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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 $\Sigma -2 \ln p_B$, 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 (χ^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^2s with their degrees of freedom and corresponding probabilities, and the trial-based effect sizes, calculated as $Z = \sqrt{N}$ where Z is obtained as the normal distribution quan- tile 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.

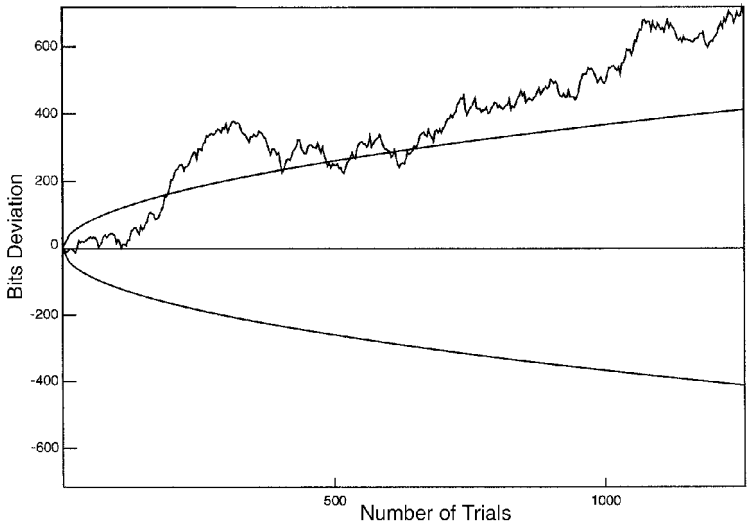

Fig. 1. Cumulative deviation of FieldREG trace during a 20-minute healing ceremony performed by a Shoshone shaman at Devils Tower. The horizontal line shows the expectation for the random walk described by the accumulating deviations, and the parabolic envelope shows the locus of the 0.05 probability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

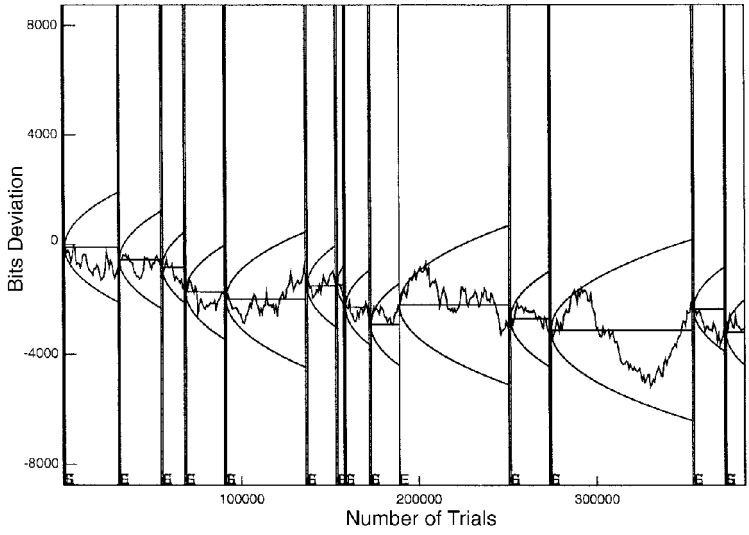

Fig. 2. Cumulative deviation of FieldREG trace during the Annual Convention of the Parapsychological Association, 1995. Vertical lines indicate the beginnings and ends of sessions, each of which contained several presentations of 15 minutes duration or more. The horizontal lines in each segment show 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 II), 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 Z-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 Z-scores in the confirmatory dataset is somewhat smaller than in the original set ($E_t = 0.0077$ compared with $E_t = 0.0049$), 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

