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Final Technical Report
Covering the Period 1 July 1986 to 15 November 1986

December 1986

ENHANCED HUMAN PERFORMANCE INVESTIGATION

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I INTRODUCTION

A. Overview

In accordance with the requirements set forth under the program, "Enhanced Human Performance Investigations" (Contract No. DAMD17-85-C-5130), this document provides a progress update for work performed by SRI International and its subcontractors during Fiscal Year 1986. The aim of the five-year program (FY 1986-1990) is to provide research and development in the area of psychoenergetics as a means to enhance human performance

B. Definitions

Psychoenergetic phenomena are defined here as direct interactions between human consciousness and the environment, which, although the mechanism is unexplained, can be observed and recorded. These human capabilities fall into two main categories: (1) the acquisition of information, and (2) the production of physical effects. These can be further defined as

- Remote Viewing (RV)/Extrasensory Perception (ESP)--The ability to gain access, by mental means alone, to concealed data or remote sites.
- Remote Action (RA)/Psychokinesis (PK)--The ability to influence, by mental means alone, physical or biological systems.

C. Program Scope

The program is designed to provide the necessary foundation to assess various aspects of psychoenergetics having the The program is highly diverse and interdisciplinary; it spans many fields and involves academic and research facilities, subcontractors, and consultants. Furthermore, it initiates an in-depth investigation into the life sciences aspects of psychoenergetic phenomena.

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D. Program Objectives

Basically, there are three program objectives: (1) to document that psychoenergetic phenomena are real and reproducible, (2) to determine the mechanism(s) underlying these phenomena, and (3) to bring the field of psychoenergetics into the mainstream of human performance research, by providing a scientific foundation equivalent to the rest of the performance research field. In the minds of some, there is no doubt that psychoenergetic phenomena are real and reproducible. In the minds of many others, both scientific professionals and informed lay persons, this is not the case.

The categories of research interest under consideration form a hierarchy ranging from basic research on fundamental mechanisms to methodologies for applications, including

- Identifying explanatory mechanisms (e.g., electromagnetic effects, neurophysiological mechanisms).
- Specifying phenomenological properties (e.g., the effects of distance and shielding).
- Determining physical, physiological, and psychological correlates (e.g., geophysical environment, EEG and GSR measures, and personality profiling).
- Developing optimal strategies for use in applications (e.g., statistical averaging).

E. Program Resources

To meet the above objectives, the SRI program is using both in-house and external expertise. For over a decade, a core group of researchers at SRI has been studying a wide variety of subjects in psychoenergetics--augmented by access to specialty centers such as our neurosciences and our microbial genetics laboratories.

Some of the work is being subcontracted to institutions, groups, and consultants who have a demonstrated track record in this research area. Other subcontractors may have had no association with this field but, because of their specific area of expertise, can make valuable contributions to our program goals. Thus, the widest possible interdisciplinary viewpoints are available to the program, and the mixture of resources will ensure that peer group review and scientific interactions are maximized. Subcontractors and consultants currently include personnel from Princeton University, Syracuse University, John F. Kennedy University, the Palo Alto Medical Clinic, MARS Measurements Associates, the Parapsychology

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Sources of Information Center, Mind Science Foundation, the University of Delaware, plus other consultants having expertise in specific areas of interest to the program.

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II PROGRESS TO DATE (U)

(U) For this reporting period, our primary progress was made in the areas of pilot and formal experimentation.

A. (U) Status of Subcontracts

(U) Table 1 shows the current status of the subcontracts for FY 1986. For administrative purposes, it was convenient to use a number of different types of contractual agreements:

- Purchase Order--Agreement for nonresearch oriented deliverables.
- Consultant--Agreement for a single individual within a large organization.
- Services Contract--Agreement for contracts having total funding of less than $100K.
- Full Subcontract--Agreement for contracts having total funding of greater than $100K.

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Table 1

(U) STATUS OF SUBCONTRACTS FOR FY 1986

Obj	Task	Institution	Subcontract Type	Funding per Year	Human Use	Contract Awarded	Technical Monitor
A E	3 4	Princeton University	Purchase Order	$22 K	no	8-Jan-86	May
A	3a	PRL	Services Contract	$16 K	no	unknown*	May
B	1	PSIC	Purchase Order	$45 K	no		Hubbard
C	1	Palo Alto Med. Clinic	Purchase Order	$109K	yes	5-Nov-85	Thomson
C	2	MARS Associates	Purchase Order	$38 K	no	7-Nov-85	Humphrey
C	5	Stanford Med. Sch.	Consultant Agreement	$16 K	yes	7-Feb-86	Lantz
D	1	Consultants International	Purchase Order	$34 K	no		May
E	5	Syracuse University	Services Contract	$38 K	yes	24-Jun-86	Hubbard
E	6	Mind Sci. Foundation	Services Contract	$16 K	yes	23-Jun-86	Hubbard
E	7	Time Res. Institute	Full Contract	$107K	no	terminated 19-May-86	Hubbard
E	8	JFK University	Services Contract	$28 K	yes	27-Jun-86	Hubbard
E	9	University of Delaware	Services Contract	$16 K	yes	19-Jun-86	Humphrey

* Contract was not awarded due to administrative delays at PRL.

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(U) The final contracts with Syracuse University, Mind Science Foundation, John F. Kennedy University, and the University of Delaware were signed and in place as of the end of the third quarter. The contract with Time Research Institute was terminated as a result of extensive review of the subcontractor's Statement of Work and qualifications.

B. (U) Progress to Date for Each Objective/Task

(U) The progress to date for each Objective and Task is described below in the order of its occurrence in the Statement of Work. Financial information for the budgeted and actual costs for each task has been provided. For those cases in which the cost differences exceed six percent, a brief explanation is afforded for the cost over- or underrun. A

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summary table of the finances and a detailed description of this budget adjustment may be found in Chapter VI.

1. (U) **Objective A, Task 1--Statistical Protocols and Research Design**

a. (U) **Technical**

(U) The Scientific Oversight Committee (SOC) met for the first time on 6 January 1986 to discuss and review the protocols for the proposed experiments for FY 1986.

(U) The primary mission of the SOC is threefold:

- To review (in advance) experimental protocols, and to provide critical comments where necessary.
- To volunteer to monitor specific experiments in detail. A volunteer will observe the experiment in progress, determine if the original protocol specifications are being met, and review the final report as if it were a journal article.
- To recommend directions for future research.

(U) A total of 17 protocols were submitted for review. The SOC found that the SRI protocols were in order and, except for one (Objective E, Task 7), the comments reflected a search for clarification on specific points. The comments for E/7 questioned the proposed approach by one of our subcontractors, Time Research Institute (TRI). The resolution of the TRI subcontract issue is detailed in Chapter III, *Problem Areas*.

b. (U) **Financial**

(U) Of the $37.5K initially budgeted, $34.0K was spent.

2. (U) **Objective A, Task 2--A Posteriori Assessments**

a. (U) **Technical**

(U) On 6 and 7 November 1986, SRI reconvened with the SOC for a year-end review of the FY 1986 program. As a result of these meetings, the SOC provided *a posteriori* assessments of the FY 1986 experimental designs and protocols. These assessments can be found in Appendix A; SRI has appended explanatory commentary to the SOC reviews where appropriate.

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b. (U) **Financial**

(U) Of the $37.5K initially budgeted, $9.8K was spent. *A posteriori* assessment was not completed as of 4 October 1986. Therefore, this task was underspent.

3. (U) **Objective A, Task 3--Host RV Analysis Conference**

a. (U) **Technical**

(U) On 26 September 1986, the Princeton Engineering Anomalies Research (PEAR) laboratory at Princeton University hosted an RV analysis conference. Two SRI staff attended the conference. We exchanged information about the difficult RV analysis question in general. Specifically, we were given a descriptor list and scoring algorithm for their current system, FIDO. FIDO will allow an analyst to give partial credit to a target or response element. After examining the FIDO material, we concluded that our fuzzy set technology accomplished that same objective, and was broader in scope. Thus, we have rejected the PEAR RV analysis technology at this time.

b. (U) **Financial**

(U) Of the $11.0K initially budgeted, $10.8K was spent.

4. (U) **Objective A, Task 4--Improve RV Evaluation**[1*]

a. (U) **Technical**

(U) The FY 1986 evaluation effort has resulted in (1) refinement and extension of current techniques, and (2) identification of new technologies that will be candidates for preliminary research.

(U) The mathematical formalism for the current evaluation procedure--the figure of merit analysis--is well understood and stable. In essence, it is a simplified automated procedure for the analysis of free-response material. As in earlier similar procedures, the target and response materials are coded as yes/no answers to a set of questions (descriptors). By definition, this coding defines the complete target and response information. The accuracy of the response is defined as the percent of the target material that is correctly described (i.e., the number of correct response bits divided by the total

[*] (U) In-depth discussions of specific tasks can be obtained in their respective 4th Quarter FY 1986 final and/or interim technical reports, which are numerically annotated in each subsection heading, and are listed at the end of this document.

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number of target bits = 1). The reliability of the response is defined as the percent of the response that is correct (i.e., the number of correct response bits divided by the total number of response bits = 1). The figure of merit is the product of the accuracy and reliability.

(U) The advantages and weaknesses of the figure of merit system have been identified and have been discussed (along with examples) in the FY 1986 final report for this task. One of the system's primary advantages is its ability to provide a mechanism for systematic examination of inter-analyst reliability factors, in addition to providing a reasonable assessment of remote viewing data. Mean chance expectations (MCE) have been calculated for the figure of merit, and recommendations have been made to extend current techniques and to explore new technologies in FY 1987.

b. (U) Financial

(U) Of the $189.0K initially budgeted, $194.7K was spent.

5. (U) Objective B, Task 1--Resource Library[2]

a. (U) Technical

(U) The Parapsychology Sources of Information Center (PSIC--Rhea A. White, Director) has just completed the first year of a multiyear effort intended to provide and maintain an extensive data-base facility for parapsychological literature. During this first year, PSIC purchased the necessary hardware and software and implemented the first working version of the data base. In addition, the PSIC has entered approximately sixteen years of abstracts for each of the major parapsychological journals, ending with the current issue. The overall goal is to eventually include abstracts of bibliographic information of the entire literature of parapsychology in the data-base. Although the core of the data base will consist of English-language parapsychological journals, it will also include books, chapters, dissertations and theses, separate reports, and conference proceedings. Additionally, the data base will include abstracts (in English) of parapsychological literature not originally written in English, as well as articles on parapsychology in the journals of other disciplines (e.g., psychology, psychiatry, physics).

b. (U) Financial

(U) Of the $45.0K initially budgeted, $44.7K was spent.

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6. (U) Objective C, Task 1--Health Assessments

a. (U) Technical

(U) Those individuals who have been selected (from the larger subject pool) to participate in experiments have been asked to undergo a medical examination to include

- Height, weight, pulse, and blood pressure
- Blood analysis to include
  - Hgb or Hct
  - Urea nitrogen
  - Sugar
- Urinalysis for albumin or sugar.

(U) Scheduling of medical examinations for experiment participants commenced during the third quarter, and eleven individuals have undergone examinations as of the close of FY 1986.

b. (U) Financial

(U) Of the $118.9K initially budgeted, $55.6K was reprogrammed to Objective E, Task 8. Thus, $58.3K was budgeted and $52.5K was spent. The original budget assumed that all 100 potential participants in the project would be required to have a medical exam. Later, it was decided that only the actual participants need take the exam.

7. (U) Objective C, Task 2--Personality Assessment[3]

a. (U) Technical

(U) In the continuation of a promising FY 1984 effort, the development of remote viewing (RV) subject selection criteria has continued to center, primarily, on performance-based psychological testing, and secondarily on the use of self-report instruments. The particular performance battery that was used both in this study and in the earlier FY 1984 study is the Personality Assessment System (PAS). The PAS provides a comprehensive interpretive framework for profiles of subtest performances that have been generated by the Wechsler Adult Intelligence Scales (WAIS). The principal self-report test under examination was the Myers-Briggs Type Indicator (MBTI).

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(U) A subject pool of 95 candidates, who completed the PAS and the self-report tests, was created by the end of FY 1986. On the basis of hypotheses formed from the previous FY 1984 effort, nine participants were selected from the pool of new candidates for inclusion in SRI's novice RV training group. A protocol was established to maintain SRI control over subject anonymity, and to ensure that all participants involved in the PAS/self-report testbed remained blind to the predictive criteria.

(U) At the conclusion of the FY 1986 novice training program, the predictive ability of the PAS was assessed. Results indicate that the PAS provided a conceptual replication of the earlier FY 1984 PAS effort: i.e., in the earlier study, the PAS was used successfully to predict the top performer out of each of three different training groups; in FY 1986, the PAS was used effectively to predict two out of the top three performers in a single training group.

b. (U) Financial

(U) Of the $38.0K initially budgeted, $38.4K was spent.

8. (U) Objective C, Task 3--Screen for RV Subjects

a. (U) Technical

(U) In conjunction with Task 2 above, MARS Measurement Associates has completed the PAS analysis of approximately 95 individuals. To maintain experimental protocol, it is necessary that SRI personnel remain uninformed as to the details of this analysis.

b. (U) Financial

(U) Of the $50.0K initially budgeted, $53.4K was spent, which resulted in an over-expenditure of $3.4K. Start-up costs were slightly larger than expected, and we had anticipated (based upon past experience) that some of the participants would not charge their time to project during their exams. The latter assumption was not true. Thus, the slight overrun.

9. (U) Objective C, Task 4 (now Objective A, Task 3a) Meta-analysis

a. (U) Technical

(U) Not applicable.

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b. (U) **Financial**

(U) The contract was not awarded because of administrative problems at the Psychophysical Research Laboratories. Of the original $16.0K budgeted for this task, $8.0K will be carried forward to FY 1987. The remaining $8.0K was used to cover unscheduled administration costs.

