ISUR), I took careful notice of the report recently issued by the Society for Scientific Exploration on UFOs. I was especially struck by one statement in the report that said, "It was clear that at least a few reported incidents might have involved rare but significant phenomena such as electrical activity high above thunderstorms..." While the "phenomena" I am about to relate did not occur "high above thunderstorms," it appears to have some relation to powerful storms.

On June 16, 1998, at approximately 11:50 p.m., an intense and violent thun-

derstorn hit LaGrange, Georgia. As part of a wide front that swept through Georgia, it caused widespread damage and left many without power. In general, the storm moved on a southwest to northeast track and was of short duration. A similar brief, but intense, storm had tracked through LaGrange the year before, in April.

The 1997 storm produced the first report of what I now call a "weather UFO." This happened off Bartley Road, several miles southwest of LaGrange. An individual living there said that "45 minutes before the storm" arrived he had seen a "red ball of house size" come through. Describing the UFO as "fire," he said it "rolled" for a long distance over trees and farm fields. He did not think it was a space ship or ET craft but something that was associated with the storm.

The witness of the 16 June LaGrange incident, Melvin Smith, owner of a large cab company and garage, said while stopped at the intersection of Colquitte and Ogletree Streets he initially heard a "loud roaring noise." Looking slightly to his left (southwest) he saw "a ragged fireball" come "rolling" over Colquitte Street. As the red fireball passed in front of him, it "rocked" his car. The round fireball he said had a diameter of five feet and traveled to the northeast at an altitude of 150 feet. He estimated the speed of the fireball to be in excess of a 100 miles-per-hour. During the brief fly-over, the bright red fireball showed no sign of growing smaller, slowing or going down. The sighting of the fireball, Smith also said, came after the worst of the storm had passed.

In the search for other witnesses to Smith's sighting, an individual witness to a past "weather UFO" event was located. While no witnesses were found to directly support Smith's claim of seeing a fireball, there was much testimony provided to substantiate the basic points of his account. The other "weather UFO" sighting occurred while the remnants of Hurricane Opal were moving through the LaGrange area on 5 October of 1995.

With sustained winds of 65-70 mph at 3 a.m., the storm tracked generally to the north-east-north. The witness living six miles southwest of LaGrange, in Cannonville, said three hours earlier he had seen a "cone of fire." This cone moved at a high speed to the northeast and was of "4-5" feet in size. Flying at several hundred feet high, it showed no signs of slowing or going down. Like the Bartley and Colquitte sightings, the "fire cone" was not seen during the greatest intensity of the storm.

While the sightings do not prove "weather UFOs" exist, the accounts by three different and unrelated witnesses are striking. The "mechanism" for how these "weather UFOs" are created and kept aloft is admittedly not known. For more information on these singular sightings, a detailed analysis, including edited notes, of the 16 June investigation can be found on the internet at, http://www.isur.com/cases/case_fil.cgi?file=100131.

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Comments on Pickett's Review of "Relic, Icon, or Hoax? Carbon Dating the Shroud of Turin"

The Shroud of Lirey-Chambery-Turin is one of those classic mysteries with which nearly everyone is familiar but in which scientific investigation is wanting. Therefore, it was gratifying to read Pickett's (1998) recent book review of *Relic, Icon or Hoax? Carbon Dating the Shroud of Turin* by Harry E. Grove (1996). In our opinion the review was well-written and informative, but we feel that Pickett was dogmatic about validity of the 1988 carbon dating results. For example, he ended his review by stating that the book "...serves as ammunition for those who wish to defend reason and science against the Faithful who would discredit the dating" (p. 344). This is strong, emotion-laden language that mimics the passionate denunciations of carbon dating by Shroud proponents.

In fact, the findings of the carbon dating and other Shroud controversies are under intense scrutiny by several respected *scientists* (e.g., it is reasonable that the dated fibers from the Shroud could have been heavily contaminated which would affect the results; for an overview of the current arguments for and against claims for the Shroud see web-sites: www.hist.unt.edu/09w-rel6.htm and www.humanist.net/shroud/).

Until this debate is settled, we feel a cautious position is best to take, namely that the Shroud has not been *definitively* established as being of medieval age. However, the controversy can easily be resolved if the reasonable criticisms of the previous carbon dating are addressed and new analyses replicate the 1988 findings. We speculate that replications will indeed validate a medieval age for the Shroud, but this prediction does not stem from an *anti-religious* position (nor do we suggest that Pickett is anti-religious). Nevertheless a medieval date for the material of the Shroud does not solve, much less address, the nature of its anomalous image. A medieval date simply suggests that it is not miraculous. There are three main categories of theories that attempt to explain the image: paint, stain, or dye from an artist; an imprint produced by some form of 'bodily' contact; and a natural byproduct of chemical reaction (vaporography). The empirical evidence for all three is weak, so the image on the Shroud remains an enigma.

Recently, Nicholas P. L. Allen offered an innovative and intriguing alternative explanation. He proposed that the image on the Shroud represents a primitive form of solar-photography employing either silver nitrate or silver sulphate as a light sensitive agent (see his web-site at www.petech.ac.za/shroud/isthe.htm). Whatever the image on the Shroud is, it appears to be a remarkable *human* achievement. Accordingly, the Shroud should not be dismissed by the scientific establishment as a nonsensical icon of the Faithful but rather continue to be studied for its importance in the evolution of science and technology.

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Response to J. and M. C. Houran

I am grateful to the Hourans and the editors of JSE for the chance to comment on some aspects of the Shroud's carbon dating that are not touched on in Gove's book.

The twin puzzles of the origin of the image and the authenticity of the Shroud (as Christ's burial cloth) are bound together in peoples' minds, though they need not be. For me, the Shroud ceased to be interesting the moment the carbon dating results were announced. People's reactions to the dating, and to the Shroud itself, however, are as fascinating as ever. The Hourans' focus on the image's formation is fine with me. On the other hand, there is no doubt that the Shroud's fame and interest are due to the continued belief that it is Christ's burial cloth, and this has a negative impact on any serious investigation into the nature of the image: for anyone who believes the Shroud is genuine, the puzzle of the image is solved — it's a miracle. However, I doubt there are many people who think the image is of a miraculous origin who do not already believe the Shroud is Christ's burial cloth. Therefore the pivotal question is not how the image was formed, but when. This is why the carbon dating of the Shroud has been the focus of so much discussion: for the Faithful (they call themselves "shroudies") it's an all-or-nothing situation. Let me explain why I see no reason to doubt the carbon dating results.

The only credible criticism of the dating (of which I am aware) is the charge that the material is contaminated. The most important thing to keep in mind when considering the effect of contamination is just how much is needed to alter the carbon date by a significant amount. In particular, a simple calculation (Pickett, 1996) shows that to alter the carbon date of a 2000-year-old relic into a 600-year-old result (which is what the shroudies claim) requires a 200% level of contamination; *i.e.*, for every genuine carbon atom, there has to be two from contamination. This is enormous; it implies that the artifact we call the Shroud weighs three times what an identical piece of clean linen weighs. This is why the microbial source of contamination is the only realistic one: no

reasonable amount of smoke, dirt, mud, sweat, *etc.*, could do this. Personally, I do not think bacteria can do it either, but since they live in among the individual fibers it may be possible.

The contamination-guru who has attracted the most media attention is L. A. Garza-Valdes of the University of Texas Health Center. He is part of a small team that claims to have found abundant bacterial deposits on actual Shroud samples, in a form that is difficult to remove. The team is a curious bunch, having issued numerous statements to the media, some of which are mutually inconsistent. But they are clearly not unbiased, and therefore a healthy dose of skepticism is necessary when considering their work. Garza-Valdes not only claims that bacteria can contaminate linen at the 200% level, but that he possesses actual Shroud fibers with this kind of contamination. Others have flatly denied the fibers come from the Shroud, and even the Vatican and Turin would not support his claim.

