Final Technical Report *December 1987*

ENHANCED HUMAN PERFORMANCE INVESTIGATION (U)

By: EDWIN C. MAY

Prepared for:

PETER J. McNELIS, DSW
CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE

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SRI International

Final Technical Report
Covering the Period 1 October 1986 to 30 September 1987

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Approved by:

MURRAY J. BARON, *Director*
Geoscience and Engineering Center

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I INTRODUCTION (U)

A. (U) Overview

(S/NF) 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 1987. 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 enhancing human performance for military applications.

B. (U) Definitions

(U) 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. (U) Program Scope

(S/NF) This program is designed to provide the necessary foundation to assess various aspects of psychoenergetics with the DoD's needs in mind. 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.

D. (U) Program Objectives

(U) There are three basic 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 that of 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.

(S/NF) 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. (U) Program Resources

(U) 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.

(U) 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, Psychophysical Research Laboratories, the Parapsychology Sources of Information Center, Mind Science Foundation, and the

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University of Delaware, plus the consultants having expertise in specific areas of interest to the program.

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3. (U) Objective A, Task 3--Improve RV Evaluation

a. (U) Fuzzy Set Applications in Remote Viewing Analysis

(U) In FY 1987, fuzzy set mathematical techniques were applied to the problem of remote viewing analysis. Two analytical methods were developed: the first was designed to be sensitive to the verbal content of the RV response; the second was designed to account for the visual/spatial arrangements of response elements. A definition of "ground truth," against which these new analytical techniques could be tested, was also devised.

(U) The verbal method is predicated on the application of fuzzy set mathematics to the figure of merit (FM) technology.* The method also features a new descriptor list, which was introduced to provide a richer vocabulary for analysis. The list's hierarchical structuring in levels, ranging from very abstract to very concrete, affords considerable flexibility for analytical manipulation of descriptor elements. A pilot application of the verbal analysis was shown to correlate highly with ground truth.

(U) The combination of fuzzy set technology and the new descriptor list also proved effective for the visual/spatial approach. The implementation of these techniques--in conjunction with a third technique known as "cluster analysis"--has resulted in an algorithm for the production of orthogonal target sets. This has resulted in a significantly more effective rank-order analysis procedure.

(U) The visual and verbal analyses were each determined to have certain strengths and weaknesses. The verbal analysis is statistically more powerful and provides a more comprehensive breakdown of the verbal information in an RV response. It is quite labor-intensive to apply, however, and it appears to be relatively insensitive to noisy RV data. "Noisy," in this context, can be defined as a preponderance of incorrectly identified response elements. The visual analysis system is statistically much less powerful and is less capable of providing systematic objectification of the true RV signal content. It can be rapidly applied, however, and is sensitive to the primary manifestation of true RV signal in noisy data--namely, the visual arrangement of RV response elements, regardless of their verbal labels. Potential applications of these techniques in their current states have been suggested; areas of future research for their refinement have also been identified.

* (U) The FM analysis has continued to undergo refinement since its inception in FY 1984.

b. (U) An Expert System Approach to Remote Viewing Analysis

(1) (U) Motivations to Explore Expert Systems

(U) The judging of RV transcripts has proven to be a difficult task for the experienced as well as the uninitiated analyst. Judging can be both analyst and viewer dependent, in that the combination of a viewer's response style and an analysts's interpretive style may enhance or hinder the analytic task. The process is, to a large extent, a subjective task that does not lend itself to a literal or procedural quantification. In an effort to render the judging more transferable, if not more uniform, we decided that, if development were feasible, an expert system to assist the analyst would prove invaluable.

(U) The ultimate task would be to develop an expert system that could ask an analyst a series of questions about a given RV transcript, arrive at a composite description of the response, and map the response to a group (possibly with only a single member) of targets within a known target pool. The system would have standard data about a number of common abstract and concrete objects. Furthermore, the system would maintain a data base of the ideograms and idioms commonly used by a particular viewer and their possible/probable correspondences. By prompting the analyst for information about the concrete or unambiguous elements of a response (i.e., are there parallel lines, or are there elements labeled as structures), the system would combine the user-supplied data with data collected in previous experiments with the same viewer, to piece together composite hypotheses about the transcript. In an interactive exchange, the system would attempt to present the analyst with possible transcript interpretations of increasing complexity and/or concreteness until some kind of composite picture could be drawn.