10. (U) **Objective C, Task 5--Neuropsychological Assessment**[4]

a. (U) **Technical**

(U) One of the long-term goals of the neuropsychological assessment project, should we be able to demonstrate reliable and consistent psychoenergetic functioning, is to assess the role of brain mechanisms and processes in the mediation of psychoenergetic output. As a beginning effort in this direction, a neuropsychologist, Dr. Ralph Kiernan, was contracted on a consulting basis to (1) review the Personality Assessment System (PAS) data, and (2) based on patterns found in these data, develop specific hypotheses that could be tested with a series of neuropsychological tests. His efforts resulted in a critique of the PAS as personality measure, a theory of psychoenergetic function involving the frontal lobes, and a battery of tests to examine positive frontal function as correlated with significant psychoenergetic functioning.

b. (U) **Financial**

(U) Of the $16.0K initially budgeted, $12.2K was spent resulting in an underexpenditure of $3.8K. Dr. Kiernan did not require as much time as he originally estimated to fulfill the requirements for this task.

11. (U) **Objective D, Task 1--Develop RV Training Protocols**[5]

a. (U) **Technical**

(U) At SRI, the apparent ability of certain individuals to provide correct descriptive information of concealed photographs or remote sites has been designated Remote Viewing (RV). While latent ability and motivation undoubtedly play a significant role, certain accomplished remote viewers have *claimed* that RV can be taught and learned to varying degrees. In FY 1986, SRI awarded a subcontract to Consultants International (CI) for the purpose of providing a detailed report by an expert viewer of the subjective experiences associated with RV. The goal of CI's report was to suggest procedures that might evolve into a testable training methodology. SRI furnished an additional report to present, in abbreviated

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form, the basic principles and techniques that CI proposed. For the purpose of testing the value of these ideas as a training methodology, two key concepts have emerged. These two concepts are that: (1) a perceptual "window" or "channel" to RV data may be briefly opened *on demand* through proper application of a stimulus-response type technique, and (2) once access to the target has been established, correct impressions are fleeting, vague, and generally indistinct in outline; this information is captured as "bits" of data, which are said to have a symbolic character.

b. (U) **Financial**

(U) Of the $34.0K initially budgeted, $33.7K was spent.

12. (U) **Objective D, Task 2--Test and Develop RV Training Protocols**

a. (U) **Technical**

i. (U) **Novice RV Training**

(U) In FY 1986, SRI began a novice RV training program, using nine individuals selected by psychological profiling and a training technology based on the two concepts outlined under Task D-1 above. The results of this experiment will be reported at the end of the first quarter of FY 1987.

ii. (U) **Advanced RV Training**

(U) Two experienced remote viewers (Number 009 and Number 342), who have been responsible for helping to formulate advanced training directions, were formally calibrated during FY 1986. Viewer 009 was tested in an experimental series involving *National Geographic* Magazine targets; Viewer 342 was calibrated in a series using outbound sites in the San Francisco Bay Area. Both percipients demonstrated strong, statistically significant evidence of functioning.

(U) In the advanced training program, hypothesis formulation and testing is currently underway in conjunction with Consultants International. Three out of four advanced training participants produced statistically significant RV results in an experiment designed to test whether production of photons occurs concomitantly with successful RV (see 13.a.i. below).

b. (U) **Financial**

(U) Of the $377.0K initially budgeted, $388.2K was spent.

13. (U) Objective E, Task 1--Fundamentals

a. (U) Technical

(U) The two experiments under Fundamentals that were approved by the SRI Human Use Review Board (HURB) involve (1) a replication of an FY 1984 study claiming weak correlation between RV figure of merit and the noise emanating from a photomultiplier,[4] and (2) a study of dependency of RV quality upon feedback parameters. The instrumentation necessary for both experiments has been installed in newly acquired laboratory space. Final reports detailing the results of both experiments will be delivered at the end of 3rd Quarter FY 1987.

i. (U) Photomultiplier Experiment[6]

(U) We conducted a replication of work published in FY 1984 in which we experimentally examined the possibility that light is emitted in the vicinity of correctly identified remote viewing (RV) target material. In that earlier experiment, a state-of-the-art, ambient temperature, photon counting system was used to monitor the target material (35-mm slides of *National Geographic* Magazine photographs). The statistical measure derived from the photon counting apparatus in that study showed a significant positive correlation with the RV results ($p \leq 0.035$). That is, when the remote viewing was good, there was an increase in the signal detected by the photon counting system. In addition, we observed two anomalous pulses having a signal-to-noise ratio of about 20-40:1.

(U) In the FY 1986 experiment, we improved all hardware aspects of the previous work, substantially reducing the background noise level, and improving shielding against artifact. In addition, analysis of the remote viewing indicates that three out of the four viewers produced independently significant results. If the probability of success is $p \leq 0.05$, the binomial probability of obtaining three out of four successful results by chance is $p \leq 0.00048$. These RV results are substantially better than those achieved in the FY 1984 study. At this time, we have not completed the detailed statistical analysis comparing the photomultiplier tube (PMT) output with the RV results. However, all data collection is complete and visual inspection of the RV trials does not reveal any large anomalous pulses. Our preliminary conclusion is that the anomalies observed earlier were the result of transients in the experimental apparatus arising from normal sources.

ii. (U) Feedback Dependency Experiment[7]

(U) The issue of information source in a correct remote viewing (RV) response has practical implications for experimental protocols as well as for defining the

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mechanism involved. In an attempt to partially address the issue of information source, we designed an experiment to examine the role of feedback in an RV experiment.

(U) For purposes of learning, immediate feedback (in the form of pictorial representations of target material) has become a standard part of our RV protocol. We wish to determine the degree to which the quality of an RV response is a function of the magnitude of feedback.

(U) Four calibrated remote viewers will receive tachistoscopically delivered feedback of target pictures at varying intensity levels. Figure of merit analysis of RV data will be correlated with the intensity level of the feedback.

b. (U) Financial

(U) Of the $252.0K initially budgeted, $265.9K was spent. The 5.5% overrun on this project is because of minor additional administration costs and unforeseen task start-up costs.

14. (U) Objective E, Task 2--Search[8]

a. (U) Technical

(U) One reported psychoenergetic skill, known to the general public as "dowsing," is the ability to locate lost or hidden items of interest. In an effort to bring this putative ability that we call "search" into the laboratory, we conducted a computer-assisted-search (CAS) experiment. Participants scanned a computer graphics display and attempted to locate a hidden computer-generated target. We explored two conditions: (1) the target was fixed in space--space condition, and (2) the target was randomly shifting locations each millisecond--time condition. Eight of 36 participants showed above chance ability ($p < 0.027$) to find computer-generated targets in our laboratory simulation of dowsing ability. This replicates and extends the results of work done in FY 1984, and provides a pool of individuals for a formal study of search techniques. A final report detailing advances in search technology will be delivered at the end of the 3rd Quarter FY 1987.

b. (U) Financial

(U) Of the $252.0K initially budgeted, $263.2K was spent. The 4.4% overrun on this project is because of minor additional administration costs and unforeseen task start-up costs.

15. (U) Objective E, Task 3--Pseudorandom Number Generators (PRNG)[9]

a. (U) Technical

(U) The hypothesis under test with the pseudorandom number generator (PRNG) experiment is whether individuals are able to make a decision (and subsequently act upon it) based upon information available only at a future time. We have developed a model, called Intuitive Data Sorting (IDS), that might account for such an ability. The particular mathematical formulation of the IDS model applied to PRNG experiments contains a specific prediction: the z-score distribution derived from the PRNG data will possess a variance significantly greater than one. A secondary consideration is to determine whether the variance contains a sequence length dependency. We accomplish this by varying the sequence length resulting from a single press of a button.

(U) In 1985, Radin and May* reported pilot results for two participants (Number 105 and Number 531) who were selected on the basis of past successful performance in PRNG experiments. In the 1985 pilot experiment, participants 531 and 105 contributed 500 and 298 trials respectively. The analysis showed that neither of the participants produced sequence length dependencies different from MCE (i.e., a slope of -0.5). However, the analysis revealed that both individuals showed independently significant evidence for IDS (i.e,. the intercepts were significantly above MCE at the $p < 0.005$ level for each participant). Thus, our tentative conclusion from these data is that IDS appears possible, at least with these two participants.

(U) During the FY 1986 program, we conducted the experiment in two phases: a screening phase and an experiment phase. For the screening phase, we asked 20 individuals to contribute 100 trials each under the protocol described above. All but four of them completed this task. For availability reasons, the remaining participants contributed varying numbers of trials (less than 100). We had decided to select seven individuals from within the pilot group to participate in a formal PRNG IDS experiment. The criterion for being included in the formal group was that the participant had to produce a significant increase above MCE of the variance of the z-score distribution over 100 trials (the MCE variance = 1.0).

* (U) Radin, D. I., and May, E. C., "Testing the Intuitive Data Sorting Model with Pseudorandom Number Generators: A Proposed Method," *Proceedings of the Presented Papers of the 29th Annual Parapsychological Association Convention*, pp. 539-554, Sonoma State University, Rohnert Park, California (August 1986) UNCLASSIFIED.

(U) Of the 16 participants who finished the 100 trial series, only one, Number 531, met the above requirement (variance = 1.37, $p < 0.008$). The second best performer, however, produced a variance = 1.21 ($p < 0.07$). Judging from the 1984 study, we would not expect to see a significant intercept after only 100 trials, and none were observed.

(U) While it is particularly interesting that Participant 531 maintains his/her consistent performance, we felt that we should continue the pilot screening until we are able to select seven significant participants. Thus, at this point, we have nothing to report for the formal experiment.

b. (U) Financial

(U) Of the $62.5K initially budgeted, $64.0K was spent.

16. (U) Objective E, Task 4--IDS Test[9]

a. (U) Technical

(U) We have been in the process of developing a comprehensive model of psychoenergetic functioning called Intuitive Data Sorting (IDS). Extending purely philosophical arguments, we derive specific mathematical predictions for the interpretation of random number generator experiments. In our analysis of an RNG experiment conducted at the Princeton Engineering Anomalies Research (PEAR) laboratory at Princeton University, we note that we are consistent with their analysis: while the magnitude of the effects are small, they are, nonetheless, persistent and statistically robust.

(U) Unfortunately, their data were *not* collected to provide a specific test of our IDS model. Thus, the sequence lengths that were chosen and, more importantly, the number of trials collected at each sequence length, were not optimized for our test. In the extreme, if all the data were collected at a single sequence length, our IDS analysis would be completely inappropriate (i.e., the IDS formalism requires testing as a function of sequence length). To first order, these Princeton data suffer from the same problem. Sixty-five percent of the total data were collected at a single sequence length (i.e., 2,000), which was the only sequence length that scored a mean chance expectation. Because the data were not collected uniformly as a function of sequence length, it is difficult to interpret the results of analysis. It is, therefore, premature to speculate upon forms of either remote action (RA) or IDS models that can fit their data.

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b. (U) Financial

(U) Of the $11.0K initially budgeted, $10.9K was spent.

17. (U) Objective E, Task 5--RA Effects on RNGs[10]

a. (U) Technical

(U) In FY 1986, SRI awarded a subcontract to the Communication Studies Department at Syracuse University for the purpose of determining the effects of distance between remote action (RA) subjects and random number generators (RNGs) and to determine subjects' performance differences in influencing RNG's based on fundamentally different sources of random noise. This subcontract is in part a "joint venture," because SRI is providing three different RNGs and a computer-controlled communications link to serve as the "distant" half of the experiment.

(U) Unforeseen delays arose in the subcontracting process, and as a result the subcontract was not in place until 24 June 1986. These delays were due to questions regarding the use of human subjects, differences in the cost-accounting procedures of SRI and Syracuse, a dispute over the publication approval process, and the designation of a new principal investigator at Syracuse. (Professor Edward Storm has replaced Dr. Robert Morris who moved to Edinburgh University in January of 1986.) As a consequence of the delayed start, no experimental data were recorded as of 15 November 1986. However, all of the specialized hardware and software necessary to generate random numbers from a noise diode, β-decay, and a pseudorandom algorithm have been developed and debugged. In addition, the telecommunications data link software has been written and test data have been successfully transmitted between SRI and Syracuse. The staff at Syracuse has volunteered to complete the pilot and confirmation experimental work so that we anticipate receiving a report on the outcome during FY 1987.

b. (U) Financial

(U) Of the $38.0K initially budgeted, $37.4K was spent.

18. (U) Objective E, Task 6--RA Effects on Skin Parameters[11]

a. (U) Technical

(U) The Mind Science Foundation (MSF) examined possible remote action influences on biological systems. This experiment attempted to determine whether an

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(U)

apparent RA influence on the electrodermal activity of an individual could be explained in part by intuitive data sorting during the experiment rather than by an actual RA "force." The results provided evidence for a psi effect in the RA condition ($p = 0.019$), no evidence for a psi effect in the IDS condition, and a psi score superiority of the RA over the IDS condition, which very closely approached significance ($p = 0.08$, two-tailed).

(U) We note, however, two problems in the experimental procedure that render these results uninterpretable. One, a rest period whose duration was determined by the key participant was interposed after each effort period. Because a fundamental difference in the two conditions was intended to be a fixed versus flexible protocol, the effect of this variable rest period was to render the RA and IDS conditions indistinguishable when attempting to interpret the outcome. Second, the order in which the two conditions were carried out during the experiment was based upon the timing of a computer keyboard carriage return, which occurred while the experimenter was entering information about the subject. If we assume the existence of psychic functioning, it is clear from the above procedure that the experimenter had the first opportunity to "sort" the data. In this way, the experimenter could have enhanced the probability that the final outcome of the study would conform to his/her prejudice. In our Recommendation Section,[11] we submit alternative protocols to help alleviate these difficulties in future experiments.

b. (U) Financial

(U) Of the $16.0K initially budgeted, $15.8K was spent.