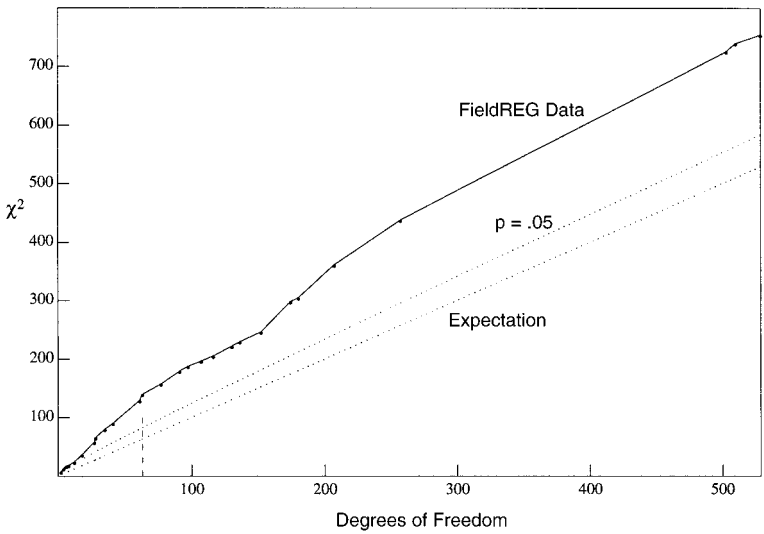

Fig. 3. Anomalous effect. The solid line shows the cumulative χ^2 over the applications in the predictor set detailed in Table 1a (the first 63 degrees of freedom, marked by a dashed line) and the applications in the confirmatory dataset detailed in Table 2a. The dotted lines show the expectation and 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-

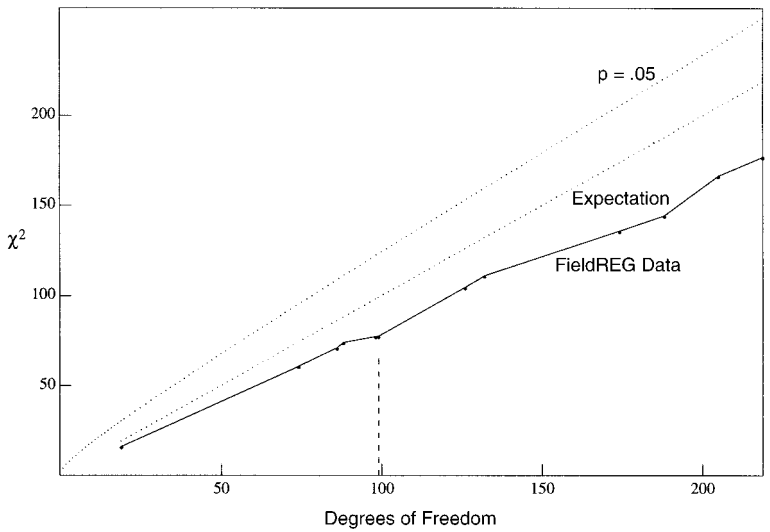

Fig. 4. Null effect. The solid line shows the cumulative χ^2 over the applications in the predictor set detailed in Table 1b (the first 99 degrees of freedom, marked by a dashed line) and the applications in the confirmatory dataset detailed in Table 2b. The dotted lines show the expectation and the 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, ± 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.

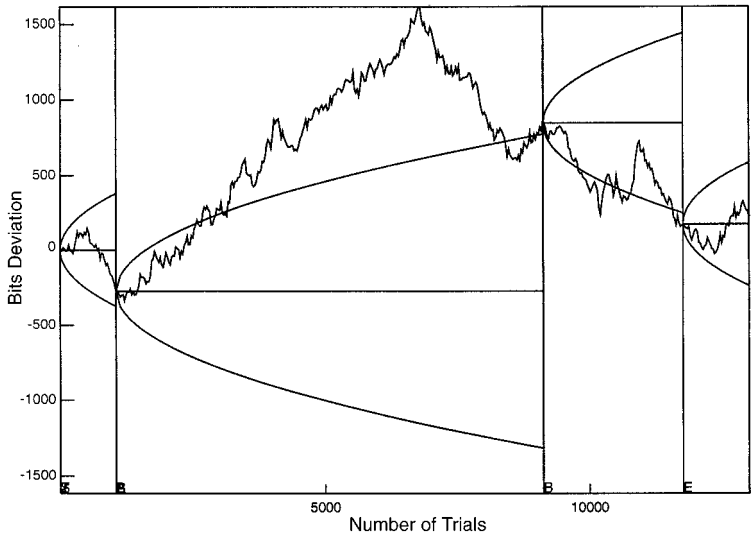

Fig. 5. Cumulative deviation of FieldREG trace during a convivial Halloween party in 1996. Vertical lines indicate index entries made at times that seemed to mark different phases of the party. The horizontal line shows the expectation, and the parabolic envelope shows the locus of the 0.05 probability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