(U) Clearly, such an undertaking is very ambitious and well beyond our current expertise. Acting as a consultant, Dr. Jacques Vallee was to undertake the initial steps towards the development of such a system. As requested, we supplied him with the NExpert®* development system, an expert system shell which exploits non-monotonic reasoning (i.e., simultaneous forward and backward chaining or, analogously, simultaneous inductive and deductive reasoning). As the analyst's task is by no means a clearly hierarchical or linear process, this feature of the NExpert® system is a clear necessity.

(2) (U) Initial Goals

(U) The delivery of an expert system matching our specifications, if indeed such a system can be devised, would obviously require numerous development cycles, and

* (U) NExpert® is a product of Neuron Data, Inc., 444 High Street, Palo Alto, California.

(U)

was therefore not an immediate expectation. After discussions with Vallee, it was decided that the thrust of the FY 1987 effort should be focused upon the mapping of response to target. Rather than assuming that the target possibilities are effectively infinite, the system should be designed and programmed to have prior knowledge of the structure and contents of the 200 targets in our current target pool. This design decision renders the problem much more tractable, and certainly does not prevent further efforts from focusing upon response analysis with little or no knowledge of the target universe. Once a system was in place, we would supply Vallee with transcripts from 1987 experiments to serve as test data for the system.

(U) Even with a limited universe of targets, mapping a response to a single target is not a practicable goal. Many targets are visually similar, and the information contained in a typical response transcript is not sufficient to distinguish, for example, the Gobi desert from the Sahara. Rather, a more reasonable task is to break up the target pool into similar groups and map responses to a target *type*. As we had not yet determined these groupings, Vallee undertook the description and classification of the 200 targets and used the resulting target types as the basis for his work.

(3) (U) Description and Classification of Sites (DACOS)

(U) The system Vallee developed for categorizing the target pool, DACOS (Description and Classification of Sites), contains 40 distinct target categories made up of specific combinations of 27 possible target attributes. The set of attributes used is broken up into six types: Water, Structures, Interfaces, Contours, Land, and Features (Figure 1).

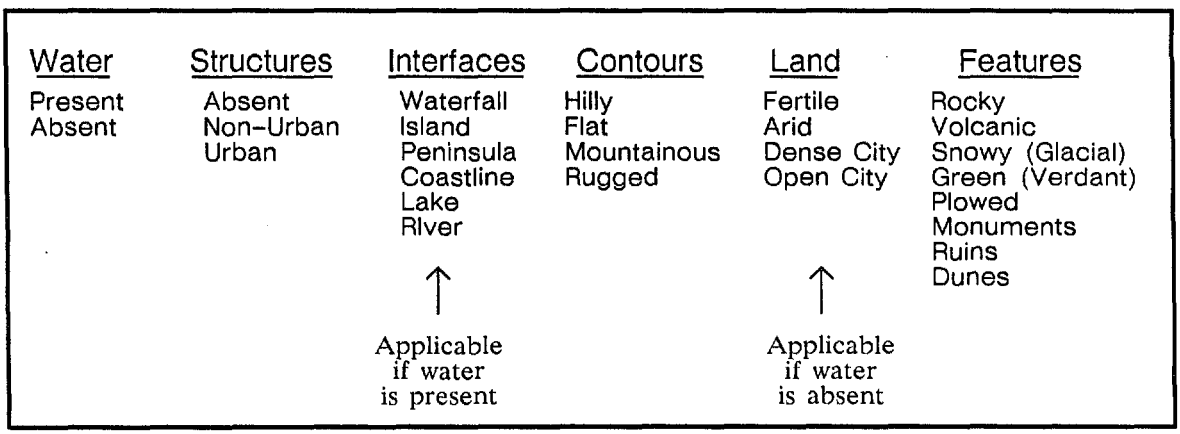

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FIGURE 1 (U) THE ATTRIBUTE SET FOR THE DACOS SYSTEM

(U) DACOS is a hierarchical system which is best described by a tree whose interior nodes each represent a decision point and whose levels each represent an attribute type. By selecting one of the possible paths at each node, one traverses the tree until a leaf node is reached, at which point a target category has been selected. As is clear by inspecting the hierarchy, it is possible to determine a target category by answering a maximum of five questions (Figures 2 and 3).