19. (U) Objective E, Task 7--Correlates with ELF and Geomagnetic Variables

a. (U) Technical

(U) As a result of extensive analysis of the subcontractor's Statement of Work and qualifications, the decision was made to terminate Time Research Institute's subcontract. This termination was effective 19 May 1986. The reasons for termination of this subcontract are outlined under Chapter III, *Problem Areas*.

b. (U) Financial

(U) Of the $107.0K initially budgeted, $106.1K was spent. While this task was halted on 19 May 1986, SRI personnel time was required for the orderly suspension of activity. Thus, there was not an appreciable savings in cost.

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20. (U) **Objective E, Task 8--RA Effects on Strain Gauges**[12]

a. (U) **Technical**

(U) Researchers from John F. Kennedy University, under subcontract from SRI, have provided five participants for a series of remote action experiments conducted at SRI. Each participant was asked to influence one of a pair of piezoelectric strain gauges, operating in anticoincidence mode, so as to produce an event above a predetermined threshold. The threshold was defined as a system output of 25 mV, where 4 mV is the normal system noise. Altogether, the five participants contributed 20 sessions, each lasting approximately 90 minutes. The last eight sessions were conducted under the most rigorous conditions, in which the sensor enclosure was in a locked laboratory adjacent to the participant's room. At that point, the participant was approximately three meters from the sensor pair. Under those conditions, one of the participants produced a total of 11 events above threshold distributed in three separate effort periods over two sessions on different days.

(U) Control trials of up to six hours in length were recorded with no one present in the experimental room but with normal activity in the rest of the building. No equivalent, uncorrelated events above threshold were detected in those control periods. Known sources of artifactual events (electromagnetic, acoustic, mechanical, infrared) were considered, and wherever possible were controlled, minimized, or measured. However, some potential but unlikely sources of artifact (such as cosmic rays or extremely low-frequency magnetic fields) were excluded from consideration in this initial series of experiments. The preliminary and pilot nature of these sessions cannot be stressed too strongly, especially because all possible sources of artifact have not been excluded. Nonetheless, our conclusion at this time is that sufficient data have been collected to warrant further investigation.

b. (U) **Financial**

(U) The $30.6K initially budgeted was later ammended to $78.8K. Of this amount, $79.9K was spent.

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21. (U) **Objective E, Task 9--RA Effects on Marine Algae**[13]

a. (U) **Technical**

(U) The College of Marine Studies of the University of Delaware has been conducting experiments with *Dunaliella* algae for a number of years. They claim that individuals are able to cause significant changes in the velocity of single algae cells. SRI International has formulated a different hypothesis to explain their putative effect--i.e., individuals initiate experimental runs at a time during which the algae will naturally swim in the prescribed fashion. This ability is called Intuitive Data Sorting. The interim technical report on this experiment contains a historical overview of the effort at the University of Delaware and a detailed outline of a proposed experimental test of the IDS model.

b. (U) **Financial**

(U) Of the $16.0K initially budgeted, $16.0K was spent.

22. (U) **Objective F, Task 1--Single Particle Hardware**

a. (U) **Technical**

i. (U) **Single α-particle Experiment**

(U) The 4th Quarter FY 1986 final report detailing the status of the single α-particle experiment is included in its entirety as Appendix B.

ii. (U) **Single Photon Experiment**[14]

(U) Since the inception of quantum mechanics, there has been a debate as to whether consciousness plays a part in determining physical reality. We propose an experiment to examine this question empirically. In a standard, few-photon Michelson-Morley interference experiment, a quantum effect (i.e., interference) is seen because of the uncertainty about which path was traversed by the photon. We will modify this standard interferometer by placing a shutter, controlled by a random event derived from β-decay, in each of the two interference paths. When both shutters are open simultaneously (i.e., equivalent to the standard setup), an interference pattern will be seen at the detector. If both shutters are closed simultaneously, no light reaches the detector. If a human

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"observer" is watching while one or the other shutter is closed, no interference is seen. E. H. Walker claims that this is so *not* because of the apparatus (i.e., the metal shutter stops light), but rather because the observer *knows* which path was traversed by the photon.*

(U) We test Walker's hypothesis by asking what happens when one shutter at a time is open and the observer does *not* know (and can never learn) which one is open when. There are two possible results: (1) an interference pattern will be seen, or (2) no pattern will be seen. If the first case is true, Walker would be correct. The metal shutter would not be sufficient to determine reality. Because consciousness (i.e., the knowledge about which shutter was closed) is the only element that was missing, we would conclude that consciousness *is* necessary to determine reality. The prevailing opinion in physics, however, is that consciousness is *not* necessary, and therefore *no* interference pattern will be seen.

b. (U) Financial

(U) Of the $60.0K initially budgeted, $59.2K was spent.

23. (U) Objective F, Task 2--Real-Time Computer and RA Hardware

a. (U) Technical

(U) We received the following real-time computer hardware and interface equipment on or near 15 March 1986:

- Sun Microsystem 3/160 computer including
  - 4 Mbytes of main memory
  - 1 75-Mbyte disk
  - 2 color monitors, keyboards, and mice
  - 1 ethernet interface
  - 1 GPIB interface for the CAMAC real-time front end.
- CAMAC interface equipment including
  - 1 CAMAC crate
  - 1 CAMAC GPIB crate controller
  - 6-channel, 50-MHz counter
  - 16-bit relay-output register

*(U) Walker, E. H., *Private Communication*, (June 1985).

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(U)

- 48-bit change-of-state module
- Dataway display
- 8-channel, 12-bit, 100-kHz transient recorder (ADC)
- 32 Kbyte memory
- Programmable clock
- Prototype module.

(U) Since that date, the real-time computer system has been working in a projection mode by controlling the photomultiplier tube and the tachistoscope experiment.

b. (U) Financial

(U) Of the $85.0K initially budgeted, $90.7K was spent resulting in an overexpenditure of $4.3K. This overrun was due to unexpected hardware failure.

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III PROBLEM AREAS (U)

As a result of the SOC comments at the commencement of the FY 1986 program, substantial criticism was directed toward the Time Research Institute (TRI) subcontract. An extensive review of TRI's proposed Statement of Work, facilities, techniques, and qualifications was subsequently carried out by SRI, and three major problem areas were revealed: (1) tenuous overall scientific justification for pursuing this area of investigation; (2) inaccurate measurement techniques employed by TRI; and (3) questionable statistical approaches proposed by TRI for data analysis.

As a result of this review, the decision was made to terminate TRI's subcontract. This termination was effective 19 May 1986. At the time of the termination, approximately $25,000 remained in this subcontract. TRI has provided an initial estimate of approximately $9,800 in termination expenses. According to Federal Acquisition Regulations (FAR), however, TRI has until one year after the termination date to formalize its claims. In addition, a determination must be made as to the disposition of the equipment purchased by the subcontractor under the present contract and the one immediately preceding. Therefore, a final settlement on the TRI subcontract is still pending.

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IV ADMINISTRATIVE COMMENTS (U)

(U) This section has been included to provide a chronological overview of the following significant technical and administrative meetings that took place during FY 1986:

- The Scientific Oversight Committee (SOC) met for the first time on 6 January 1986 to discuss and review the protocols for the proposed experiments for FY 1986.
- A technical meeting was held on 26 February 1986 with C. Honorton (Psychophysical Research Laboratories) and D. I. Radin (Bell Laboratories) to discuss technical issues concerning the meta-analysis of random number generator data.
- Client representatives visited SRI on 12 March 1986 to discuss administrative and technical issues and to obtain a program status update.
- SRI personnel met with E. H. Walker (Aberdeen Proving Ground) on 21 March 1986 to discuss the feasibility of implementing Walker's proposed single-photon experiment.
- SRI personnel attended the Personality Assessment System (PAS) annual conference that was held in Arlington, Virginia, from 18 to 20 April 1986. The purpose was to obtain an overview of current PAS applications and to determine the status of PAS acceptance within the mainstream psychological community.
- A technical meeting was held on 27 June 1986 with consultant J. Spottiswoode to discuss technical issues concerning the evaluation of RV data.
- On 25 and 26 September 1986, SRI personnel met with researchers at the Princeton Engineering Anomalies Research laboratory for technical discussions concerning RV evaluation technologies.
- On 6 and 7 November 1986, SRI reconvened with the SOC for a year-end review of the FY 1986 program. As a result of these meetings, the SOC provided *a posteriori* assessments of the FY 1986 experimental designs and protocols.

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V PROJECT MILESTONE CHART (U)

(U) The overall project milestone chart for FY 1986 is shown in Table 2.

Table 2
(U) ENHANCED HUMAN PERFORMANCE INVESTIGATION--FY 1986

Phase I		QUARTER 1	2	3	4
Objective A – Protocols: Design	Task 1	▶	●	●	
	Task 2			▶	
	Task 3	▶			◁
	Task 4	▶			◁
Objective B – Library	Task 1	▶	●		●
Objective C – Psychophysiological Profile	Task 1	▶			
	Task 2	▶			◁
	Task 3	▶			
	Task 4	▶			◁
	Task 5	▶			◁
Objective D – Training	Task 1	▶			● ◁
	Task 2	▶			
Objective E – RV and RA Parameters	Task 1	▶			●
	Task 2	▶			●
	Task 3	▶			◁
	Task 4	▶			◁
	Task 5	▶			◁
	Task 6	▶			◁
	Task 7	▶			
	Task 8	▶			◁
	Task 9	▶			●
Objective F – Hardware Construction	Task 1	▶	●		◁
	Task 2	▶			◁

Key
▶ Begin
◁ End With Deliverable
● Deliverable

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VI COST SUMMARY (U)

(U) The following is the overall project cost summary that was referenced in Chapter I, Introduction.

(U) Table 3 shows a cost summary on a task-by-task basis. The amount budgeted in the SOW for each Objective/Task was divided into project and administrative costs. The amount spent is shown as project and administrative costs also. The totals and percent differences are shown in the last two columns respectively. Any significant difference is explained under the appropriate Objective/Task heading in Chapter II.

(U) Total project expenditures are detailed in Table 4. These funds reflect expended funds, but do not include committed, but unspent, funds. The data in Table 3, however, include committed funds.

(U) The project total expenditure for FY 1986 was within $500 of the budgeted amount of $1,887.5K.

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Table 3

(U) FINANCIAL SUMMARY FOR EACH TASK

Ojective/Task	Budgeted ($K)			Spent ($K)			
	SOW	Project	Admin.*	Project	Admin.*	Total	% Diff.
A 1	37.5	35.0	2.5	31.4	2.6	34.0	9.3
A 2	37.5	30.0	7.5	1.8	8.0	9.8	73.9
A 3	11.0	12.0	-1.0	121.8	-1.0	10.8	1.8
A 4	189.0	143.0	46.0	145.7	49.0	194.7	-3.0
B 1	45.0	49.1	-4.1	48.8	-4.1	44.7	0.7
C 1	58.3	63.9	-5.6	58.1	-5.6	52.5	9.9
C 2	38.0	41.5	-3.5	41.9	-3.5	38.4	-1.1
C 3	50.0	37.0	13.0	39.6	13.8	53.4	-6.8
C 4	16.0	17.5	-1.5	8.0	-1.5	6.5	59.4
C 5	16.0	17.5	-1.5	13.7	-1.5	12.2	23.8
D 1	34.0	37.1	-3.1	36.8	-3.1	33.7	0.9
D 2	377.0	275.0	102.0	279.5	108.7	388.2	-3.0
E 1	252.0	184.0	68.0	193.5	72.4	265.9	-5.5
E 2	252.0	184.0	68.0	190.8	72.4	263.2	-4.4
E 3	62.5	37.0	25.5	36.7	27.3	64.0	-2.4
E 4	11.0	12.0	-1.0	11.9	-1.0	10.9	0.9
E 5	38.0	41.5	-3.5	40.9	-3.5	37.4	1.6
E 6	16.0	17.5	-1.5	17.3	-1.5	15.8	1.3
E 7	107.0	116.7	-9.7	115.8	-9.7	106.1	0.8
E 8	78.7	85.6	-6.9	86.8	-6.9	79.9	-1.3
E 9	16.0	17.5	-1.5	17.5	-1.5	16.0	0.0
F 1	60.0	70.0	10.0	69.2	10.0	59.2	1.3
F 2	85.0	100.0	-15.0	105.7	-15.0	90.7	6.7
TOTALS	1,887.5	1,624.4	263.1	1603.2	284.8	1,888.0	-0.03

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* Negative administrative costs means that funds must be added to the SOW budget to cover fees not covered.