Later, the Garza-Valdes group was joined by Harry Gove to test the effect of microbial contamination on the carbon dating of a mummified Egyptian bird. The result of this collaboration was an almost silly paper (Gove *et al.*, 1997) in which no conclusions are reached, but speculations about the feeding habits and other oddities of these birds abound. The Shroud is mentioned twice, but no work on the actual Shroud is done (or even claimed). In fact, the authors, (including Gove, who witnessed the original Shroud dating experiment as a guest of the Arizona lab), calls the Garza-Valdes samples "putative." Finally, none of the Garza-Valdes work establishing the contamination of the Shroud was published. What are we to make of this team's claims when they do not publish research on (supposedly) actual Shroud samples, but do publish inconclusive work on mummified birds, during which they mention "putative Shroud samples?"

All this is to say, the Shroud of Turin may or may not have excessive bacterial contamination. What if it does? Then two questions come to mind.

1. Are these bacteria like plants, getting all of their carbon from the CO₂ in the air, or do they consume and process the Shroud material they're living on? I personally have no idea; it should not be that hard to find out, and it's vitally important to do so, if you want to challenge the carbon date, since if the bacterial deposits are the result of processed Shroud material, *they constitute no contamination at all.*
2. If the deposits are from the surrounding air, we still have to ask when did the bacteria do all this? This is important because the 200% figure for contamination I quoted earlier assumes that the deposits are very recent; older deposits will require more contamination to confuse the dating. If the deposits are as old as the linen itself (which seems reasonable) then again we have no contamination at all as far as dating is concerned.

In light of this it seems that there is much work to be done, as the Hourans suggest. On the other hand, we should remember that the carbon dating pro-

duced results in exact agreement with the historical date of the Shroud. In my opinion, the real miracle here is not the image on the Shroud, but that, with all the possibilities mentioned above, a flawed dating attempt produced this perfect agreement. The overwhelmingly probable conclusion is that the dating is not flawed. If another dating is performed on the Shroud, I'm betting it will produce the same result as the first.

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BOOK REVIEWS

Why People Believe Weird Things: Pseudoscience, Superstition & Other Confusions of Our Time by Michael Sherrner. New York: W. H. Freeman, 1997. 306 + xii pp. \$22.95 (c). ISBN 0-7167-3090-1.

This book has much to recommend it, in particular an unusually sound understanding of what science is and a detailed analysis of some salient contemporary controversies. The author shares some personal experiences that are relevant to his exposition and to the forming of his attitudes, and in doing so reveals an open seeker after knowledge or enlightenment whose self-description as "skeptic" is uncommonly apt, by contrast to the many self-styled "skeptics" who are in actuality dogmatic debunkers.

Sherrner's choice of topics raises interesting questions. Part 1, "Science and Skepticism," can be thoroughly recommended as a summary of how science works and of how human thinking easily goes awry. The author's recounting of how he was led to skepticism is engaging. Part 2 is a motley group: Edgar Cayce, near-death experiences, UFO abductions, witch crazes and their modern counterparts, and the cult of Objectivism à la Ayn Rand. Perhaps the clearest explanation for this grouping is that "Most of the chapters began as essays originally published in *Skeptic* magazine, which I edit" (p. 9). So this book is really a collection of essays with some connecting discussions, more than a determined, coherent attack on the questions adumbrated by the book's title. Part 3 is about creationism, Part 4 largely about Holocaust denial, Part 5 a sort of summary and analysis.

I recommend this book strongly. If the bulk of this review nevertheless seems rather negative, it is only because I see little point reiterating the many things the author has done right, but do think it may serve readers well to be warned of the few places where the author seems to have gone a little wrong. Among the deep points in the book not addressed are, What exactly do you mean by "weird"? What warrant is there for pronouncing "weird" a belief like creationism that is held by a very large proportion of our society? Wrong, maybe, but "weird"?! Could one not call *all cosmology* weird on the same sort of grounds?

Stephen Gould's foreword adverts to another issue that could have borne more discussion: "facilitated communication" is described as irrational and unscientific; yet one of the knotty aspects of this and similar enthusiasms (therapeutic touch, recovery of memories of sex abuse or of Satanic rituals) is that many proponents hold certified positions in the relevant professions.

But I will not continue thus, reviewing a book that was not written rather than the one actually at hand. Shermer begins very engagingly by recounting experiences "debating" on the Oprah show, and introducing the salient point, (p. 7) that science has progressed through eliminating both false positives and

false negatives. How long-distance competitive bicycling led Shermer to skepticism makes Chapter 1 a page-turner. I applauded "The flaw in pure skepticism is that when taken to an extreme, the position itself cannot stand" (p. 16). But on the same page, "Some things... have been tested and have failed the tests often enough that we can provisionally conclude that they are false" — sure, but would everyone include among those, as Shermer does, water dowsing, extrasensory perception, and creationism? This illustrates an enduring pitfall or pratfall for anyone who writes about these subjects: unexceptionable principles, but disagreement over application to specific cases. Another illustration: "Shouldn't we know by now that the laws of science prove that ghosts cannot exist?" (p. 27) Really?! What laws are they? And Shermer allows to pass without comment the Gallup poll that included under "paranormal" the opinion that humans and dinosaurs coexisted; wrong, almost certainly; but "paranormal"?! That (p. 33) the "search for extraterrestrial life is not pseudoscience because it is plausible" begs the question, plausible to whom, in light of what? Still, the substance of Part 1 is commendably well based and judicious.

The cases in Part 2 are discussed at appropriate length. A really serious lapse (p. 71) comes however with the "Bell Curve," where a *symmetrical* curve rather than the correct unsymmetrical one is drawn for the correct hits out of 25 to be expected by chance in Zener-card trials — though a histogram in *the same Figure* gives the correct numbers. This is a crying shame, for Shermer correctly points to popular ignorance of probability and statistics as a common source of confusions, and a lapse like this undermines the book's credibility in a crucial area. There is another such lapse in "Science and Immortality" (p. 83-87) — itself a distracting digression — "25 percent of a child's genes come from each parent"; with the norm of 2 parents, however, that accounts for only 50% of the child's genes. It seems a little gullible, too, to accept that "for girls born in 1984 [the life expectancy in Japan] is 80.18 years" (p. 84). Sherrner should be a little more skeptical about numbers and the precision they imply through the manner in which they are written.

As for near-death experiences and the like, Shermer sticks his neck out admirably: "Baker, Kreskin, Randi, and others think that hypnosis is nothing more than fantasy role-playing. I disagree" (p. 75). "If a coma is not an altered state [of consciousness], I do not know what it is" (p. 76).

It captures interest when Chapter 6 begins, "On Monday, August 8, 1983, I was abducted by aliens." The author plays fair and square with the reader, moreover, in his analysis of the experience. Chapter 7 is sound enough on the commonalities in "Epidemics of Accusations," but perhaps the sociological analysis is too general to be of much specific help on the pseudo-science-versus-science front. Thus of the 8 "components of the early witch crazes" (p. 100), 7 are also clearly to be found as components of the contemporary miasma of political correctness. But a little-known and worthy point is that science does *not* displace superstition so much as stimulate counterparts like

witch crazes (p. 105).

The chapters about creationism cover much of the important ground, including legal battles; and the author deserves a hearing if only because he reveals at the outset that he had been a born-again Christian (p. 127). It may well be that we can learn best about these knotty intellectual issues by being guided through them by one who has run the gamut of beliefs.