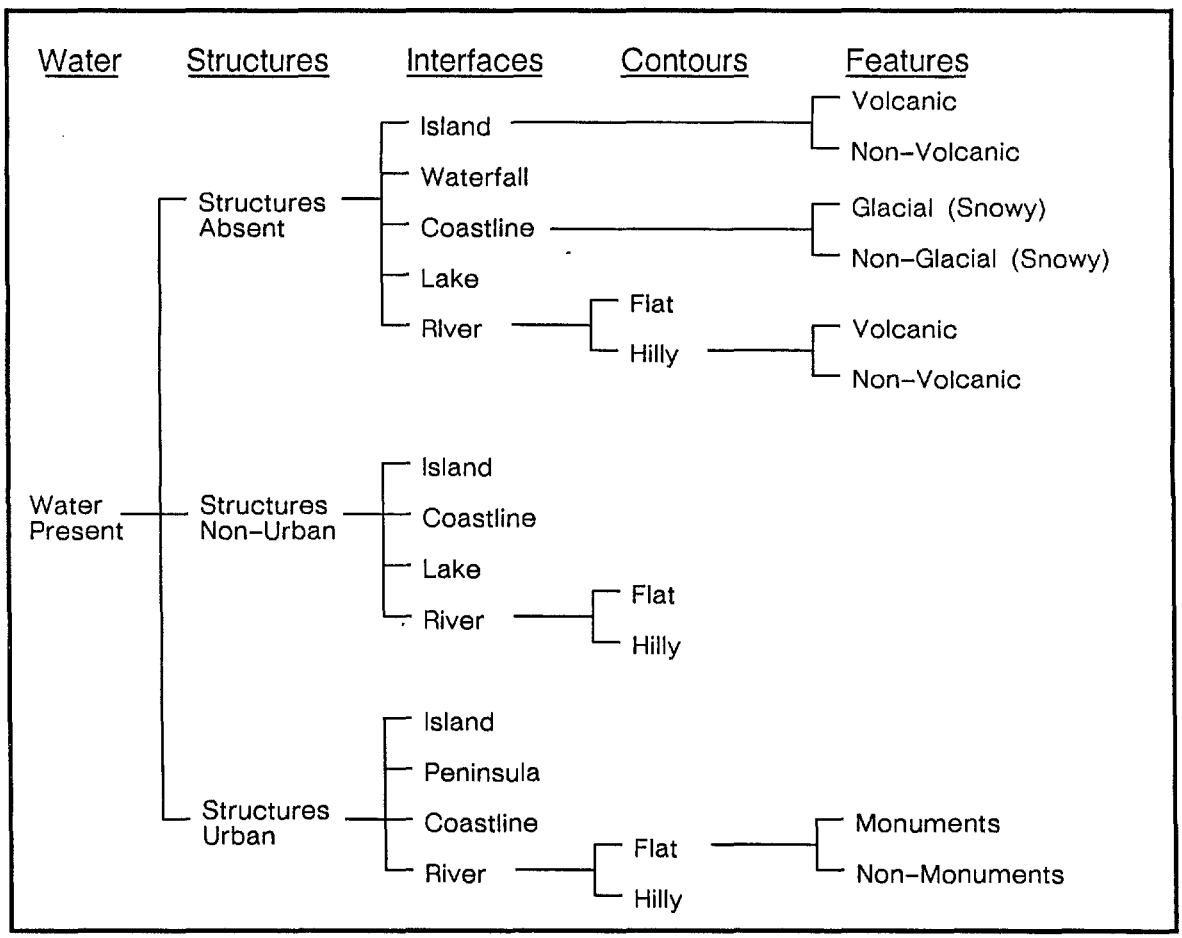

FIGURE 2 (U) DACOS HIERARCHY FOR WATER-PRESENT TARGETS

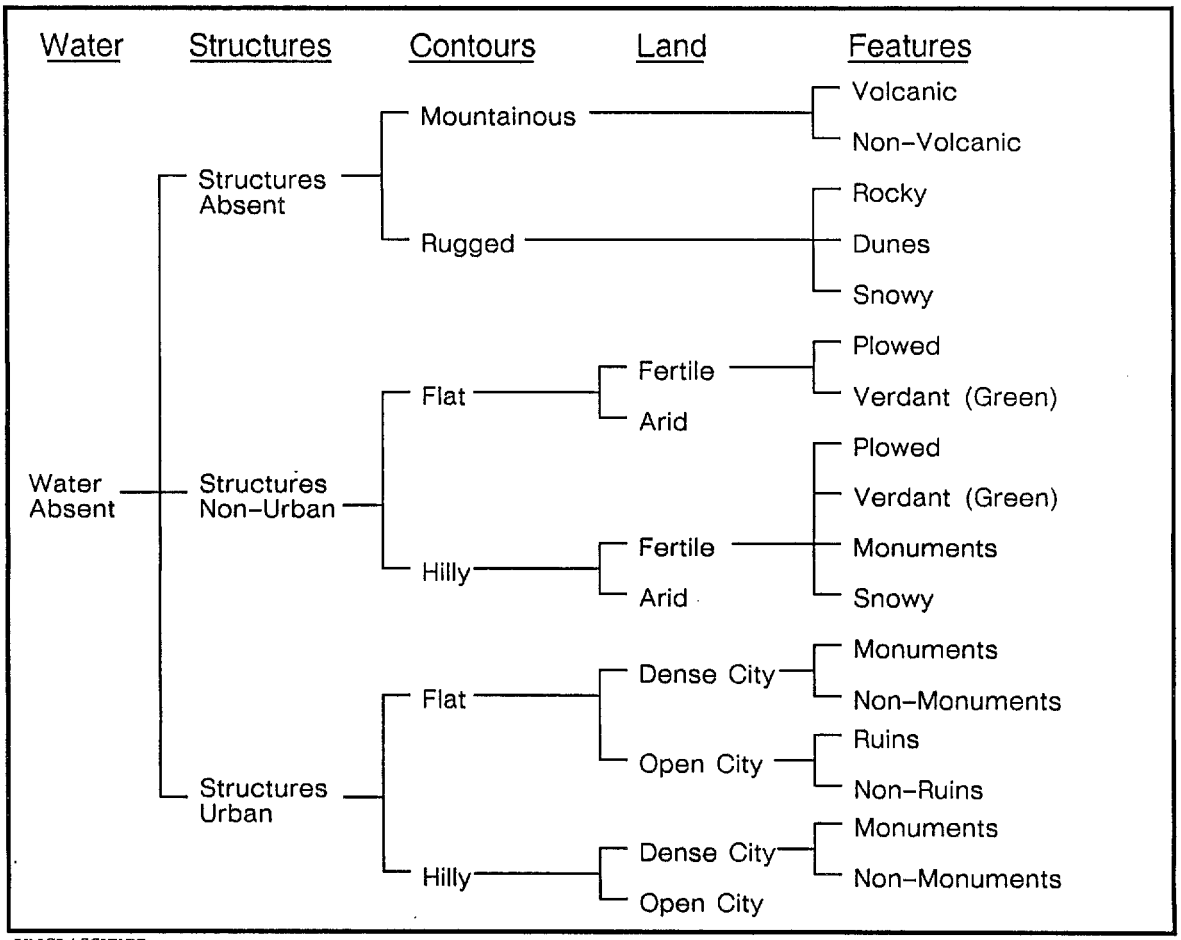

FIGURE 3 (U) DACOS HIERARCHY FOR WATER-ABSENT TARGETS

(U) The computer system Dr. Vallee delivered was developed using the NExpert® system, but was later transferred and coded in BASIC for efficiency reasons. The DACOS *program* initially prompts the analyst for an answer to the question "Is there water present?" and, depending upon the response, continues to traverse the appropriate DACOS decision sub-tree asking further questions. The final output is a list of pairs, the category type with its corresponding confidence factor. These confidence factors directly reflect the number of attributes that correspond to any given category. For example, if the final attributes were Water, Urban, River, and Hilly, the categories under the Water-Absent node would have a factor of zero, the categories under the Water-Present, Non-Urban node and the Water-Present, No-Structures node would have a factor of one, etc. With these confidence factors, one can then determine a hierarchy of possible correspondences for the given transcript and propose a best match category.