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Table 4

(U) TOTAL PROJECT

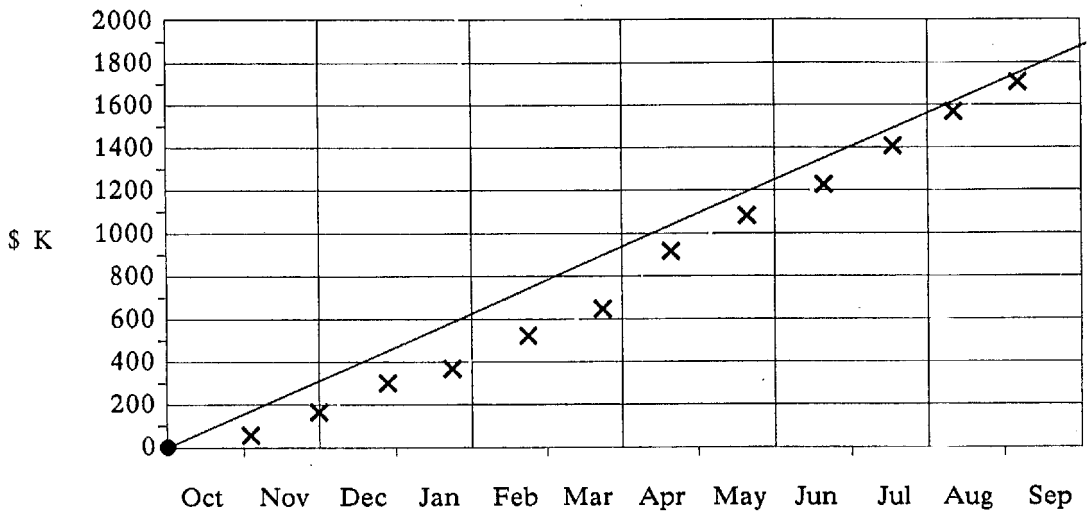

Table 5

(U) COST DETAILS ($K)

Date	Total Expenditures This Period	Total Expenditures To Date
02-Nov-85	53.109	53.109
30-Nov-85	107.265	160.374
28-Dec-85	135.855	296.229
25-Jan-86	68.857	365.086
22-Feb-86	153.748	518.834
22-Mar-86	123.111	641.945
19-Apr-86	268.206	910.152
17-May-86	167.785	1,221.392
14-Jun-86	143.455	1,221.392
12-Jul-86	181.185	1,402.578
09-Aug-86	160.550	1,563.128
06-Sep-86	139.960	1,702.878
04-Oct-86	86.627	1,789.506

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Appendix A

A POSTERIORI ASSESSMENTS OF THE SCIENTIFIC OVERSIGHT COMMITTEE*

(This Appendix is UNCLASSIFIED)

*The SOC members were requested to complete a "Reviewer's Comments" sheet (see example on next page) for each task that they had elected to review. This Appendix provides a verbatim, unedited transcription of the reviewers' (mostly hand-written) comments on a task-by-task basis. SRI responses have been appended to the reviewers' comments where appropriate.

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REVIEWER'S COMMENTS

The attached report titled:

_____

_____

has been reviewed by the undersigned.

It is my opinion that, with the following exceptions, the research design, statistical protocols employed, data analysis, and conclusions reached in this report appear to be scientifically sound and appropriate.

Please list any exceptions (if none, please say so).

Additional comments:

I do/do not recommend release of this report.

_____

SIGNED

_____

DATE

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SOC Reviewers' Comments on Final Report for Objective A, Task 4 (RV Evaluation)

(verbatim transcription--not edited)

NICK YARU

Exceptions: None.

Comments: Recommendations, especially In-House Effort are logical, intelligent extensions of previous work. Do more!

Recommendations: I do. 11-7-86

MICHAEL A. WARTELL

Exceptions: None.

Comments: Time was too short to make adequate technical evaluation of this work. I agree with the approach taken and, if mathematically correct, believe that the formalism is promising.

Recommendation: Unable to comment on technical (mathematical) issues. 11-7-86

S. JAMES PRESS

Exceptions: None.

Comments: *General*--Overall, the report presents an interesting & potentially useful collection of ideas & approaches for evaluating RV experiments. The idea of calculating a "figure of merit" is useful, as is the discussion of vagueness associated with trying to characterize what a viewer "sees," and what descriptor terms should be used. Also useful is the notion of breaking down the "view" into a small set of descriptors.

Page 1 What the viewer will see if the analyst were to stand in the middle of Golden Gate Bridge might or might not depend upon whether there were fog that day or not, which could obscure the vision & the landscape.

Page 5 Here k denotes "response number" and line 10 k denotes "target number."

Page 6 Here k denotes "session number."

Page 3 (overview)--As described, the assessment of an RV response is subjective, depending upon the analyst's interpretation of the RV's picture. I propose developing a descriptor list with broad terms, & ask a

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remote viewer to complete a form with descriptor questions himself (no intermediate analyst). In advance the correct descriptor list should be defined. Then, a comparison is easy & is objective.

Page 6 — Section (b): Why should we do a regression analysis of "figure of merit" regressed on "session number?" Unless we believe there is learning from experience (increasing number of sessions), the slope of the regression should be zero; i.e., there should be no relation.

Page 9 — Bottom line: The method developed by Fisher for combining p-values, which is referred to, involves combining p-values from independent experiments. But here, the different p-values are obtained from experiments all carried out by the same person (a "single viewer"), & that person's responses must all be correlated, so these are *not* independent p-values. Why should we combine p-values at all? There is much more to an experiment than a single characterizing value, a p-value. There are mean values for all subjects; there are standard errors; in fact, there is an entire distribution for all outcomes (replications) of the experiment. The overall distribution is much more meaningful than just a p-value.

Page 11 — While the descriptors may be limited in ability, a first step which would go a long way, is to establish an RV ability as a fact, & not worry about loosing the detail in the pictures as a viewer might be able to draw. The latter is a *much* more complicated problem. Let's solve the simpler one first.

Comments: The remote viewing project should be vigorously pursued. The research base should be expanded, & startling results should be clipped together & a file should be put together.

Recommendation: I do.

11-6-86

ROSS ADEY

Exceptions: This study uses Figures of Merit (FM) and Mean Chance Expectations (MCE) to evaluate RV. These indices appear to offer no insights on the *sequence* of events in RV that was a key development in earlier RV research at SRI by Ingo Swann, et al. Does the image build up, and if so, how? It is *not* clear how the present approach will establish anything more than very rudimentary yardsticks about the clear reality of RV. Much wider acceptance of the credibility of this phenomenon would appear an imperative goal.

Comments: This report cites but does not evaluate biases that may develop with this protocol relating to development of knowledge ("learning") about the pool of target images.

Use of Zadeh's fuzzy sets in data analysis here requires justification. The method is appropriate in its assumptions about *complexity*, but cannot be

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used in assessment of *nonlinearitus* (SIC?) that may be inherent in spatial and temporal organization of RV.

Recommendation: None. 11-10-86

EDWIN MAY

Response: Besides a notation problem that has been repaired in the RV Evaluation report, Dr. Press has two comments of substance. The most important is that he believes that our method of combining p-values across sessions for a single viewer is invalid because the RV trials are *not* statistically independent. In a follow-up letter, dated 10 November 1986, he remarks:

"*But the outcomes of the experiments carried out by the same individual are correlated, because that person has a certain ability, and he uses that ability in each of the experiments in which he is the subject.*"

We believe that Dr. Press is incorrect on this point. Our NULL hypothesis, which is the basis of our testing, is that there is *no* ability. If the NULL hypothesis is true, then a series of RVs done by the same individual is statistically equivalent to the same individual tossing a fair die--a certain case for statistical independence. Our contention is especially true in that normal free-response biases of various forms are "normalized" out of the session p-values.

It is important to note that we agree with Dr. Press' overall comment that we should focus our attention upon the information-richer distributions rather than on a single p-value. In the analysis section of this particular report, we describe the methods that we use to do just that.

In his second important comment, Dr. Press wonders why we do regression analysis on the session figures of merit. It is true there is an MCE for the regression line (not equal to zero, however), but we are specifically interested in whether our RV training techniques can be shown to be effective (i.e., a slope of the data line significantly larger than the slope of the MCE line).

In responding to Dr. Adey's comments, we wish to note that our current analysis is a crude attempt at analyzing a "natural language" description of a natural scene. To do this comparison, some quantitative description of the response and target is needed. To our knowledge, except for a few special cases in AI, this problem has not been solved in general. Our approach represents a significant improvement of the rank-order judging performed in the earlier SRI remote viewing experiments. We agree with Dr. Adey that the sequence of events in RV is particularly interesting. It is our full intention over the next four years to address this issue. The mechanism questions that he asks are of equal importance.

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This particular report *does* evaluate the effects of development of knowledge from a number of known and unknown sources. The end result of the evaluation is the MCE line.

Lastly, Dr. Adey questions our interest in fuzzy set theory. Fuzzy set technology has already had some modest success in environmental psychology in describing natural scenes. Our initial use of it, however, is quite simplistic: we will use it to provide a continuous subjective scoring of the response and target, whereas now the scoring is only binary. As a research issue, we believe we will improve the sensitivity of the descriptor list technology by using fuzzy set theory.

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SOC Reviewers' Comments on Final Report for Objective C, Task 2 (Screening and Selection of Personnel: The Personality Assessment System--PAS)

(verbatim transcription--not edited)

PHIL ZIMBARDO

Exceptions:

Give traditional statistical information in rank correlation coefficients and p-values.

See *MS* for places where elaboration/or justification is requested.

Need more information on "_____ of figure" D.V., and aspects of training--number of sessions (duration, task, feedback, etc.).

Comments:

Well written report. Good, concise overview of the PAS and personality measures.

Can you give in an appendix any more information on how WAIS subscores get *used* to form a PAS score, i.e., one example.

A model selection and testing procedure.

I would state results as predicting 3/4 best and 1/3 worst cases and as 5/9 "hits."

To answer Kiernan's criticisms, you need to state SRI's use of PAS as purely an empirically-based screening procedure (without buying Saunder's or Gittinger's theory of personality).

Prediction about a fundamental perceptual difference between RV and others. Bit-map training procedure answers remote viewing psychic ability is one of bottom-up sensation process of just extracting elementary signals from background noise; then combining, integrating these simple figures into ones of increasing detail and complexity, and finally, giving the parts a whole framework, making them into a "percept." This is how the primitive sensory system works, but is quickly over ridden by perceptual-cognitive top-down processes which impose structure, meaning, labels, and figures on elemental stimuli ASAP in the processing. If the opposite is true of good RV subjects, then it should follow that in their everyday functioning, they are more likely to be "bottom-uppers" than "top-downers" (or less likely to be top-downers). That is, they should have more difficulty (than the norm group) or take longer on tasks requiring part -> integration, but do better finding embedded figures, or decomposing wholes into parts. Just a prediction.

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Recommendation: I do. 11-6-86

ROSS ADEY

Exceptions: None.

Comments: None.

Recommendation: None. 11-10-86

BEVERLY HUMPHREY

Response: In the formal, edited version of the PAS report, statistical information for viewer performance and learning will be presented as effect-size estimates, *Pearson's r,* rather than as p-values. It was determined that effect-size estimates appropriately take into account the number of trials that a viewer performed.

Detailed information on training methodologies and analysis procedures, respectively, can be obtained in the SRI FY 1986 reports, "A Remote Viewing Training Methodology," (see Reference 5) and "Remote Viewing Evaluation Techniques." (See Reference 1.) It might be of interest to note that we are in the process of formulating hypotheses about how the current training procedures (including such issues as duration, task, feedback, etc.) may *only* be effective for certain kinds of cognitive styles and not for others. Exploratory work is underway to "tailor" training procedures to the different cognitive styles of the various PAS Reference Groups that have shown promise in psychoenergetic tasks.

The psychometric algorithms used to generate the PAS profiles are proprietary to the subcontractor, MARS Measurement Associates. It is likely, however, that we can enlist MARS' cooperation in providing a satisfactory overview of the PAS psychometric procedures, as well as a model selection and testing procedure.

The PAS is a highly complex system, and Kiernan's criticisms are based in large measure on lack of complete information about it. A subsequent meeting between Kiernan and Saunders has helped considerably to dispel some of Kiernan's misconceptions and misgivings about the PAS. Further meetings are planned for FY 1987 in an effort to resolve any possible remaining controversy. I believe that all the researchers involved in psychological screening technologies would support the opportunity to collaborate on a formal "position paper" that would provide a formal evaluation of all methodologies (including the PAS) that are currently in use.

A comparison of perceptual differences between remote viewing and other perceptual modalities would be a very interesting and important

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undertaking. The PAS program is anticipated to last five years; presumably there will be ample opportunity to explore these kinds of research issues.

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SOC Reviewers' Comments on Final Report for Objective C, Task 5 (Neuropsychological Assessment of Participants in Psychoenergetic Tasks)

(verbatim transcription--not edited)

PHIL ZIMBARDO

Exceptions: Change title. This is *not neuro*-psychological assessment, but a reanalysis of *PAS* in terms of different criteria and *suggestions* for relationships between RV good Ss and frontal lobe functioning.

Comments: I would like to see specific predictions made about neurophysiological EEG measures of frontal lobe functioning and RV processing features of RV "stars" and "no goods," & also hypotheses about differential frontal lobe involvement in other psychoenergetic functions.

Recommendation: I do. 11-6-86

HERB LEY

Exceptions: None.

Comments: None.

Recommendation: I do. 11-6-86

PHIL SIDWELL

Exceptions: Strongly recommend pursuing ideas presented in this paper. An alternative approach to the PAS is needed to determine if other psychometric batteries can successfully identify good potential RV candidates. I agree with the author's comments on the strong reliance on a large number of cells or categories--96--my impression being that it is much too cumbersome for practical-minded users to accept --I could be wrong on this, however.

Comments: See Exceptions above.

Recommendation: I do. 11-6-86

NEVIN LANTZ

Response: In response to Dr. Zimbardo's comment, the title of this report has been changed from "Neuropsychological Assessment of Participants in

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Psychoenergetic Tasks" to "Neuropsychological Exploration of Psychoenergetic Functioning."

Regarding Dr. Zimbardo's additional comments, his suggestions will be considered in experiments to be conducted in subsequent years. We will be exploring central nervous system correlates of psychoenergetic function through the use of neuromagnetometry during FY 1987.

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SOC Reviewers' Comments on Final Report for Objective D, Task 1 (RV Training Methodology)

(verbatim transcription--not edited)

CHRIS ZARAFONETIS

Exceptions: None.

Comments: It would be helpful if numbers were assigned to *each* protocol and its *informed consent* statement, and for final reports to include same as appendices. The final report should make a statement in its summary regarding any untoward events, their nature, etc.--or none during course of the study. (The Format of the report should include key points noted in the protocol--number of participants, no. and kinds of tests, etc.

Recommendation: I do. 11-6-86

MICHAEL WARTELL

Exceptions: None.

Comments: Protocols appear to be far too complicated. Simple experiments appear to be possible using bit descriptions directly and should be pursued. Data is loosely presented and, what there is, is poorly analyzed. Additionally, procedures appear to be ineffective.