The chapters on Holocaust-denying have several points of high value. For one, a determined defense of the benefits of freedom of speech for unpopular views. For another, a frighteningly true-ringing description of the intellectual ineptness and lack of preparation of talk-show hosts. And further, interesting biographical sketches of prominent Holocaust deniers. Shermer's generalizations about such groups and their methods (p. 207, 212) are well founded and useful. He concludes by reviewing a mass of evidence to confound the deniers.

The concluding Chapter 17 cannot be said to do justice to the book's title, but its points are solid nevertheless: there is not a single answer, but among them are believing what we wish to believe, seeking immediate gratification, liking simplicity rather than being bothered by details, and seeking morality and meaning which seem so elusive in modern society. As a whole, the book offers much of interest for people curious about the topics discussed, and its analyses are in the main both well based in logic and ethically appealing.

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The Conscious Universe: The Scientific Truth of Parapsychology Research by Dean I. Radin, Ph.D. New York: Harper Collins Publishers, 1997, 340 pp. \$25 (Cloth).

When Dean Radin set out to write a book that would raise the level of public discourse about what 150 years of parapsychology research has shown, he took on a daunting task. Perhaps no area of science has so much controversy as the study of parapsychological phenomena and no area of parapsychological science has so much controversy as the nature of the conclusions that can be drawn from the data. A post to an Internet parapsychological discussion group about the scientific conclusions from parapsychology research started a heated debate that went on for days. Dr. Radin clearly comes down on one side of the topic, saying the short answer to the scientific proof question about *psi* phenomena — "Is this for real?" — is "Yes." The book will serve as his long answer.

This is not an objective, unbiased review. I was delighted to find a review copy of the draft manuscript in a journalist friend's office. As a long time "*psi* enthusiast" with an interest in bringing the scientific method to the anomalies

of human experience, I welcomed the publication of a strongly stated, well documented, positive review of the psi field and its findings. I also am a fan of Dean Radin and his persistent and creative career in parapsychology, including President of the Parapsychological Association. Dr. Radin is a prolific producer of scientific articles and as methodologically sound and data driven as one could want in such a contentious area. He seems well suited to the task of making the science of psi clear to non-parapsychologists and a curious public.

Conscious Universe starts with the assertion that scientific investigation over the last 150 years clearly supports the reality of psi phenomena in spite of little consensus in the theoretical or explanatory realms. At the same time, Dr. Radin also even-handedly refutes and dismisses non-scientific "New Age" assertions about paranormal realities and the knee-jerk, extreme, "there is no data for *psi*" skeptical stance.

One of the functions of the book is to differentiate clearly between the true need for and function of skepticism in science and the extreme tactics and active disregard for scientific discourse by the anti-psi skeptical position.

He contends that parapsychology research is on the threshold of being a "Stage 2" area of scientific development — no longer just a collection of anomalies, but not an accepted body of knowledge with a coherent theoretical structure. The argument about whether psi effects and phenomena exist is over for individuals familiar with the whole range of the scientific literature. The phenomena are now dismissed as too insignificant to be important by former skeptics who have given up refuting the research findings. The stage is set for process research and theory development.

The book is a challenging read for the statistically disadvantaged. Dr. Radin makes a concerted effort to educate the reader about the history, methods, psychology and politics of science in general and parapsychology in particular. This includes a careful introduction to the issues of experimental design, statistical analysis, scientific methodology, control for confounding variables, the power and pitfalls of meta-analysis and the problem of "proof" in scientific circles. A major goal of the book is making the reader a more scientifically informed consumer of parapsychological facts, fallacies, and criticisms. It may even convert some uninformed true skeptics of the moderate variety with its careful presentation of the evidence.

The statistical and scientific method sections give a clear and useful overview of the science of parapsychology, necessary in a book headed for a primarily non-scientist audience. The exposition on meta-analysis for the non-statistician is a jewel, and it needs to be, since the conclusions of the book about the scientific state of the art of parapsychological knowledge rest up on it. The reviews of the meta-analysis data from the major psi phenomena are clear, exhaustive, and well illustrated by graphics. Lay readers who toil through the explanation of the scientific, methodological, and statistical foundations of psi research will be well rewarded for the effort. The discussions of the meta-analysis studies and other background materials are

persuasive and lay a firm foundation for the scientific support of the reality of the major classes of psi phenomena. Other reviewers will have to argue if the meta-analysis process is valid and supports the conclusions reached. Any "show me the data" skeptical thinker should be delighted since data are presented in abundance, with quoted studies documented by end notes for each chapter and 20 pages of bibliographic citations.

A particularly valuable theme that runs throughout the book is a strong refutation of the claims, critiques, and rhetoric of the most extreme skeptics of psi phenomena and research, past and present. Each critique and tactic is documented and tackled with replies based on data. When Dr. Radin has thoroughly reviewed the history, factors and forces around the resistance to psi, the reader may be hard pressed to see how any informed skeptic can continue to use the same old arguments. In addition, the exposition of the blind spots, distortions and unscientific tactics of the anti-psi skeptics and critics leaves a clearer understanding of some of the reasons why parapsychology has been such a difficult area of science. This coverage is not just a confrontation with the extreme skeptical attacks on parapsychology, but is also supported by an adequate overview of how belief, expectation, perceptual defense and bias operate whenever anomalous information is encountered by human beings, scientists included.

This book flows, with enough psi stories from the history of human experience and parapsychology to catch the interest of the lay reader. Dr. Radin patiently revisits critical points over the course of the manuscript to reinforce understanding of the key concepts about the scientific method, statistical inference, the role of replication, standards of "proof" and how criticisms have been refuted. The coverage of some of the leading edges of parapsychology — field consciousness random number generator (RNG) studies, possible applications of psi in the future, and the author's personal foray into the role of psi and environmental variables in the casino — offer interesting reading. The sections on implications of psi are not exhaustive but offer intriguing looks at the changes in views of reality needed for the move into the next stages of scientific understanding of psi phenomena.

Conscious Universe is essential reading for professional parapsychologists, psi enthusiasts and skeptics. Everybody will want to comment for different reasons and agree with or dispute different points. As with all assertions about the reality of psi phenomena, the critics will likely come out in droves. Some will merely dispute the title (apparently selected by the publisher); others will tackle the conclusions from the meta-analysis data; and others will respond to the critique of the anti-psi skeptics. In any case, the field of scientific

parapsychology cannot lose from this kind of well-documented exposure and the debate should be exciting. I cannot wait to see Dean on "Larry King Live" with The Great Randi.

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The Conscious Universe: The Scientific Truth Behind Psychic Phenomena

by Dean I. Radin, Ph.D., HarperEdge, San Francisco, 1997. Hardcover, \$25.00, 345 pages, ISBN 0-06-251502-0

This is the best survey of real evidence for the existence of psychic phenomena ever compiled. Clear, comprehensive, engaging, and convincing, it provides hard facts, not hazy opinions. It is a bastion of substance in a sea of credulous *psi* publications that separates the real science of parapsychology from the morass of channelers, telephone hot-line psychics, side-show telepathics and metaphysical healers that most of the population associates with psychic phenomena, and who have unfairly caused parapsychologists to become pariahs to their colleagues in the more conventional sciences. A "must-read" for both believers and debunkers, it is even more important that it be seen and understood by scientists who have the training and resources to replicate the work described in the text. While it is not the capstone that provides legitimacy to parapsychological research and reality to psychic phenomena, it is the cornerstone that may inspire others to build upon past research and in the end, find scientific truth.

It is interesting to contrast this work with skeptical books such as C.E.M. Hansel's *The Search for Psychic Power* (Prometheus, 1989) and Nicolas Humphrey's *Leaps of Faith* (Basic Books, 1996), both of which argue strongly against legitimacy for parapsychological research and both of which are written by psychologists. Perhaps I am more in tune with the more comprehensive and hard scientific approach taken by Radin, because when I read those books in conjunction with this review, I found them to be far less convincing in their evidence and arguments against psychic research than Radin in his supportive manuscript. Radin's wry sense of humor also comes through often in the book, such as in the anecdotal preface involving his interaction with skeptic Harry and the credulous Shirley. A play on Houdini and MacClaine perhaps?