(4) (U) Results of Testing DACOS with Actual Remote Viewing Data

(U) The data given to Vallee for testing consisted of 30 RV transcripts from one 1987 experiment. He then used the DACOS program to assign confidence factors to the different target categories. Overall, the DACOS performed only marginally better than chance. Out of 30 transcripts, the water attribute was correctly identified 17 times, the structures attribute 13 times, and the full target classification twice. Unfortunately, this series of remote viewings, when judged, did not show a significant RV effect, and thus proved a poor test case. Nonetheless, this exercise allowed us to evaluate the progress and direction of this work.

(5) (U) Shortcomings of DACOS

(U) The categories within the DACOS system were constructed to produce visually distinct or "orthogonal" target types. The first two attribute levels of the DACOS hierarchy, Water and Structures, are by far the most clear, simple, and symmetric; most important, they correspond to common elements of RV transcripts. Nonetheless, some of the target classifications are inappropriate for the kind of RV response data typically seen. Experience has shown that the *visual* content is the most important aspect of a target; the minute details of a target are often missed and thus should not overpower the *overall* description of the target. For example, although several of the water targets do picture water, the water is confined to such a visually insignificant region as to be either unnoticed or ambiguous.

(U) The deeper levels of the DACOS hierarchy do not maintain the symmetric nature of the first two levels because they inherit properties from the preceding levels. Furthermore, the attributes chosen for the deeper levels do not necessarily reflect the actual *visual* nature of the targets. The attribute Monument discriminates targets on a very high social and cognitive level; identifying a monument requires a significant amount of conceptual or functional knowledge about a particular site, and is not necessarily evident from the visual contents of a target. The attribute Non-Monuments, representing the explicit absence of monuments, is even more abstract and visually ambiguous. Although Vallee's hierarchy yields a target category with a maximum of five questions, the choice of attributes is not ideal for the task.

(U) Clearly, the most significant problem with the DACOS system is its strict hierarchical structure. The system, by its tree traversal method, makes each decision strictly binding; once water has been determined to be absent, the system does not have any means of reconsidering water as an attribute. Effectively, by completely isolating sub-sections of the decision tree, the DACOS system renders the attribute Hilly for Water-Absent targets to be distinct from the attribute Hilly for Water-Present targets because the categories on one side of the tree will receive credit and those on the other side will receive none. This occurs because the

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system does not allow for any network or global attribute semantics. Ideally, the system would not force a decision about the presence or absence of an attribute if that information is not available; rather, it would consider the data already acquired, and prompt for alternative data. Further efforts in the development of an expert system *must* allow for a broad and dynamic evaluation of *all* of the data the analyst presents.

(U) The DACOS system implicitly assumes that all the information it receives is certain. Clearly, a tool for the novice or uninitiated analyst must not expect that the analyst will be correct in 100% of his decisions. Furthermore, the system must not expect that an analyst will be able to render a meaningful decision about every possible attribute; in the absence of data about any given attribute, the analyst cannot necessarily assume that the attribute in question is in fact not present. For example, the particular attributes chosen for the lower levels, optimized for the minimality constraint Vallee imposed upon the system, do not best represent the elements typically contained in an RV response. The attributes Fertile, Arid, and Plowed are rarely seen; assuming that data pertaining to these three attributes cannot be discerned, eight categories are reduced to two, and the system has no way of resolving the analyst's uncertainty. As all RV response data are, by their very nature uncertain, the expert system we envision *must* deal with uncertainty from the very start.

(6) (U) Future Directions

(U) The NExpert® development system offers many capabilities tailored to dealing with uncertain reasoning. Unfortunately, the power of NExpert® was by no means fully tapped by Vallee's initial effort. For this reason, we cannot make a meaningful assessment of the potential utility of an expert system approach to RV analysis. Further development should continue in this area, but the development will clearly need to focus upon the rectification of two specific shortcomings of this year's effort: (1) the integration of uncertain reasoning into the data analysis, and (2) the redefinition of an attribute set and network that allows for a more flexible and comprehensive evaluation of the response data.

4. (U) Objective A, Task 4--Gross Physiological Correlates to RV

(S/NF) One of the persistent problems in deploying RV in an operational environment is the lack of an *a priori* method for assessing the quality of a particular RV session. The present exploratory investigation was an attempt to discover whether external physiological cues could be used to discriminate accurate from inaccurate sessions.