Recommendation: I do. 11-6-86

PHIL SIDWELL

Exceptions: This is a position paper by Gary Langford. It presents his thinking, but is not a research report.

Comments: I discussed with Scott Hubbard the need to add instrumentation (such as EEG) to the RV session protocol to determine if RV activity can be seen simultaneously on an EEG, etc.

Recommendation: I do not. I would keep it internal to SRI. 11-7-86

PHIL ZIMBARDO

Exceptions: This is flawed report--an informal experiential analysis of the variables and processes that might affect RV Quality which at times gives the impression of being an empirical, scientific assessment of training effectiveness An outcome - evaluation study remains to be done with

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variables between operationalized pre/post measures. Good (especially ?) *data tables*--not data-masking graphs.

Page 6. Hypnosis--use as means of noise reduction only. Minimize internal distractors through specific suggestions.

Page 7, 8. Training--why not have initial training procedure use only the common RV symbols-bits (p. 7) plus some others to form a 10-unit set? This simplifies S's task and provides a more objective basis for hit/miss feedback to subject.

Note: The bit -> Composite Analysis is a "bottom-up" perceptual process, but the Interpretive Overlay Analysis is a "top-down" Cognitive process. In everyday, non-PSI transactions with the world, humans use *both*. The bit-training procedure reduces to a focus on only the bottom-up procedure--that is *not* how perception works.

Page 21. Good addition to training is to get S's to report *BITS* rather than holistic impressions.

Page 22. Question: In assessing training is there a *baseline*, pre-training evaluation of the S's RV ability? There must be one in order to demonstrate it is the training per se that transformed novices into experts--and not merely the S's unrecognized, latent ability being tapped. Remember these are self-selected volunteers who may do so with a sense of "being intuitive."

Page 31. Interpretations--Reinforcement analysis of target feedback.... "so necessary for the functioning to be developed." What about feedback of non-similarities? Does that weaken accurate functioning development?

Page 37, 38. These data are for 1 novice and 1 expert? Need to have larger sample, especially of novices' time-function allocation.

Page 39. Why reproduce Figure 2 here as Figure 7 with different captions, especially when caption for Figure 2 is more appropriate here under "Data Access?"

Page 43. Again--delete this redundancy from the report.

Page 44. Question: *Status* of assertions re: the "correctness" of the "new" information or the secondary "flood" of information and re: "at this stage the viewer will be interpreting data correctly." We need some *factual* basis for such generalizations.

Deleted in Final Subject Selection: Only 7 of 45 completed the training. (a) We need better information about the possible reason for *failure* to complete--"not wanting to devote time" is inadequate explanation. (b) Of the 7 who completed training, how many qualify as having RV ability?

Deleted in Final This is really scanty discussion of expert training. What about individual differences in style? What % of the time expert Ss are improved outcomes found with each of the two methods mentioned here.

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Page 60.	Hypotheses may be arrived at by the means mentioned here, but then they *must* be subjected to systematic evaluation by formal experiments to become "fact" or generalizations.
	A failure in this entire document is the confusion between the two classes of assertions. One never knows the evidential basis for most of the assertions presented.
Page 65.	Is it an idealized graph or data summary? If so, then we must know the N and the criterion for Quality of Viewing. Also the text confuses "practice" and "reinforcement"--they are separate.
Page 66.	This is not a "correlation."
Page 68.	Not clear what events are reinforcing in the training situation. Showing someone else's work is *not* per se vicarious reinforcement. It is only when the other person gets praised or appears to be happy over a good match.
Page 68.	Where is the data table relating "Rate of improvement and frequency of new concepts?" I do not believe that they collected RATE data.
Page 72.	Now we have a new, universal definition of *reinforcement*--visiting a target site.
Page 73.	Figure 9 is hypothesized or empirical?
Page 74.	Ditto--also how is motivation assessed?
Deleted in Final	Finally, we get the (some) data. This must be presented earlier in the report. I read this as a failure of training: 4/45 novices -> advanced training. 1/4 advanced -> expert training, and ?/1 became expert?

Zimbardo Comments continued:

A Remote Viewing Idealized Procedure--"Outbound Targets"

1. **Viewer-Subject**
   a. Does not know 2 or 3 (below) at all. OR
   b. Constraints are set -- especially target categories and viewer characteristics.
   c. Response. Viewer draws scene on computer screen with a light pen and identifies descriptive features.

2. **Objective Scene--Viewer-Sender**
   a. Does not know 1 (above) or 3 below. OR
   b. *Vary* experimentally knowledge or "intimacy" with 1 (above) across viewer subject pairs.

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3. **Targets/Display**

   a. Individual set of stimuli from large pool.

   b. Selected randomly.

   c. Targets are schematic graphics of scenes with specifiable elements.

   d. Presented on video laser disks to 2 (above).

   e. While blank screen is available to 1 (above).

   f. *A priori* set of descriptors are made by ratings of each target.

4. **Analysis**

   Data set is each pair of computer–generated targets and S's response scene which are stored in copy–protected locked files as a paired set for analysis.

5. **Monitor's**

   a. Role must be *reduced* to that of handling only "logistics" of subject–viewer's participation. (Queries, prompts must follow written standardized format––e.g., Describe major feature in scene, or Describe context, setting, background.

   b. Should have *no* knowledge of target set in general or specifically.

6. **Feedback**

   a. Should be specifically varied within the experimental design.

      i. Sessions W/O feedback

      ii. Sessions with feedback after each trial within Ss.

      iii. Sessions with alternating feedback by stimulus sets *across* Ss. (e.g., S_1 1st x trials = yes, 2nd x trials = no; S_2 1st x trials = no, 2nd x trials = yes)

   b. Involves seeing the target on the video screen *and* also the viewer's response. Perhaps include additional data collected at this point on S's reactions to the hit/miss and any reasons for a miss.

7. **Other Features**

   Some viewers may be instructed to be allowed "pass" trials on which they feel their "perceptual window" is not open (e.g., a given target may have negative symbolic value that creates "noise" which adds interference to the bit–grabbing process.

SCOTT HUBBARD

General Response: With the exception of Dr. Sidwell, the SOC comments all appear to reflect a misunderstanding of the nature of this report. This report is *not* a description of experimental results; it is *not* a statement of protocols for

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ongoing or future experiments. This report *is* an account of an expert remote viewer's subjective experiences of the RV process and his suggestions for (principally) a novice RV training program. We regret this misunderstanding and have revised the SRI overview of CI's report to strongly emphasize this point. We found Dr. Zimbardo's detailed comments to be very interesting and thought provoking. The entire set of comments has been forwarded to CI for their consideration and response. We anticipate that future discussions of those comments between the subcontractor and SRI staff will be very rewarding.

We wish to further thank Dr. Zimbardo for his suggestions for an ideal outbound RV experiment. Those suggestions will serve as a departure point for future discussions of our RV program.

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SOC Reviewer's Comments on Interim Report for Objective E, Task 1 (Possible Anomalistic Behavior of Photon Detection System)

(verbatim transcription--not edited)

NICK YARU

Exceptions: None.

Comments: Good experiment with knowledgable electrical isolation work.

Recommendation: I do. 11-6-86

HERB LEY

Exceptions: I need a briefing to explain the statistical procedures reflected in Tables 1 - 4. My questions re. procedures stem from my reluctance to accept (Table 2) an overall $p \leq 0.0488$ from a series in which 2 of 6 "p's" are < 0.05 and 2 $\approx$ 0.35, and 1 is an even 1.000. Is it appropriate to average p values [in this case p(av) = 0.3172]? Sequential probability of all 6 sets of data being the result of chance is, by my calculation, $2.6 \times 10^{-6} : 1$. These questions reflect my lack of understanding of methods used, I am sure.

Comments: Would like to see final analysis including PMT/RV correlation. Would also need to see protocol, informed consent statement, and final review to reach a comment whether human use requirements have been met.

Recommendation: I do not...until final PMT/RV correlation has been incorporated. 11-6-86

MICHAEL A. WARTELL

Exceptions: None.

Comments: None.

Recommendation: I do. 11-6-86

SCOTT HUBBARD

Response to Ley: The sequential probability calculation that Ley suggests appears to be the joint probability derived from multiplying the p-values listed in Table 2. (Although by my calculation, the value is 2.6×10^{-5} .) Such a

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calculation confuses *post-hoc* analysis with *a priori* prediction in the following way: If we had predicted in advance that the p-values obtained would be those observed, then a joint probability calculation would be correct. However, because no prediction about the p-values was made, we can only test the null hypothesis by examining the distribution of observed values as compared with the MCE distribution. One acceptable way to accomplish this is through the Fisher χ^2-test, cited in the report. An easy way to see the difference between these two approaches is to imagine a series of 10 coin tosses whose random outcome is HTTHTHHTHT. No one would claim that this outcome is extraordinary, especially because the number of heads equals the number of tails. However, applying Ley's idea, we would multiply the p-value associated with each element (0.5) ten times. This value is 0.5^{10} or 9.8×10^{-4} ! Clearly this probability would be relevant *only* if we had predicted the outcome of the coin toss in advance.

The request to review the informed consent documents, etc., was satisfied in a separate meeting of the Human Use Review Board.

Response to Press: During the verbal presentation of this experiment, Dr. Press took issue with the use of the Fisher χ^2-test. He believes that our method of combining p-values across sessions for a single viewer is invalid because the RV trials are *not* statistically independent. In a follow-up letter, dated 10 November 1986, he remarks:

"*But the outcomes of the experiments carried out by the same individual are correlated, because that person has a certain ability, and he uses that ability in each of the experiments in which he is the subject.*"

We believe that Dr. Press is incorrect on this point. Our NULL hypothesis, which is the basis of our testing, is that there is *no* ability. If the NULL hypothesis is true, then a series of RVs performed by the same individual is statistically equivalent to the same individual tossing a fair die--a certain case for statistical independence. Our contention is especially true in that normal free-response biases of various forms are "normalized" out of the session p-values.

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SOC Reviewers' Comments on Interim Report for Objective E, Task 1 (RV Feedback Dependency Experiment)

(verbatim transcription---not edited)

NICK YARU

Exceptions: None.

Comments: Appears protocols are proper to isolate feedback variable as only possible variable affecting RV performance. The issue of the information source in a correct RV response appears well thought out.

Recommendation: I do. 11-6-86

MICHAEL A. WARTELL

Exceptions: None.

Comments: Suggest accomplishing a two condition, simple experiment in which feedback is there or it isn't in order to test hypothesis initially.

Recommendation: I do. 11-6-86

BRIAN SKYRMS

Exceptions: None.

Comments: None.

Recommendation: I do. 11-10-86

NEVIN LANTZ

Response: The experiment suggested by Dr. Wartell, while appearing less complicated, is actually more difficult because of the enormous problem of entirely eliminating the feedback: it is easier to control the magnitude of the feedback than to eliminate it. Another reason for conducting the experiment as we described is to gain information about a possible interaction between routes of information transfer (real-time acquisition vs. precognition) as the magnitude of feedback varies from subliminal to supraliminal.

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SOC Reviewers' Comments on Final Report for Objective E, Task 2 (Search)

(verbatim transcription--not edited)

CHRIS ZARAFONETIS

Exceptions: None.

Comments: Same as for "A Remote Viewing Training Methodology" (No protocol or informed consent with report.)

Recommendation: I do. 11-6-86

MICHAEL A. WARTELL

Exceptions: None (edge effect mathematics needs closer scrutiny).

Comments: "Edge effects" on statistical interpretations might be handled through a spherical display. While not quite "real world" enough, it would remove the natural edge avoidance bias. Also, why not attempt the experiments without feedback, as well.

Recommendations: I do not. Question of edge effect math. 11-6-86

S. JAMES PRESS

Exceptions: I do not think the analysis is sound.

Comments: I have handwritten some four pages outlining why I feel the analysis is flawed, & suggesting an alternative experiment with an appropriate analysis.

Recommendation: I do not. 11-6-86

Analysis of *Location of Target Material in Space and Time*

p-value is not computed correctly. If d = distance observed, $p = P\{D \geq d/H\}$ = p-value.

For a given individual, there are n trials (not replications), & results are *correlated*. There is a joint probability distribution for the n trials. Results might be $d_1, \ldots, d_n$ for a given subject. $(d_1, \ldots, d_n)$ = joint probability density function for $d = (d_1, \ldots, d_n)$. There may also be learning with each trial,

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because of feedback, in which case we would expect an approximate ordering: $d_1 \geq d_2 \geq \ldots \geq d_n$. Averaging the n separate p-values ignores the trial-to-trial correlation.

A problematic issue is that some d's are more likely than others, just from the geometry of the matrix. For example, choosing the center of the matrix is likely to give smaller d's than if the subject chooses the corners.

If n subjects were to guess target position for the same *fixed* target position, then we could logically compare subjects. If we then changed the target position to a new location, & then had all n subjects again try their luck on that target, we could again compare subject's ability. Doing this k times gives us an experimental procedure that can be analyzed statistically. The experiment has 2 factors: subject factor, & target factor. Analysis of variance methodology can be used in a traditional way to seek "main effects" for subject, and subject-target interaction. We can even introduce replication by having the same subject do the same target, randomly. In this event, replications are not independent, & the correlation must be accounted for. In the same experiment, subjects evaluate different targets, so direct comparisons are extremely difficult.

By using p-values with changing targets in each trial (in the space condition) you are subject to the criticism often leveled at the use of p-values; namely, you can get whatever effect you like by taking a small, or a large sample, since the consistency of the test demands that even if the hypothesis is off only very slightly, we will reject the hypothesis with probability one. Thus, even if a small data set confirms the hypothesis, a larger data set will reject it!

Because the subjects in the current experiment evaluate different subsets of targets (there might of course be some overlap), their output "distances" from n trials for each of them have different distributions. So what is the meaning of averaging p-values?

EDWIN MAY

Response: We have examined the "edge" effects carefully with our statistical consultant, Dr. J. Utts, and found them to be both conservative and sound. Dr. Wartell's suggestion of a spherical display, however, is quite ingenious, and we plan to look into it as a modification to the approach.