Some may argue that *The Conscious Universe* provides unequivocal evidence for the existence of psychic phenomena. I must dissent and use the over-worn terminology that "it is suggestive but not conclusive." Most of my skepticism lies in the use of "meta-analysis" for the validation of anomalous effects observed over many experiments by numerous investigators. The issues are so important that Chapter 4 of the book is devoted to the topic. The author rightly

documents the objections to meta-analysis including experimenter bias, over-weighting of data from a small number of large studies, inclusion of outlier data, and the file-drawer problem. I believe that he underestimates the significance of a number of these objections, particularly experimenter bias and the file-drawer problem, and ignores the significance of non-random bias in experimental design. For example, in Chapter 8 on Mind-Matter Interaction, the criticisms to meta-analysis of dice experiments are addressed. The claim that a few investigators who reported the bulk of the studies could be the source of the significant results was eliminated by trimming the data set of those studies. The objection that a few extreme studies biased the conclusion was similarly eliminated. And the file-drawer effect was found to require 121 unpublished and unsuccessful studies for each study used in the meta-analysis to reduce the odds to less than twenty to one. So what's my problem? I am reminded that "statistics is a systematic method for getting the wrong conclusion with 95% confidence" or even greater confidence in the case of meta-analysis. Problem 1: If one were to do a meta-analysis of the published literature on physical phenomena known to be fallacious, such as polywater, biotransmutation, the Allison Effect, or N-rays, would meta-analysis indicate that the phenomena were real? Very likely, since the vast majority of publications on these topics have been supportive. Typically there are only one or two significant papers that finally prove the phenomena to be invalid. Scientists tend to publish in support of a new and unique phenomenon, and not to publish just to beat a dead horse. Problem 2: It is not impossible that most of the included studies were invalid because of the confounding effects of experimenter bias and non-random bias in the experimental design. The file-drawer effect assumes that unsuccessful and unpublished studies are required to offset the successful studies, but if the successful studies are largely biased and thus invalid, the whole structure of the meta-analysis falls apart. From my highly non-statistical viewpoint, meta-analysis is a vain attempt to make a silk purse out of a sow's ear, and should be abandoned in favor of carefully controlled experimentation.

A much more powerful argument for psychic phenomena than meta-analysis can be found in carefully controlled experiments, such as the PEAR work described in Chapter 8 and the author's own work presented in a number of chapters throughout the book. Here is hard evidence by credible scientists that some phenomena exist that may not be readily explainable by current scientific knowledge. On the other hand, attempts at theoretical explanations (Chapter 16) and implications and applications of psychic phenomena (Chapter 17) are interesting but very speculative and somewhat out of character to the general tone of the book.

One of the more blatant themes running through the book is an unveiled attack on unbridled skepticism. Chapter 13, "A Field Guide to Skepticism," is dedicated to the topic, with significant parts of other chapters also addressing the issue. The overall treatment of skepticism is fair, with a few negative outbursts addressed at skeptics in general and a few individual skeptics in

particular. The author does seem to vary in opinion between "skepticism is one of the hallmarks of the scientific approach" and "damn skeptics," perhaps as those certain individual skeptics come to mind. While a negative attitude towards dogmatic skepticism is understandable, since parapsychologists have been subjected to constant and sometimes vicious attacks by skeptics, there is still no justification for quotes such as "to distinguish the lone wolves from the properly socialized wolf packs, skeptics have invented labels like pseudoscience and pathological science." Pseudoscience and pathological science are terms used to describe bad science once it has been proven to be flawed, no matter if it was performed by a lone wolf or a nation (*i.e.*, the Nazi racial science). Some parapsychology has been bad science and deserves to be described as pathological, just as bad science in other disciplines should be similarly labeled.

Finally, one of the topics discussed in Chapter 3 on "Replication" needs to be elaborated upon. The author relates the question of replication in psychical research to the discovery of the "omega-minus" particle in physics. As described in the text, the discovery was based on the observation of two events out of a total of 200,000 experimental trials, and the author ascribes acceptance despite the rarity of the event to the existence of a well-respected theory, to the work having been done by respected scientists, and to the results being not too remote from accepted scientific knowledge. What is not clearly brought out is that the difference between the physics experiment and the search for psychic phenomena is that the former is the search for a discrete event and the latter for statistical significance that implies a discrete event. If I seek to prove that "acorns fall from trees," I can stand under the oak tree in my front yard for a minute once a day until I'm hit on the head by an acorn. Eventually when I'm hit I can conclude with 100% certainty that acorns fall from trees. If I attempt to psychokinetically induce an acorn to fall on my head every time I stand under the tree, I must determine the probability of an acorn falling with and without PK, and consider all possible confounding factors, such as time of year, wind speed, the presence of squirrels, earth movements, *etc.* This is far more difficult and it is the reason why many scientists are going to remain skeptical of psychic phenomena until they become explainable by accepted scientific laws. It is similar to the problem of determining the influence of a drug or radiation on a biological system, but with the additional burdens of a lack of theoretical backing plus the confusing inputs of pseudo-parapsychologists and psychics who muddy the water. It is to the credit of parapsychologists that they undertake this very difficult experimental problem at the risk of their careers.

I was recently asked to do a magazine interview on mind-matter interaction, but had to refuse because of my employment in a government agency. In speaking with one of our public relations officials, through whom such interviews are approved, I found that she had the common belief that such topics were associated with channeling and telephone psychics. I recommended this

book to her. If *The Conscious Universe* does nothing more than raise the consciousness of the general public and the scientific community toward the real science in parapsychology, it will have achieved something truly significant.

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L'Esprit de la Nouvelle Science by Marcel Odier. Lausanne: Editions l'Age d'Homme, 1990. pp. 268. (This book, out of print with the publisher, is obtainable from the author. Write to: Marcel Odier, 77 Route de la Capite, 1223 Cologny (GE), Switzerland. The price is \$20.00 post paid.)

The editors of this journal wish to draw the attention of its readers to books in languages other than English that deserve their attention. This is one, and we should have noted its excellence earlier.

The author was trained in science and subsequently became a banker without losing his interest in science and knowledge of it. His book is in the first place a lucid exposition of modern physics. It is, however, much more than that, because Odier believes that there is nothing incompatible between what physicists say about the world and paranormal phenomena. He deplores the widespread tendency, evident even in many well-educated persons, to think of science and religion as inevitably opposed to each other.

The book is divided into three parts. Part One is devoted to "the facts" and Part Two to concepts. Part Three consists of dialogues about the topics of the book between the author and five distinguished thinkers: two theologians, a publisher, a writer, and a physicist. Of these, the best known outside francophonic countries is the physicist Olivier Costa de Beauregard.

Not being a physicist myself and being aware of my ignorance of physics, I try to alleviate my condition by reading books on physics written for general readers. Over many years I have read many of these, and this is one of the best. Odier has a remarkable gift for lucid exposition. The dialogues in Part Three add to the value of the book, because the different speakers examine the facts and the concepts of the first two parts and introduce fresh perspectives, sometimes with reference to the experiences that generated them. For example, Father Bruckberger describes how he shook off an oppressive cartesian emphasis on rationalism (inculcated by his educators) and converted, one might say, to the empiricism of Claude Bernard's *Introduction a la Médecine Expérimentale*. Bruckberger also alludes favorably to *La Me'lodie Secrète*,¹ an exposition

¹This work was published in Paris by Fayard in 1988. An English translation, entitled *The Secret Melody: And Man Created the Universe*, was published by Oxford University Press in 1995.

of cosmology by the Vietnamese astrophysicist, Trinh Xuan Thuan, who does not believe our universe could have occurred by chance.