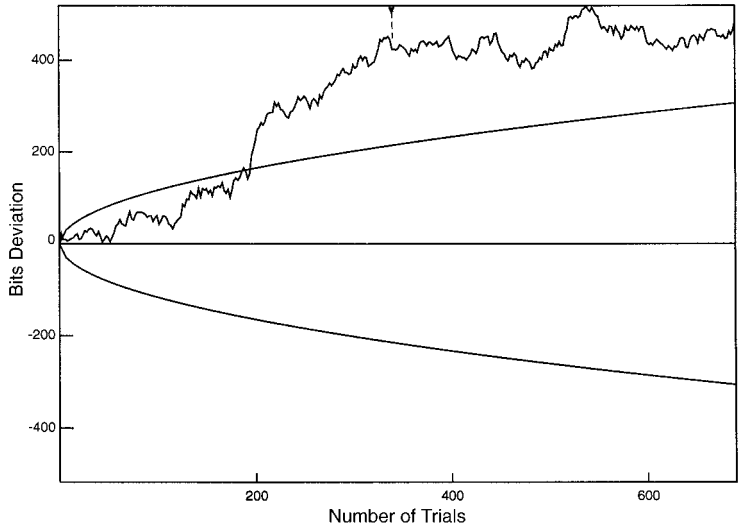

Fig. 6. Cumulative deviation of ContREG data recorded in Princeton at the time of the assassination of Prime Minister Rabin. The graph shows a ten-minute period of time exactly centered on the time of the shooting. The horizontal line shows the expectation, and the parabolic envelope shows the locus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

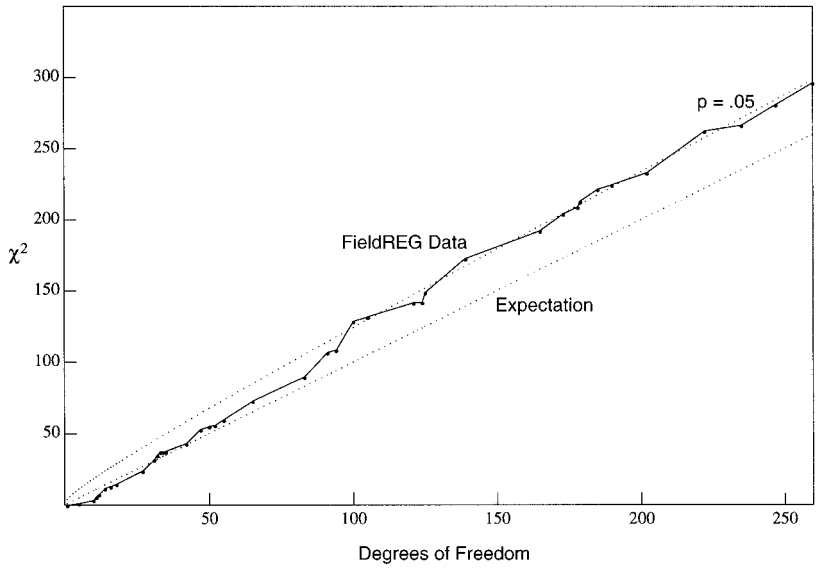

Fig. 7. Exploratory data. The solid line shows the cumulative χ^2 over all the applications in the exploratory database detailed in Table 3. The dotted lines show the expectation and the locus of the 0.05 probability for so large a deviation as the database increases.

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.

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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 undesignated 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 +/– 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 (arbcal):

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 (arbcal).
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 +/_ 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.