In examining the analysis and the questions raised by Dr. Press, we find that he is not correct in his assessment. We plan to invite Dr. Press and Dr. Utts to SRI in early December to attempt to resolve the dispute.

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SOC Reviewers' Comments on Final Report for Objective E, Tasks 3 & 4 (Intuitive Data Sorting)

(verbatim transcription--not edited)

HERB LEY

Exceptions: None.

Comments: None.

Recommendation: I do. 11-7-86

FRED ZACHARIASEN

Exceptions: It doesn't seem to me that the data is really sufficiently good to distinguish the various models, either from each other or from the purely statistical prediction. Further, the model (IDS) violates such basic physical principles that it's highly suspect on the face of it. I'd wait with this report until there's better data. (Incidentally, no real data is shown in this report, & it should be.)

Comments: None.

Recommendation: I do not. 11-7-86

BRIAN SKYRMS

Exceptions: None.

Comments: None.

Recommendation: I do. 11-7-86

ROSS ADEY

Exceptions: (1) The study does not address the possible significance of individual social and cultural backgrounds in determining forced choices.

(2) The concept that "information from the future is available in the present" is in the realm of one-shot learning. Differences in these processes in man and planarian worms, for example, emphasize man's ability to utilize the armamentarium of past experience; and thus further emphasize the importance of evaluating social and cultural backgrounds.

Comments: None.

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Recommendation: None. 11-10-86

EDWIN MAY

Response: Dr. Zachariasen is correct in that the PEAR data does not allow us to separate RA from IDS. Also, because we have not yet completed the PRNG formal experiment, he has a point with regard to the premature nature of this report. However there are a number of points that should be mentioned in favor of releasing this as an interim report.

While it is true that we do not present the RNG data base as part of this report per se, we do reference a detailed analysis of the data base and describe the conclusions we drew from 330 separate experiments--a p-value suggesting some form of a statistical anomaly of $\approx 10^{-18}$ for the historical data base consisting of $\approx 10^9$ bits.

IDS provides a descriptive model of this historical data base that appears more parsimonious than does either RA or MCE. As such, it should be stated as clearly as possible in order for the model to receive proper scrutiny by our research community, and in order to provide guidelines for proper experimental protocols to test IDS correctly with RNGs.

We agree with Dr. Zachariasen that our proposal *appears* to violate basic physical principles, but, as we say in the report, we feel that proposing an RA explanation violates even more basic physical principles. We do not present a meta-analysis of the literature claiming evidence for information flow from the future, but our proposal is based (and referenced) upon a rather large historical data base claiming that such a phenomenon is statistically "real." It is important to note that the IDS model is a *heuristic* model in that the data are *best* fit, assuming backward flow of information.

Lastly, we do present the data from the PEAR laboratory in reduced form. Princeton provided over 23,000 individual data points consisting of 200; 2,000; 10,000; or 100,000 bits each. Data from the historical data base are also too volumnous to be included in this particular report.

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SOC Reviewers' Comments on Final Report for Objective E, Task 5 (An RNG Experiment)

(verbatim transcription--not edited)

HERB LEY

Exceptions: None.

Comments: None.

Recommendation: I do. 11-7-86

MICHAEL A. WARTELL

Exceptions: None.

Comments: Experimental protocols appear to be appropriate.

Recommendation: I do. 11-7-86

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SOC Reviewers' Comments on Final Report for Objective E, Task 6 (An Experiment to Test Apparent RA Effects on Electrodermal Activity)

(verbatim transcription--not edited)

CHRIS ZARAFONETIS

Exceptions: None.

Comments: NOTE: A *rest* period was added after each *effort period* during *actual procedure* as distinct from the protocol. Was protocol amended through SRI-IRB approval? Has this been noted for record in SRI-IRB minutes?

If RBC are to be used in FY 1987, the protocol and IC statement should show that blood will be drawn (how much, how many times) and there are possible complications from venipuncture, etc. How many subjects? How many men or women? Timing of hemolysis tests, anticoagulant used, etc., are important considerations as well.

Recommendation: I do. 11-6-86

HERB LEY

Exceptions: None.

Comments: Need to see protocol, informed consent statement, for evaluation of meeting human use requirements.

Recommendation: I do. 11-6-86

PHIL ZIMBARDO

Exceptions: The staff's abstract says: P=.08 (one-tailed) statistical test of psi superiority is reported or "very closely" approaches significance." *It does not; is not.* If P < .05 is criterion, then *any* greater value is non-significant. The data table for the Page 10, Paragraph. 2 results needs to be here.

The results in Page 15/16 indicate *no* statistical significance. No psi effect, no IDS effect.

Where are data tables--at this stage we need appendices with primary data as well.

Page 1 Remote Action (RA) -> causal effect
Intuitive Data Sorting (IDS) -> informational effect--viewer anticipates data change. Need to clearly parcel out hypotheses:

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Hypothesis 1. RA -> influences EDA

Hypothesis 2. IDS -> also occurs with EDA data

Hypothesis 3. RA effects are separable from IDS and still are significant when IDS effects are parsed out.

Page 4 — $p = .08$ is *not* significant from psi superiority. It does *not* "very closely approach significance" as asserted. If the statistical criterion of $p < .05$ is *not* met, there is not significance and should not be reported.

Pages 2 and 3 — *Method* is not clear.

a. What was the EDA measure.

b. How were subjects and influencer situated?

Recommend: DATA ANALYSES: ANOVA *Not* T-test. Mixed between--within ___. 5 sources of degrees of freedom:

1. Trials--12 (for each type)
2. Seed type--2
3. Influencers--8
4. Subjects--32
5. Type a influence (calm/activate)--2.

Question: Were these counterbalanced in some way? Also: The dependent variable (DV) is *skin resistance*.

1. How is this corrected for initial B.S.R. basal levels?
2. Is there subsequent corrections?
3. Why not carry (?) our B.S.R. differences from D.V.

ARTIFACT: Real time feedback was an uncontrolled variable, subject selected--must be controlled/included or excluded or varied (?) systematically.

The derived DV masks a lot of different effects, such as arousal vs. calming influences, and should be used *only after* the separate analyses are presented.

Comments: The SRI staff's detection and reporting of the 2 serious artifacts in this procedure which render the results "uninterpretable" is to be *commended!* Their new hypothesis and suggested paradigm (pp. 7 and 8) appear viable.

Recommendation: I do not. 11-6-86

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SCOTT HUBBARD

Response to Zarafonetis:

We regret that Dr. Zarafonetis received the impression that the IRB approved protocol was in some way modified or circumvented because of problems experienced by the participants. In actuality, the IRB protocol never specified the extremely detailed minute-by-minute experimental procedure. Since the influencer was asked to alternately activate and then calm the subject, the staff at MSF introduced the "rest" period as a natural time to reorient the influencer's thinking. It was their unfamiliarity with the IDS model which prevented them from recognizing that this small element would completely disrupt the hypothesis under test. In no way was this rest period a response to any perceived stress or fatigue by the influencer or subject. The final report has been suitably revised to clarify this point.

The issues surrounding planned experiments for FY 1987 will be addressed when the protocols are written, very likely in January of 1987.

Response to Ley: The request to obtain the consent forms, etc., was satisfied in a separate meeting of the Human Use Review Board.

Response to Zimbardo:

Dr. Zimbardo is correct that a p-value of 0.08 is nonsignificant. This phrase has been deleted from the SRI overview report. The general requests for data tables that support the statistical conclusions have been forwarded to MSF for their consideration.

As indicated by the title of Appendix A, the first set of results were for the Pilot study, which was nonsignificant, as indicated on pages 15 and 16. The results cited in the SRI overview are only for the Confirmation experiment.

The next series of comments appear to reflect a misunderstanding as to the basic hypothesis of the study. We proposed that MSF's earlier work on EDA could be *entirely* explained by the IDS model, not that there is a mixture of RA and IDS effects. Page 1 has been rewritten to emphasize this point.

In the SRI overview, we did not feel it was important to repeat the details of the EDA measurements or the physical layout of the experimental area as reported in the MSF paper. We refer Dr. Zimbardo to pp. 10 and 24 for those particular explanations.

We have referred the proposed ANOVA analysis to Dr. Braud of MSF for consideration. In a telephone conversation, however, he responded that he favors a single, simple, *a priori* defined statistical test rather than the ANOVA "fishing expedition." In Braud's opinion, complex analysis that results in a statistically significant third-order term may be more confusing than revealing.

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As described on pp. 13 and 25 of the MSF report, the trials were appropriately counterbalanced.

The next series of questions and comments seem to stem from the idea that the EDA measurements were of dc skin resistance. This was not the case. EDA is identical to GSR, which is an ac measurement of the fluctuations in skin conductance. In any ac-coupled system, questions of baseline drift are irrelevant. This observation has been incorporated into the revised report.

A detailed discussion of the possible role of real-time feedback was provided by MSF and may be found on pages 30 and 31 of the original report. Dr. Braud's conclusion was that possible artifact due to real-time feedback had been adequately excluded.

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SOC Reviewers' Comments on Final Report for Objective E, Task 8 (RA...Piezoelectric Strain Gauges)

(verbatim transcription--not edited)

NICK YARU

Exceptions: None.

Comments: Shielding (it may not be enough) is the first thought through my mind. I was impressed however with the measures employed thus far for mechanical, acoustic, heat and E.M. isolation. I worry about the window, especially at low frequencies where even double shielding flex cables are not sufficient and solid copper shield is used for EMI or antenna pattern ranges. I agree with the conclusions of the report. Consider Tempest testing of the system.

Recommendation: I do. 11-6-86

HERB LEY

Exceptions: Can't understand cell entries in Tab 1. Needs revision or footnotes.

Comments: Need to see protocols, and informed consent statement for evaluation of meeting human use requirements.

Recommendation: I do. 11-6-86

FRED ZACHARIASEN

Exceptions: It's not clear if there are 11 or only 3 events. Statistically, 3 events in 20 hours of experiment vs. 0 events in 30 hours of background is not obviously inexplicable statistically. Why is the left hand gauge more noisy?

Comments: This ought to be viewed as a preliminary description of the experiment--with next year conclusive results.

Recommendation: I do. 11-7-86

BRIAN SKYRMS

Exceptions: *Physics*: It should be possible to do much better in isolating the strain gauges from acoustic vibration. Such isolation is a standard problem in many areas and standard techniques should be available.

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Methodological: These results are so surprising that SRI should see if an independent experimenter can replicate them.

Comments: None.

Recommendation: I do not. 11-10-86

ROSS ADEY

Exceptions: (1) There should be an adequate account of subjective states of mind associated with attempts to influence the strain gauge.

(2) Since the test epochs are long (10-20 min.), these subjective accounts should be supplemented by appropriate physiological measures (e.g., eye saccods, EEG, EKGR-R, intervals, etc.).

(3) There should be a detailed account of the number, configuration and temporal distribution of strain gauge responses, with data acquisition in ways allowing strict temporal correlation with physiological events outlined under (2).

Comments: (4) The frequency response of the strain gauge in the ELF spectrum should be described.

(5) Serial spectral analyses should be made of strain gauge activity throughout control and test epochs.

(6) Strain gauge activity spectra should be examined for evidence of entrainment by weak, *coherent* ELF stimuli, in accordance with models developed for such systems by Nicolis (1969, 1972, 1983, etc.).

Recommendation: (None.) 11-10-86

SCOTT HUBBARD

Response to Yaru: We agree completely with Dr. Yaru that the window is the weakest link in the EMI shielding. This aspect of the system is discussed in Section II, 2.a, of the report, where we point out the initial psychological necessity for the subject to be in visual contact with the sensor. We also agree that there is a need for standardized testing of the unit (e.g., TEMPEST). In the Conclusions Section of the revised report, we now clearly state that future work will include appropriate EMI characterization and trials with an intact (i.e. windowless) enclosure.

Response to Ley: Table 1 has been suitably revised to make the number of effort periods in each condition as clear as possible. The request for informed consent documents, etc., was satisfied in a separate meeting of the Human Use Review Board.

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Response to Zachariasen:

In the absence of a more detailed PZT output record, we cannot be certain that signals above threshold, which are closely spaced in time, are separate events. Therefore, Dr. Zachariasen is correct in stating that a more conservative estimate of the number of events is 3 rather than 11. Although we have modified the report to reflect this point, we must point out that the *a priori* definition of an event of interest was any signal crossing the predetermined threshold. If we hypothesize that the events have a pulse-like Poisson distribution, then we can compute the probability of observing 0 counts in thirty hours, assuming an *average* of 3 events in twenty hours. That value is $p \leq 0.01$. If one assumes an average of 11 events, the probability is 6.8×10^{-8}. While not *inexplicable* statistically, the observed outcome is unlikely given the stated assumptions.

In Section IV, B., of the modified report, we discuss (in somewhat greater detail) problems of contact noise, which probably causes the slight difference in the two sensors.

We agree completely that this year's effort should be regarded as preliminary, a view unequivocally stated in the Abstract. Certainly in any future work we will address all the issues raised by Dr. Zachariasen (better time resolution, lower contact noise, longer control periods, etc.)

Response to Skyrms: Dr. Skyrms appears to proceed from a misunderstanding as to the nature of the experiment. Several times in the report, we addressed the engineering compromises that were necessary to meet the psychological requirements of the participants (i.e., visual contact with the sensor). We also pointed out the methodological steps taken to assure the credibility of the final data (e.g., enclosure isolation and session audio recording). To avoid such misunderstanding by other readers, we have rewritten the acoustic artifact discussion (to emphasize the degree of isolation actually achieved.

In his methodological comments, Dr. Skyrms has perhaps missed the point. From the very beginning, the SRI/JFK University experiment was conceived as possessing a "built-in" replication feature: No participant was allowed to begin trials at SRI unless he had first produced greater or equivalent effects at JFK. Again, to prevent future misunderstandings, we have rewritten the Introduction to make this feature even more clear.