I recommend *L'Esprit de le Nouvelle Science* to all French readers of this journal. Even physicists, familiar as they are with "the facts," may find themselves stimulated to think again about the assumptions they have held.

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Die Idee der Reinkarnation in Ost und West, edited by Perry Schmidt-Leukel. Munich: Eugen Diederichs Verlag, 1996, 240 pp. DM28.00 (\$16.50). SBN 3-424-01335-8.

This work is part of a series published by the Gesellschaft für europaisch-asiatische Kulturbeziehungen (Society for Cultural Relations between Europe and Asia). It consists of nine essays divided into three sections.

The first three chapters (comprising the first section) provide an excellent introduction to the belief in reincarnation expounded in Hinduism and Buddhism. In Chapter 3 Hans-Peter Muller describes at length the teachings of the Western-educated Indian sage, Sri Aurobindo.

The three chapters of section two describe the history and present state of the belief in reincarnation in the West. In the first of these chapters, Norbert Bischofberger reviews the belief in reincarnation among ancient Greeks and early Christians. In discussing passages of the New Testament that are often cited as supporting the idea of reincarnation, Bischofberger shows that all of these are open to other interpretations; they are not necessarily allusions to reincarnation. In a later section of this chapter he discusses the concepts held by theosophists and the derivative anthroposophists. In the following chapter, Wolfgang Seelig reminds us that many Europeans showed an interest in reincarnation long before the advent of theosophy and "New Age" teachings. The writings of Arthur Schopenhauer and Richard Wagner in the 19th century did much to stimulate such interest. In the last chapter of this section Christoph Bochinger reviews ideas about reincarnation among adherents of "New Age" doctrines. Bochinger points out that, although almost all such teachings imply or explicitly assert reincarnation as if it were factually established, they have almost nothing to say about it in detail. There is, to put it mildly, no theological faculty studying the concept. "New Age" writers promulgate reincarnation, but they do not examine it; nor are its processes even conjectured, apart from naive endorsements of *karma*, regarded as a universal solvent of all possible questions about misfortune and misconduct.

The third section, entitled "Perspectives about Research and Discussion"

will perhaps be of most interest to readers of this journal. Peter Graf discusses the idea of reincarnation as an important place where the cultures of East and West meet and, as we might say, rub off on each other. In the following chapter Eberhard Bauer asks whether reincarnation is susceptible to scientific investigation; he then gives an even-handed account of research on the cases of children who seem to remember previous lives. He concludes that the subject needs much more research. (No one can quarrel with that.) In the final chapter, Perry Schmidt-Leukel discusses the idea of reincarnation as a challenge to Christian theology. Surveys have shown that about 30% of Westerners questioned believe in reincarnation, although it has no place in the Western religions to which they at least nominally adhere. Obviously, scientists and scholars need to take the subject seriously. In his text and notes, Schmidt-Leukel shows an impressive acquaintance with the writings of philosophers who have grappled with the question of what constitutes personal identity and with those of theologians who have grappled with that of theodicy.

This book is well-written and with one exception, well-produced. The references are adequate and, so far as I can judge, accurate. There is, however, no index, which I consider deplorable in a work of such excellent scholarship. I hope that its readership can be increased by translations into other languages. I recommend it to philosophers interested in the definition of personal identity, to scientists and scholars who take the subject of reincarnation seriously, and to any theologians who are complacently satisfied with Christian teachings about life after death.

Here I may mention another book, also recently published in Germany, which focuses on a particular aspect of reincarnation. This is *Wiedergeburt der Ahnen: Eine Religionsethnographische und Religionsphänomenologische Untersuchung zur Reinkarnationsvorstellung* (Hamburg: Lit Verlag, 1994). The author, Michael Bergunder, is with the theological faculty of the University of Halle. His work is exclusively concerned with the belief in the reincarnation of ancestors within a family; he is well aware of empirical research on this matter.

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Riding With The Lion by Kyriacos Markides. New York: Penguin Books, 1996, 368 pages, (p) \$13.95, ISBN 0-14-019481-9.

This book is an account by a sociologist from the University of Maine of his visit to a monastery in Cyprus. Indirectly, it is concerned with the present paradigm in physics and the implications for this of the paranormal happenings

associated with groups of monks on the island, who subject themselves to extreme measures in self-discipline.

The book opens with a wide-ranging discussion involving a mixed group of scientists, computer people, and medical practitioners in New York. The second half of the book follows a pilgrimage to Greece. The author spent 10 nights at the monastery on Mount Athos in Cyprus. The climax of the pilgrimage is a visit to the head of the monastery, Father Vasilios, who actually lives the life of a hermit in a hut apart from the monastery.

It takes 8 hours of mountain walking from the monastery — located in very isolated territory — to reach this monk, who has hidden himself in a hut. A number of miracles are attributed to him. The author finds the priest to be affable and rather lively, his age being judged to be "anywhere between 60 and 90." When the author returns to civilization, after the ten days' isolation with the celibate monks, he realizes he is not fit for the life of excruciating discipline to which the monks subject themselves. Before returning to Maine, he visits a seaside village on Cyprus for a few days to contemplate the implications of what he has learned. His conclusions fill the last chapter.

Chapter 1 exposes the author's main point, the rest of the book being a presentation of the evidence. His viewpoint is extremely radical in nature, and has great breadth in its implications. Scientism as a public philosophy is inconsistent with many experimental observations, some of which undermine the basis of the present physics. The apparent disarray among the world's religions fades once one looks beneath the surface to the spiritual experiences upon which they are all based. Then, suddenly, they present a common front, a kind of universal philosophy, variously called Buddhist, Christian, and Rosicrucian.

The contrast which the author presents is then a very sharp one. There is a common philosophy, several thousand years old, going back to the Upanishads. It does not need experiments to prove it. It arises in thoughts within us — so long as one disciplines oneself sufficiently, prays, and meditates. Then, one enters into altered states of consciousness, and the common realizations, to which the common philosophy gives rise, become conscious. The Yogis, the Sufis, and the Christian mystics all have the same things to say. The paranormal happenings present physics with a confrontation, brutal and direct, which it can no longer continue to ignore. Levitation, bilocation, and out of the body experiences are all phenomena experienced in the monasteries. In so far as they are accepted as real, they lead immediately to a collapse "by the people," *i.e.* in the popular world view. Physics, on the other hand, is the basis of the miracles of technology which have occurred since Bacon, Newton, and Leibniz.

The author is dramatic in his quiet way: he tells the reader to stop pretending, we have gone 400 years out on a limb, the wrong limb. Chapter 2 consists largely of discussions in New York with those eager to penetrate and escape the straitjacket of scientific materialism. Miraculous healing shows up here

and there — in fact, it permeates many of the discussions used in the book to illustrate the marvelous and the impossible. He faces up to the "big questions" which we all discuss as sophomores. A soul? (Yes, but it is complex.) Reincarnation? (Sometimes.) God? (Um: very difficult. We experience "God" filtered through our own consciousness and the filter has small holes.)

Chapters 3 and 4 describe paranormal happenings in the USA. Among the many peculiar events described is one concerning a sophisticated Indian yogi whom the author met at a party. Markides describes the events observed in great detail and finally concludes that the Yogi was able to make one of the participants disappear for a few minutes.

The book is full of challenging thoughts which turn up in the discussions. It was Freud who melted the glue of the western civilization. Was he sent by Lucifer to spoil God's plan? No, for without Freud, there would have been no Jung, who stimulated spiritual insight in modern times, an era in which the "educated classes" regarded all religion as superstition. Then, in Chapters 5 and 6, the author softens us up for what is to come. For example, he points out that Wilder Penfield, the great brain surgeon of Montreal, concluded from his experiments on exposed brains that there could be no interpretation of them within the present paradigm of physics and chemistry. The brain is a computer, but someone is writing its software, clicking its mouse. Randall Byrd has established that a prayed-for group of cardiac patients recovers quickly, while the corresponding unprayed-for control group recovers more slowly. The story of Arigo, the trade union leader who performed a stream of rapid and effective operations using rusty tools and neither antiseptics nor other anesthetics (and was frequently photographed doing so by western medical doctors) is given in detail. Here, one of the mysteries of our time is faced. Scientific and Western-style evidence for a number of "impossible" phenomena has been around for many years; in a few cases, for about 100 years. It is Galileo and the telescope all over again, but this time, it is not the priests who refuse to look — it is the scientists. Why has this situation been going on for so long?

By Chapter 10, we are in Cyprus and in the monastery on Mount Athos. The lion of Mount Athos — the origin of the title in the book — turns out to be the chief of the monastery. He is said to have many of the characteristics associated with Christian saints and Yogis. He can fall into an ecstasy (trance state). Several detailed accounts of radically "impossible" feats alleged to have been performed by Father Vasilios are given. Chapter 11 explains to a degree why all these amazing things can happen on Mount Athos, while they occur so rarely in New York. Thus, the paranormal happenings cannot be brought about easily, but only in the presence of those who have disciplined themselves for many years. Fasting, complete obedience to an elected abbot, praying and meditating for many hours per day, having little sleep, these are routines which the monks have found lead eventually (for some of them) to what the Yogis call "Siddhis." The goal of all the discipline, obedience, and fasting is to obliterate the Ego.

This is a tenet of the monastic life: if one pushes one's self down sufficiently, obstructions to the direct action of God, which in most of us are dense, fade gradually. A person who perseveres in the monastic life of deprivation begins to experience new states of consciousness. In time, he finds that happenings which are impossible within the confines of our understanding of physics may occur. "You see," says Father Maximos, "you have to reach a state where you don't have any personal desires. Then, God acts for you and things happen which are not possible in normal life."

Finally, the author ruminates on what he has witnessed in the ten days. He is back in civilization now. Can it be that the residuum of a medieval religion has a message for the 21st Century? Why are so many things being thrust upon us now which seem to tell us that we have it all wrong: the near death experiences, the UFO abductions, the successful experiments in psychokinesis? Kenneth Ring, Professor of Psychiatry at the University of Connecticut, has had his say on this. He thinks that the shamanization of humanity is occurring. A "Great Transition" is under way. Have the last few hundred years been a time of bedazzlement? Have the inventions and machinery which flowed from Newton's 17th Century discoveries of gravity glued our eyes upon the outer world and closed our minds to other worlds? Is the sudden collapse of the only great world power that stretched the scientific paradigm to eliminate the spiritual "officially" actually a characteristic of the present change? Could it be that the monks on Mount Athos are not a fading remnant of an ancient faith, but the strongly beating hearts of the perennial world philosophy — the spiritual consciousness which is the common foundation of all religions?

These are great questions and this book poses them in a very calm and palatable way. The author reminds himself and us that he is a western scientist and a tenured professor at a U.S. university. The tone is even-paced and the text is never heavy or hard to read. For one thing, the author is generous in his descriptions of his surroundings where all these discussions occur, whether they be in Orono, Maine, or on the shores of Mount Athos. He shines his light and then lets his colleagues speak at length. They contradict; they discuss; they explain. The presentation is often persuasive, but always dispassionate. It is, above all, brave, for as the reviewer knows, to come out with evidence for truths inimical to the paradigm which flows through U.S. universities often gives rise to painful reactions from powerful colleagues. But the questions will not go away. Indeed, we may ask whether the astounding events said to have been witnessed by monks in monasteries on a Greek island are more amazing and more paradigm-shifting than results of some of the scientific experiments described in refereed papers in the *Journal of Scientific Exploration*.

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Be Careful What You Pray For... You Just Might Get It. What We Can Do About the Unintentional Effects of Our Thoughts, Prayers, and Wishes by

Larry Dossey, M.D. San Francisco: Harper San Francisco, 1997. 256 pages. Hardcover \$22.00. ISBN 0-06-251433-4.

It takes a certain courage to openly address topics that we'd rather not think about, and the negative potential of prayer described in this book is clearly one of those topics. My first response upon seeing the working pre-publication title, "Toxic Prayer," was probably representative. Isn't it better to leave the dark side left in the darkness? But reading the book answers that question with information and an empathetic understanding of issues that are pertinent to a richer perspective on prayer as a general name for a variety of important interactions of human consciousness with the world. Far from being a simple examination of the darker impulses we may embody in intentionally disruptive and destructive invocations, the book looks at a broad spectrum of rather normal and ordinary thoughts and activities that may touch upon or activate conscious and unconscious influences in the world. The publication title says, "Be careful what you pray for. You may get it." We are provided with a splendid collection of insights and perspectives that can educate a more conscious and deliberate application of the possibility that our thoughts and wishes may actually make a difference.

As in his other books dealing with prayer in medicine, Dossey takes a quasi-scientific approach, basing much of his discussion on research in various fields including medicine, biology, anthropology, parapsychology, *etc.* The references and bibliography are detailed and almost certainly are the most complete available on this general theme or topical area. Scholars and other researchers will find both breadth and depth here; the book is an important resource in this regard even for those with no specific interest in the negative aspects of prayer. Beyond the value of the book as a scholarly work, it is interesting and well written, and between the technical discussions and beyond the analytical overlay, Dossey also tells stories that illuminate the points he feels we should consider. Taken from his own experience as a doctor and from his wide network of contacts with healers in various cultural traditions, these stories form a background that is at once both interesting and useful as another form of evidence that the questions he addresses can be and are deeply important. The doctors and healers, on the one hand, and the patients and their loved ones on the other, tell us that it is worthwhile to think about and study the implications of a nearly universal tendency to wish for a particular future, or to pray for some sort of intervention that will affect our lives and well being.

The book has five major sections, and within these, chapters dealing with specific topics including "death wishes," inadvertant toxic prayer, and the possibility that some form of "protection" from negative or destructive wishes may be invoked. Dossey begins with the question why anyone might want to delve into a topic that is widely regarded as forbidden territory, saying, based

on extant research, "If we accept that human thought has distant effects, it is irrational to think that individuals throughout history would not have tried using this power for harm. This is the domain of curses, hexing, and the casting of spells, and the use of prayer to harm others. The goal of this book is to explore how these practices manifest in everyday life." He deals with topics such as voodoo and the "evil eye," and with self-inflicted negative prayers. Some of the examples are exotic, but Dossey also includes quite prosaic but widespread practices that might be thought of as medical hexing, where physicians occasionally confront patients who fully believe they have been cursed or "spelled" and may actually require the equivalent of a reassuring, ceremonial de-hexing. More problematic is an all too typical modern form of negative prayer in the form of prognostications by physicians who authoritatively intone that the patient has only a few months to live. He provides evidence and experience that cumulatively make a strong case for avoiding such negatives and instead inculcating positive expectations in patients' minds.

Experiments addressing the effects of negative prayer on humans are understandably rare, but Dossey reviews relevant studies with plants, animals and cell preparations. These show the efficacy of negative prayer and wishing, but they also reveal the complexity of the situation. Healers do not wish to invoke harmful intentions, even for, say, cancer cells, and they often prefer an approach that essentially requests that, "Thy will be done." Dossey's survey suggests that experience leads healers and physicians who include prayer in their work to avoid a fix-it attitude and instead to focus on a return to normality and balance, tailoring their prayers to the temperament and personal needs of the people involved.