Response to Adey: Comments 1, 2, 3, and 6 appear appropriate only after the existence of RA in PZT strain gauges has been firmly established. Comment 4, the low-frequency response of the strain gauge, was addressed in Appendix B of the report. In it we stated that the sensor has a flat capacitative response from 10 Hz to 1 kHz. Above or below these points, the electronics sharply cut off the response. As stated earlier, we plan more detailed spectral analysis in future work (Comment 5).

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SOC Reviewers' Comments on Interim Report for Objective E, Task 9 (RA on Dunaliella Velocity)

(verbatim transcription--not edited)

HERBERT LEY

Exceptions: None.

Comments: Need to see protocols & informed consent statement for evaluation of project's meeting human use requirements.

Recommendation: I do not...until it reaches final report stage. 11-7-86

S. JAMES PRESS

Exceptions: The velocity data are fitted to a normal distribution. But the data are very clearly non-normal. So the f-tests subsequently arrived at are not valid. In fact, the data are clearly "fat-tailed," so it might be sensible to try to fit a Student t-distribution, or a stable symmetric distribution to the data.

Page 8, paragraph 2: What is meant by the statement that the velocities "are not necessarily statistically independent, & cannot be considered random variables in the usual sense"? They sure seem like random variables to me.

The "scores," or the velocity changes hypothesized to be produced by human interaction, as shown in Figures 4, 5, appear to fall with the normal range of variation of the algae circadian rhythms.

The regressions carried out appear to be poor. There is clear heteroscedasticity (sic) (unequal variances in the disturbances), (Fig. 9, Fig. 10, etc.). Moreover, it is not clear much is happening. In Fig. 11, the slope appears to be zero, indicating the regression is not meaningful. Similarly in Fig. 12.

I cannot quite figure out the measuring apparatus. I cannot help wonder whether the apparatus itself affects the velocity of the algae.

I feel this experiment is looking for an effect that lies in the noise.

I would recommend "detrending" by removing the circadian rhythms (diurnal variations) from the data, instead of removing a straight line trend.

Comments: None.

Recommendation: None. 11-7-86

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ROSS ADEY

Exceptions: (1) This report resurrects the archaism that it remains to be shown that living systems exist in "indefinite" states and can "thus qualify as quantum systems."

(2) This viewpoint fails to recognize generally accepted views of the essential role of cooperativity in (sic) an essential phenomenon in biological systems (hemoglobin oxygen association–disassociation curve, retinal photon detection, auditory threshold detection mechanisms, cell membrane amplification in transductive coupling, etc., etc.).

Comments: (3) It should be known to these investigators that many key biomolecular systems function as quantum detectors. This knowledge would seem vitally important in further development of this program.

(4) The research plan envisages a separation of informational processes (intuitive data sorting, IDS) from causal factors (Remote Action, RA), with the expectation, that, if causal, "averaging over a large number of cells will produce a strong result." This is a most important concept that should be central to future studies in RV that would be based on simultaneous multi–subject testing.

Recommendation: None. 11–10–86

EDWIN MAY

Response: We agree with Dr. Press's criticism of the in–place statistical analysis reported by Dr. Pleass. There are a number of serious objections that need to be addressed before experimentation can begin.

In the one comment about our statistical analysis, he questions whether the velocity measurements are statistically independent. Because the cells appear to have at least one known nonrandom cycle (the circadian rhythm), it is necessary to demonstrate that the "detrending" (regardless of the technique) has been successful. Until this is done, it is particularly risky to use statistics that assume sample independence.

Yes, we are looking for small effects in a very noisy background.

In responding to Dr. Adey's remarks about living systems and quantum mechanics, we point out that, while living systems might be shown to be sensitive to quantum phenomena, it has *never* been demonstrated (to date) that they can exist in quantum coherent indefinite states! In fact, an ensemble of atoms $\approx 10^5$ must be cooled to 50 milli–degrees above absolute zero before such effects can be seen.

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SOC Reviewers' Comments on Final Report for Objective F, Task 1 (RA Hardware Construction: Quantum Mechanical Photon Experiment)

(verbatim transcription--not edited)

NICK YARU

Exceptions: None.

Comments: A "ballpark" experiment usually leads to controversy and a stringently controlled experiment is required for credibility. Hence verified data that two photons are not in the apparatus simultaneously is needed; how do we know a photon does not "split." Some more data may not overly complicate the proposed experiment.

Recommendation: I do. 11-6-86

FRED ZACHARIASEN

Exceptions: None.

Comments: This is a simple experiment; & since it might get rid of an apparent (though minor) controversy it ought to be carried out.

Recommendation: I do. 11-7-86

S. JAMES PRESS

Exceptions: None.

Additional comments: I am not a physicist, so I really can't comment intelligently about the soundness of the experimental setup. It does appear to me, however, to be an important experiment to run, & it looks to be straightforward to run it.

Recommendation: I do. 11-6-86

MICHAEL A. WARTELL

Exceptions: None.

Comments: Exciting experiment--look forward to seeing results.

Recommendation: I do. 11-6-86

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BRIAN SKYRMS

Exceptions: *Interpretation:* One slit being closed at a time is not a measurement but rather a specification of basic possibilities. Thus a positive result would not support Wiogner (sic) but rather falsify Quantum Mechanics.

Redundancy: I expect that essentially this experiment has been done many times, with the expected negative results. The experimenter (sic) doesn't look till the end, after many trials. I suggest a review of the experimental literature to see if this is not the case.

Comments: You might want to check some experimentalists (sic) in the EPR field, e.g., Horne (sic).

Recommendation: I do not. 11-10-86

EDWIN MAY

Response: Dr. Yaru may be confused by the prose. In this setup, all photons are "split." The question is whether the "halves" are allowed to combine again at the detector. Dr. Yaru's excellent suggestion about showing that we have a few-photon domain will be incorporated into the experimental design.

I am not sure if I understand Dr. Skyrms' comment. The quantum mechanical question centers on identifying the proper form for the state vector. In a standard Michelson-Morely interferometer, it is given by

$$\Psi = a_1 \Psi_1 + a_2 \Psi_2 \quad \text{, and}$$

$$I = \Psi \Psi^* .$$

In the case of the "unknown" shutter, is the state vector still given by the above, or does it now become $a_1 \Psi_1$ or $a_2 \Psi_2$--depending upon which shutter is closed? A positive result *would* support Wigner. All it would say about quantum mechanics is that consciousness is a necessary ingredient in the state vector collapse.

In 1982, we had done such a literature search and found only one experiment involving positron annihilation, which was ambiguous with regard to consciousness. As of January 1986, we have found no other papers.

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PHIL ZIMBARDO--GENERAL COMMENTS

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A. Formal General Assessment Statement

1. The SRI staff has done an impressive job in meeting the research objectives set forth in our initial session a year ago.

   a. A large body of research has been started and much completed.

   b. Some of the research is of sufficiently good quality to merit continued use of these promising paradigms.

2. There are enough results that are "suggestive" and "provocative" to warrant further study using some more simplified experimental procedures, improved assessment of the outcome measures, and additional statistical analyses.

3. It is my opinion, however, that the number and scope of the research projects should be limited in FY 1987-1988.

4. There should be greater quality control exercised by SRI staff over the (fewer number of) subcontractors' performance; closer monitoring of ongoing procedures; presenting clear criteria for reporting of procedural details, data analyses and general reporting procedures.

5. The SRI staff should prepare a summary statement of what paradigms, and measures seem to them to be most promising, what results they put most confidence in, and what they believe are *not* promising and should be terminated.

6. There is a concern that experimental paradigms be simplified as much as possible, that any potential source of artifact, source of criticism re deception (intentional or non-intentional) be eliminated from new protocols.

7. I remain an open-minded skeptic who believes that *if* psychoenergetic (PE) phenomena exist, the SRI group is the best possible to demonstrate it.

B. Informal

1. Breadth of focus is too broad at this time. Need a few PE demonstrations of impecable quality (limit focus).

2. Differentiation of different types of PE.

3. Theories about how PE works (future feedback, mechanisms).

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4. Training PE subjects.

5. Selection procedures for screening PE subjects.

6 Operationally defining valid, reliable measures of RV, etc., training, learning.

7. Need to simplify number of projects and procedures within project.

8. Need a statement from SRI staff about their views as to their confidence levels of belief in various PE phenomena. And what they need to increase their confidence and what they believe would increase the confidence levels of skeptics.

9. Potential application demonstrations to be done. Working for two masters--mixed directions--mixed bag of projects.

10. Obtaining scientific credibility in academic/research community of this particular project.

11. Conclusions are stated in non-conservative terms that are excessive in the scientific community "striking," "powerful," for relatively weak effects. But are necessary to convince contractor.

12. Too much is going on to expect such quality control. Action: Cut back on subcontractors; have staff member directly responsible as liaison to each sub.; set specific guidelines re: procedural safeguards, data analysis, data reporting, get preliminary proposal for staff review prior to *any* public report.

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Appendix B

SINGLE α–PARTICLE EXPERIMENTAL HARDWARE

(This Appendix is UNCLASSIFIED)

by

G. Scott Hubbard

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SINGLE α-PARTICLE HARDWARE

Objective F, Task 1

We have designed and constructed hardware that will be used to test for the existence of remote action (RA) by examining the geometrical distribution of a beam of α-particles as a function of the attention of selected participants. The hypothesis under examination is that an RA interaction will cause an α-particle to be deflected into a position where it would never appear under "normal" circumstances. In the proposed experiment, a low-intensity (≈ 100 counts/second) collimated beam of α-particles will be allowed to drift, in a vacuum, approximately 1 cm from the radioactive source to a position sensitive radiation detector. The detector will be capable of registering the arrival of single particles. During the experiment, individuals will be asked to produce a deflection of the beam by "mental" means alone. Figure B-1 displays the conceptual approach to the experiment.

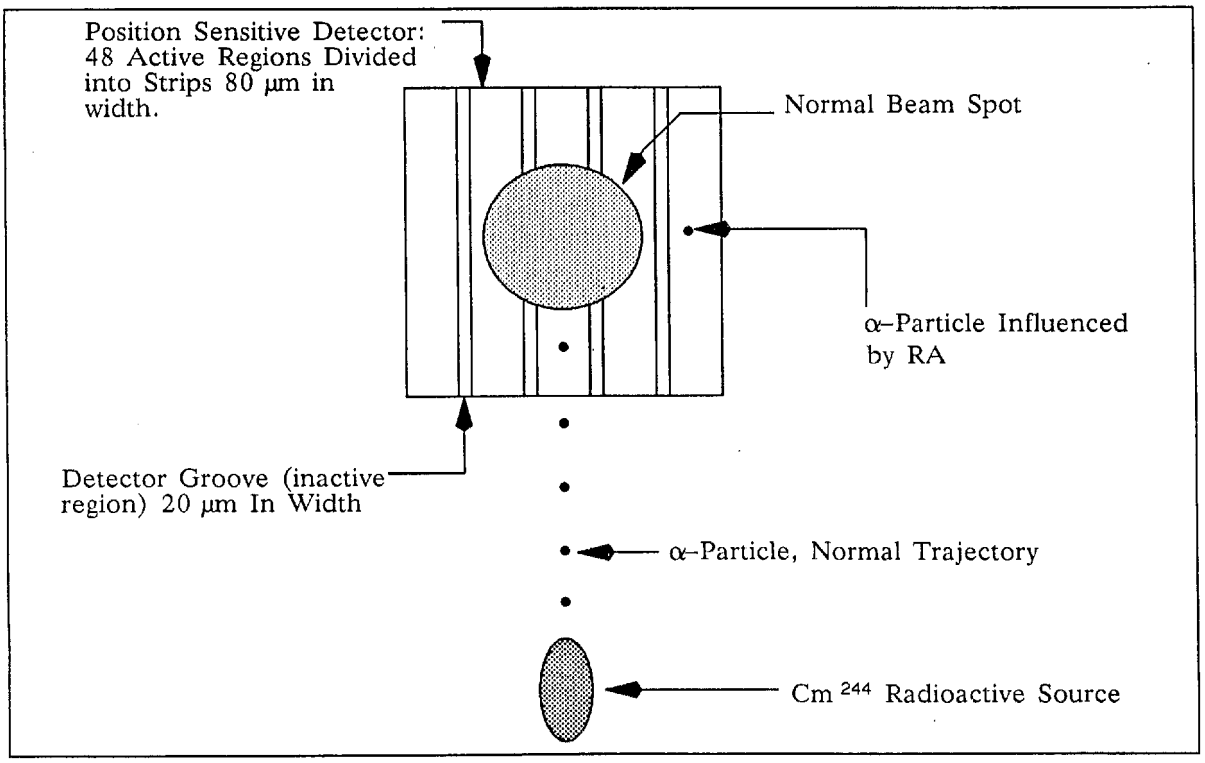

FIGURE B-1 CONCEPTUAL CONFIGURATION OF AN α-PARTICLE EXPERIMENT

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This conceptual approach was adopted for the following reasons:

- If RA exists, it is plausible to assume that a mental interaction with matter might be mediated by electromagnetic forces. This assumption is partly based on many years of published claims in the parapsychological literature that RA (more commonly known as psychokinesis or PK) can affect electrical and mechanical apparatus.
- An α-particle, consisting of two protons and two neutrons, represents an extremely simple and well-understood electromagnetic target.
- Macroscopic RA sensors (such as strain gauges) are sensitive to many influences such as mechanical vibration, acoustic energy, infrared radiation, and electromagnetic fields. With a suitable vacuum environment, the α-particle should be affected only by electromagnetic and gravitational forces.

The four hardware elements that are crucial to this experiment are a suitable radioactive source, a position sensitive detector, an appropriate data acquisition system, and proper environmental monitoring and conditions. Figure B-2 shows a schematic layout of the entire system. Figure B-3 displays the actual hardware.