The book has so many examples both anecdotal and scientific to persuade us that prayer can be an effective mechanism for harm as well as benefit that we might come away with a feeling of dismay. The final section in the book deals specifically with "protection" against the negative intentions of others. Although Dossey again documents specific recipes that we might employ, he also asserts that in this area as in the strictly physical realm, we come equipped with natural defenses, a sort of "psychospiritual immune system." He quotes an expert, a native healer from New Mexico who reminds us that in one of the most common Christian prayers a central plea is to "Deliver us from evil." Of course amulets and images and ceremonies with explicit and implicit protective functions are an important part of everyday life for many people, and even the simple get-well card, Dossey suggests, may be a form of protection against hopelessness and fear which otherwise may become an internal negative and destructive force. Many people look for a "magic bullet" in the form of exotic devices and practices to protect themselves against hexing and curses. But in the end, Dossey says, the most reliable protection against others' negative intentions lies in psychological maturity, "... honoring the presence of the Absolute in our life; and cultivating our capacity for love."

Though it is a difficult topic both because it involves anomalous connec-

tions and influences that do not appear compatible with scientific models and because it touches upon the dark or shadow side of human nature, Dossey succeeds in this book. It has sufficient scholarly depth of historical and scientific research to satisfy or at least competently address the intellectual resistance against acknowledging that there is a legitimate question here. In addition, and with both facility and humility, he reveals and treats the emotional reactions ("I was simultaneously deeply moved and horrified.") that keep the topic of toxic prayer and negative intentions buried away from inspection.

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Be Careful What You Pray For... You Just Might Get It. What We Can Do About the Unintentional Effects of Our Thoughts, Prayers, and Wishes by

Larry Dossey, M.D. San Francisco: Harper San Francisco, 1997. 256 pages. Hardcover \$22.00. ISBN 0-06-251433-4.

Prayer is part of our mental and emotional landscapes. "Say one for me, Rabbi;" "I'll keep you in my prayers;" "I'll remember you at Mass" — these are just a few familiar ways that believers (and sometimes, bet-hedging non-believers) bridge the gap between the material and spiritual realms. But can thoughts, feelings, intentions, and desires — in short, our subjective states — actually have an effect on God? And when other people are the focus of our invocations, where is the dividing line between intercession and imprecation?

This book's catchy-yet-elaborate title and subtitle tip the author's hand as to his philosophical position. Physician Larry Dossey believes that there is a connection between the "spiritual" and "material" worlds, existing within the human person and extending beyond to society and to God. Quite naturally, this leads to the question: What to do about it?

Dossey is also the author of *Healing Words* (1993). In the Introduction to *Be Careful...* he explains that this book is a response to some vehement condemnatory letters he received in response to *Healing Words*. Apparently, some readers charged that the experiments Dossey had done on the efficacy of prayer were heretical, blasphemous, and sinful. Given the contemporary cultural ambivalence toward organized religion, big science, and the corporate-culture of health care, this is a book that was begging to be written.

For the most part, Dossey succeeds in untangling some popular culture, ancient rituals, arcane theological data, scientific research, and old wives' tales concerning these matters. He writes clearly and with common sense. The possibility of "negative" prayer, and its implications for the pray-er and effect on the pray-ee, also fall within the scope of this book. The lines between prayers and wishful thinking, positive thoughts and blessings, certain psalms and hexes can sometimes be blurry. What really complicates matters is when

prayers, especially "negative" ones, appear to "work." Dossey gives ample evidence that the answer is "yes," negative prayers can work.

Be Careful... is divided into five parts, and outlines how our ancestors, contemporary thinkers, physicians, and others grapple with prayer, especially "negative" prayer. For me, the most satisfying section was the last, wherein Dossey looks back over the mountain of "evidence," stories, anecdotes, scientific papers, or as he calls it, "data," and seems to relax. I mean, it's an awful lot of material he's assembled. I recalled that it only took Anselm one sentence to prove the existence of God (the "greater than I am able to think" business), and here there is a paper trace a mile long to prove... what? That prayer "works?"

Personally, I believe that it does, but Dossey does not "prove" it, any more than Anselm or Aquinas "proved" the existence of God — at least not to people who do not want to believe it. For faith is, after all, faith, not knowledge.

In the final analysis, Dossey successfully defends himself against detractors, which he started out to do; he also demonstrates his sanity. As a matter of fact, he sounds serene at the book's end.

I have one reservation: the author covers so much ground that sometimes one is left with the contradictory feeling that the book is both too long and too short. To cite just one example: just when he gets going on one topic, *i.e.*, the understanding of the dark side of man's soul as propounded by Augustine in genetic terms ("The Urge to curse: our genetic shadow," p. 137), he drops it and moves on. But that is a danger of such studies that strive to be both scholarly and popular. Fortunately, Dossey's extensive bibliography offers ample extra reading for those inclined to dig deeper.

At the conclusion, the reader is left holding a handy reference and a compendium of insights and questions about the inevitable conflicts associated with the human condition. Some readers may even grow in wisdom about that oft-crowded corner of human existence where we hope to "wrest the will of God to ours." In addressing all seekers after power and/or truth, however, this book suggests to me that the most profound, and, ultimately, fulfilling prayer that a human being can ever utter is that of Jesus in the Garden of Gethsemane: "Not my will, but Thine, be done."

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Einstein, History, and Other Passions by Gerald Holton. Reading, MA: Addison-Wesley, 1996, xii + 240 pp., \$19.95 (p) ISBN 0201 407167.

Since the Enlightenment, there has been a general belief that science and technology are, on balance, positive forces. More recently, however, there has been what Gerald Holton calls a "Romantic rebellion" against science, a ten-

dency to think of it as evil. Holton, a leading physicist and historian of science at Harvard University, tries to make the debate about the rightful place of science in our culture "more understandable — first, by baring its historical roots and then by focusing, as a concrete example, on Albert Einstein's profound and lasting impact on our civilization" (p. ix).

Holton considers the public image of science, the evolution of trust in its findings, and the role in scientific discovery of imagination, intuition, and the other cognitive factors which are usually omitted from canonical descriptions of the scientific method. He shows a broad and tolerant view of the ways investigations can get started. It seems clear, though, that before the curtain falls, he wants experiments, measurements, and the testing of hypotheses.

Holton considers various aspects of Einstein's thought and work against the background of his sometimes-troubled personal life. Holton does this in order to highlight the fact that Einstein nonetheless remains the best exemplar of the scientific viewpoint and method in our century. He does not paint Einstein as larger than life, but plainly stands in awe of his intellect, his humility in the face of nature's mysteries, and other aspects of his mind and character. One chapter is devoted to Einstein's attempts to describe his own thought processes. The discoverer of relativity could not go terribly far, though, in passing along his "secrets" to other investigators. Much of his advice boils down to "Get the right ideas." But how does one do this? It's simple: Be a genius.

This volume does not presuppose extensive scientific background in the reader, although such background will certainly help. Overall, this is an accessible book. Sources are cited where needed, and there is an excellent bibliography.

Holton makes many a good point, such as the tendency of critics to confuse the social misuses of scientific findings with science itself. Knowing how to split atoms is good; using knowledge to make bombs is bad. Unfortunately, his treatment stops short of answering some important, related questions: What place does he see in the epistemological spectrum for faith, philosophy, and other alternatives to science for wrestling with other kinds of issues? What chances does he see for experimental treatment of some problems that are now considered off-limits by many scientists?

Holton accomplishes what he sets out to do and brings tremendous erudition and a lively sense of related social realities to the task. His book is well worth any intellectually curious reader's time.

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SOCIETY FOR SCIENTIFIC EXPLORATION
Announcement and Call for Papers
Fourth Biennial SSE European Meeting
9th to 11th October, 1998
NH Hotel Center, Valencia, Spain

The Society for Scientific Exploration will hold its Fourth European Meeting at the NH Hotel Center in Valencia, Spain, October 9 - 11, 1998. Christen Blom-Dahl, Consul General of Norway, will serve as Host for the Meeting, assisted by Vicente-Juan Ballester-Olmos. A number of distinguished scholars have accepted invitations to speak on three themes related to SSE's focus on the frontiers of science: the history of science, new directions in biological and medical research, and the current status of anomalies research.

Invited Speakers

I. The Life Of Science: Metaphysical Roots. Creative Growth

- Welcoming Remarks, followed by "Precognitive Remote Perception and the Third Source Paradigm," Christen Blom-Dahl (Consul General de Noruega, Spain)
- "Scientific Orthodoxy and the Challenge of Revolutionary Ideas," David Lorimer (Director, Scientific & Medical Network, Scotland)
- "Psycho-Physics: New Developments and New Links with Sciences" Marcel Odier (Fondation Odier de Psycho-Physique, Switzerland)

II. The Science Of Life: Biology. Psychophysiology. Alternative Medicine

- "Alternative Medicine in Europe" (provisional title), Kim Jobst (Editor, *Journal Alt. and Comp. Medicine*, England)
- "The Interconnectedness of Mind," Peter Fenwick (Inst. Psych. de Crespigny Park, England)
- "Music and Psychophysiology" (provisional title), Dieter Vaitl (Universitat Giessen, Germany)
- "The Fate and Future of Field Concepts: From Metaphysical Orgins to Holistic Understanding in the Bio-Sciences," Marco Bischof (Project Patienteninformation, Germany)
- "Health as a Dynamic Biological Attractor," Brian Goodwin (The Open University, England)
- "Physiological Measures and Hypnosis," (provisional title), John Gruzelier, Editor (*Journal Psychopheology*, England)

III. Lively Science: Experiments and Analysis at the Frontiers

- "Anomalous Interpersonal Interactions: Intentionality and Psychophysiology," Deborah Delanoy (University of Edinburgh, Scotland)
- "Homeopathy — Magic of Signs: A Nonlocal Interpretation," Harald Walach (Universitat Freiburg, Germany)
- "Anomalous Aspects of Intuition," Dick Bierman (University of Amsterdam, The Netherlands)
- "New Views of Evolution" (provisional title), Anne Dambricourt Malasse (Museum National D'Histoire Naturelle, France)

For Questions about the Program Contact:

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Schedule

There will be an informal reception for early arrivals at 8:00 PM Thursday evening, 8 October, at the NH Hotel Center.

A Young Scientists Seminar is planned for 8:00 PM, Friday, 9 October, the first day of the conference. For further information about this event, contact the Program Committee.

On Sunday afternoon, October 11, the SSE Banquet will be held near beautiful La Albufera lake, in a park noted for its populations of migratory birds as well as the local flora and fauna.

Registration and Accommodations

The Registration fee is Pesetas 14.800 (approximately \$120) before August 15, and Pesetas 20.300 after that date. A special reduced rate of Pesetas 7.400 is available for students. (The exchange rate fluctuates, but \$100 approximately equals 120 pesetas.) The Society banquet on Sunday afternoon, October 11, is an additional Pesetas 5.000. A block of rooms has been reserved for meeting participants at the NH Hotel Center at the rate of Pesetas 6.800 per day (double occupancy), or Pesetas 10.000 per day (single occupancy), which includes a breakfast buffet and two work meals. Special rates have been obtained for registration on or before August 15, 1998. For later payments, please add

Pesetas 4.500 per person. These special room rates are valid from Thursday, October 8 till Monday, October 12, 1998.

Hotel Address
NH Hotel Center
Calle Ricardo Mico, 1
46009 Valencia
Spain

Phone 34 + 96 347 50 00
Fax 34 + 96 347 62 52

Meeting registration and hotel booking should be arranged directly with Sr. Pablo Verdeguer White, using this form. Checks should be made out in Convertible Pesetas in order to avoid exchange rate problems. Please return the completed form and remit the gross total amount to the booking agent:

Sr. Pablo Verdeguer White
P. O. Box: 6091
46080 Valencia
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Email: euromusic@arrakis.es
Phones: 34 + 70 72 26 93 or 34 + 96 340 51 48
Fax: 34 + 96 331 08 87

Bankers: BANCAJA
Account No.: 2077 0737 74 1100047150
Swift code: CVAL ES VV
Fax 34 + 96 387 55 88

Accommodation rates include breakfast buffet and two work meals. Special rates have been obtained, subject to payment on or before August 15, 1998. For later payments please add Pesetas 4.500, per person. Room rates are valid from Thursday 8th till Monday 12th October 1998. The cost for the Banquet on Sunday 11th October, 1998, at 2:30 PM includes coach to & from the restaurant.

Note: Please contact Charles Tolbert if you wish to charge registration fees.
Telephone: 804-924-7494 or e-mail: crt@virginia.edu

YOUNG INVESTIGATORS PROGRAM

In response to the growing number of inquiries from young scholars interested in exploring the various topics addressed by SSE, the Society has recently initiated a Young Investigators Program. It is intended that the program be designed and implemented primarily by its young participants, under the guidance of Brenda Dunne, SSE's Executive Vice President for Education. As a first step to encourage increased student membership, the Council has approved a special reduced dues rate, open to any undergraduate or graduate student, of only \$25 per year.

Attendees at the Young Investigators Seminar preceding the Charlottesville Annual Meeting proposed a number of activities that might be included within the scope of this program, several of which are now underway. These include:

1. Development of a Young Investigators **webpage**, which will be a subsidiary link to the **JSE/SSE website**. This will include information about available academic or on-line courses of study, institutions offering relevant degree programs, symposia or conferences of potential interest, recommended reading lists, names and addresses of potential mentors for internships or independent research projects, and a **chat-room** for exchanging ideas or concerns. Marcel Kuijsten <mkuijsten@bigfoot.com> has agreed to serve as Webmaster for the site; anyone with information to contribute or interested in becoming involved with this project should contact him directly.
2. Implementation of a Student Intern program, whereby qualified students will be able to identify mentors from among the SSE membership willing to provide accommodation at their laboratories for on-site research practica during summers or academic break periods, and/or to supervise independent research projects. Modest funding is available, thanks to a special grant from The Lifebridge Foundation, to cover the costs of travel and subsistence for two or three such internships in the coming academic year. Interested students should submit letters of application, identifying a clearly specified project, to Brenda Dunne at the address below, and should be prepared to submit a written report on the results of that project within one year of their appointment. SSE members willing to sponsor student internships or independent projects should advise Brenda Dunne or Marcel Kuijsten of their availability, including the topics they are prepared to supervise and the times they have available for such activities, for posting on the Young Investigators **website**.
3. Compilation of course syllabi and associated reading lists addressing methodological, theoretical, philosophical, or historical perspectives of anomalies research that can be made available to other SSE members interested in teaching such a course, but lacking the time or resources to

resources for eventual development of SSE-sponsored on-line courses of study, another proposal to emerge from the seminar.

Other suggestions, still under consideration, include establishment of an essay or research contest for young scholars, publication of SSE-sponsored books or anthologies, and designation of a special session of Annual Meetings specifically for student presentations. Additional ideas and volunteers are most welcome.

It should be noted that a Young Investigators Seminar is also scheduled for the October European Meeting in Valencia, providing an opportunity for European students to become involved in Society activities and meet others with common interests. A special reduced registration fee is available for student participants.

All SSE members and associates wishing to contribute to or become involved in any of these projects should contact Brenda Dunne, SSE Executive Vice President for Education at email: bjd@princeton.edu; phone: (609) 258-5950; fax: (609) 258-1993; snailmail: C-131 E-Quad, Princeton University, Princeton NJ 08544 USA.

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