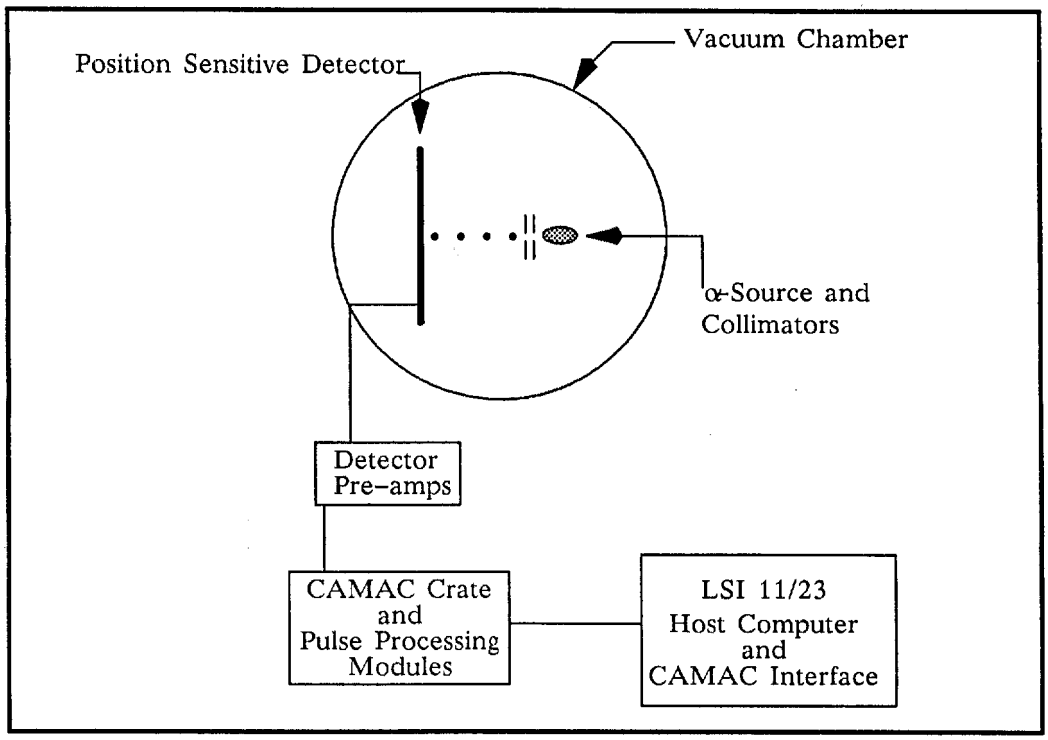

FIGURE B-2 SINGLE α-PARTICLE RA APPARATUS

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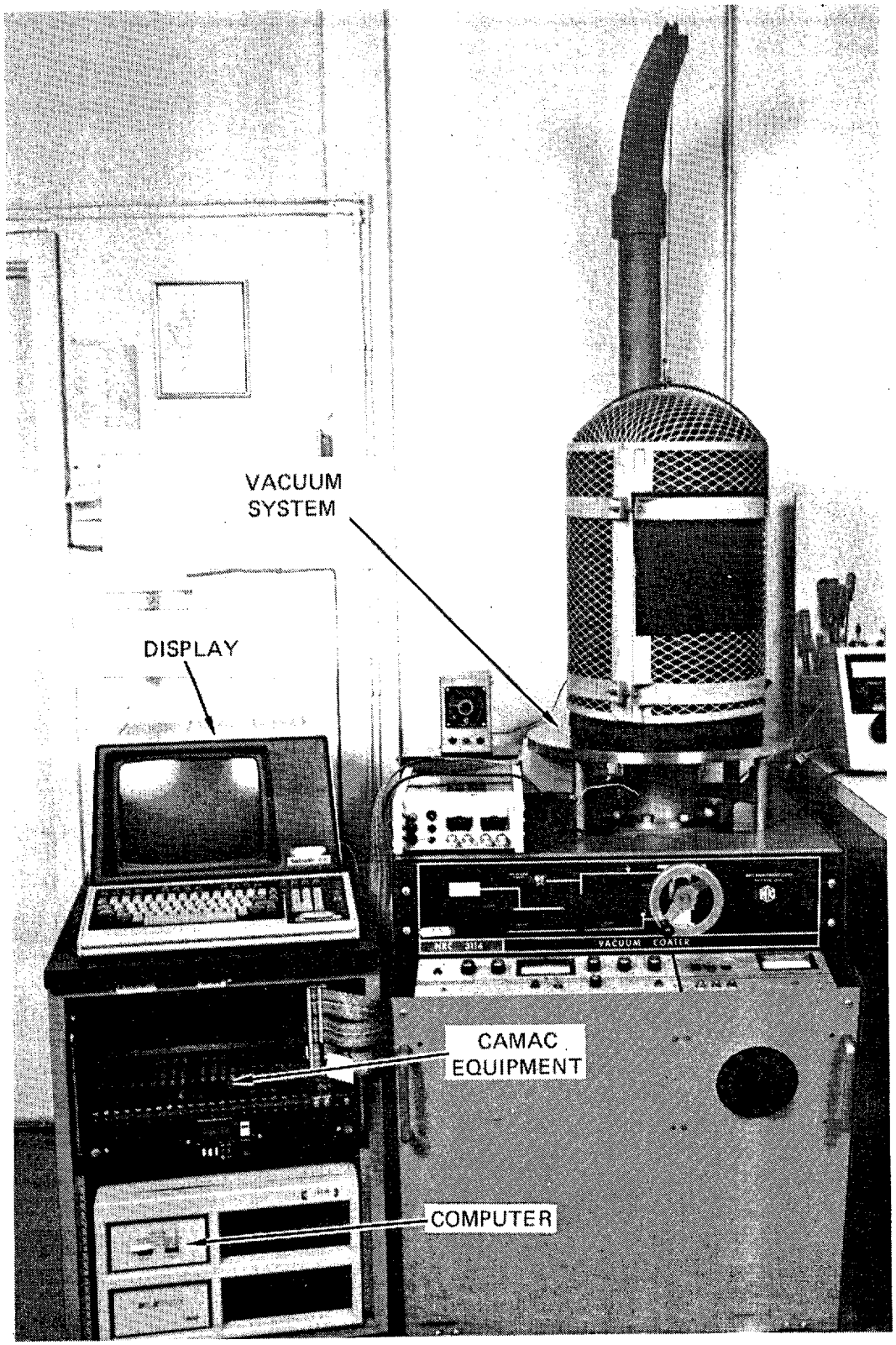

FIGURE B-3 HARDWARE SYSTEM FOR SINGLE α-PARTICLE RA EXPERIMENT

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A. Radioactive Source

The following requirements had to be met before the proper radioactive source could be selected:

- The source must be as close to a 100% α-emitter as possible so that there is no conflicting radiation that might confound the experiment.
- A sufficiently long half-life is needed so that the emission rate will not change substantially during the time of the experiment (approximately one year).
- The α-particles must be energetic enough to be sensed by the radiation detector, but also be low enough in energy to stop completely in the the detector bulk. For a typical silicon detector of $\approx$ 100 microns depletion depth, the particle energy (E) must be: $2 \text{ MeV} \leq E \leq 15 \text{ MeV}$.
- Finally, the source must be collimated so that the diameter of the beam penumbra will be $\approx$ 1 mm at a distance of 1 cm.

All of the above requirements were met by Curium 244, a 99.97% α-emitter having a half-life of 18.1 years and a principal α-energy of 5.81 MeV. [The balance of the emissions (0.03%) are 40 to 100 keV gamma-rays, which will not be detected by our system.] The vendor was also required to supply the source encapsulated with a pair of collimators spaced 2 mm apart and an aperture diameter of 0.25 mm.

B. Radiation Detector

The detector that was selected is a position sensitive silicon strip device. As indicated in Figure B-1, the device is divided into 48 active strips and inactive grooves. Each strip is connected to a separate preamplifier so that α-particles can be detected with an x-dimension position sensitivity of 100 μm. The detector purchased was a commercially available unit commonly used in high-energy and nuclear physics experiments. Figure B-4 shows a detailed view of the detector, source, and signal readout.

C. Data Acquisition and Signal Processing

In order to provide maximum flexibility, the apparatus clearly needed to be computer controlled. We selected an existing LSI 11/23 computer as the host device and the Computer Automated Measurement and Control (CAMAC) instrumentation system as the communications link to the detector system. (CAMAC is a recognized standard for nuclear digital data acquisition; modular components are available from a large number of firms.)

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Signal processing is accomplished through commercially available charge-sensitive preamplifiers, pulse amplifiers, and pulse discriminators. A 48-bit Coincidence Register receives the amplified detector pulses from each of the 48 active detector strips, thus allowing the computer to assign a unique strip-position to each detected α-particle.

D. Environmental Considerations

The primary concern in designing this experiment was to anticipate the possible normal sources of deflected α-particles, so that RA can be distinguished from artifact. Collisions of gas molecules with α-particles appeared to be the greatest source of potential artifact. This is a common problem faced on a daily basis by the operators of accelerator laboratories. Using existing data for the cross sections of α-particles and air molecules, a number of calculations of collision probabilities were performed. These calculations assumed a vacuum of 2×10^{-6} Torr, an α-particle emission rate of 1,000 counts per second, and a detector-source distance of 5 cm. Under these conditions, the probability of a collision equaled 0.05 only after 11 years of continuous operation. While this appears to be adequate protection against collision artifact, we will still conduct long control trials during experimental sessions.

Other possible sources of artifact are electromagnetic (EM) and gravitational fields. While it is likely that the local gravitational ambient will remain stable during the time of a proposed experimental session (15 to 90 minutes), the same may not be true of the EM environment. However, in order to feel confident that any detected anomalous events are due to RA, it is clear that appropriate shielding for EM fields, and transient detection for both EM and gravitational fields must be employed during the actual experimental sessions.

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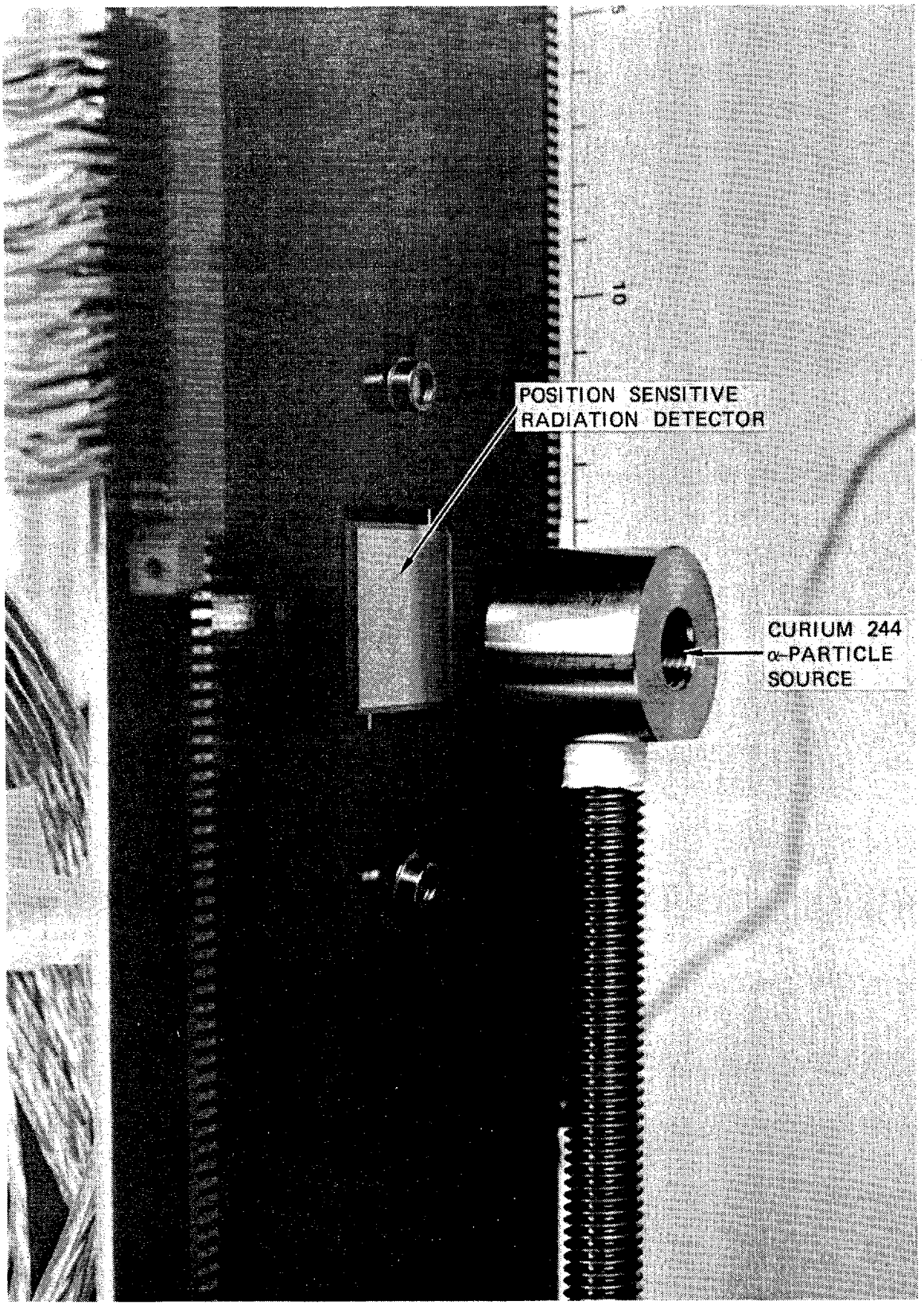

FIGURE B-4 DETAIL OF DETECTOR SIGNAL OUTPUT, RADIOACTIVE SOURCE AND POSITION SENSITIVE DETECTOR

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