(U) In an exploratory attempt to learn more about this aspect of the RV process, 20 RV sessions, comprising the output of one subject from a separate experiment, were videotaped and analyzed by a behavioral psychologist to discover if accurate sessions could be blindly separated from inaccurate sessions by gross external physiological changes which occurred during the RV session. Behaviors defined and coded included latency to first response, head movements, hand gestures, and interactive and descriptive verbalizations. Frequency counts of each behavior were made and correlated with a measure of the quality of the RV.

(U) Unfortunately for this analysis, the measure of RV quality showed no significant RV function. Thus, correlation between RV quality and the behaviors rated could not be expected to show a significant relationship. Results matched this expectation; there were no significant correlations between the measure of RV quality and the behaviors noted. There was a non-significant trend in the positive direction for latency to first response which is similar to the measurement of latency from stimulus to response time measured in another pilot experiment (see Task F-3). It should also be noted that two behaviors of particular interest, namely eye movement and facial expression, were not analyzed in this study because facial expression was considered too subjective without multiple observers while the quality of the video recordings did not permit accurate observation of eye movement.

(U) In conclusion, this study does not rule out the possibility that external physiological cues may give important clues to the quality of RV. It would be necessary to conduct a similar study with a sample of known high-quality remote viewing.

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

(U) The Parapsychology Sources of Information Center (PSIC, Rhea A. White, Director) has completed two years of a multi-year effort intended to provide and maintain an extensive data base facility for parapsychological literature, described in a separate report. The overall goal is to have the data base, called PsiLine, include bibliographic information and abstracts of the entire literature of parapsychology and related disciplines. During the first year of a multi-year effort, PSIC purchased the necessary hardware and software, and then

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implemented the first working version of PsiLine. Bibliographic information and abstracts of the major parapsychological journals from 1970 to the present were entered. During the second year, FY 1987, the main purpose was to add as much material as possible. PsiLine now contains bibliographic information and abstracts of the major parapsychological journals from 1940 to date, complete sets of some of the minor parapsychological journals and several parapsychological newsletters, over two thirds of the major English-language books on parapsychology from 1880 to date, articles on parapsychology originally published in a language other than English, and 1,000 relevant articles published in nonparapsychological journals.

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

(U) There was no activity on this task during FY 1987 because no new subjects were added to our in-house subject pool.

7. (U) Objective C, Task 2--Analyze Personality Data

(U) A purchase order was let for this work to Dr. David R. Saunders of MARS Measurement Associates during the first quarter of FY 1987. Specifically, Dr. Saunders was asked to continue adding new cases to the PAS/psychoenergetic data base both from SRI International and from subcontractor sources, to continue his study of the relationship between the Personality Assessment System (PAS) and the Myers-Briggs Type Indicator (MBTI), and to add known good hypnotic subjects to the data base as a potential basis for selecting hypnotic subjects for psychoenergetic research and hypnosis.

(U) No new cases were added from SRI during the year but Dr. Saunders added PAS data on four subjects from Psychophysical Research Laboratories, two subjects from Princeton Engineering Anomalies Research Laboratory, and nine subjects from John F. Kennedy University to the data base.

(U) In his work comparing the PAS with the MBTI, Dr. Saunders concluded that MBTI scores could be predicted from the PAS but that predicting PAS scores from MBTI data was not feasible at present. He suggested that predicting potential psychoenergetic function directly from the MBTI and then using the PAS to confirm was a better procedure at this time.

(U) On the basis of accumulating PAS data on known good hypnotic subjects, Dr. Saunders identified several potential subjects in our current data pool who would be both good hypnotic subjects and good RV subjects.

8. (U) Objective C, Task 3--PAS Review

(U) During FY 1987 we conducted a thorough review of the (PAS) to gauge its continued usefulness as a screening and selection instrument and a personality descriptor for subjects in the psychoenergetics project. Data for this review came from published articles where the PAS was reviewed or used as a research tool, attendance at the annual PAS conference, and extensive interviews with several of the principal developers.

(U) The PAS is a multifactored personality assessment instrument that has been evolving over the past 30 years using behavioral measures as raw data for making inferences and predictions about personality and behavior. The early development work was conducted by John Gittinger and his associates in a private firm that served clients in business and government. During the last 20 years, the test has begun to make small inroads into the academic environment but it remains obscure and controversial.

(U) It was concluded that although the PAS appears valid and is receiving growing attention in academic circles, the instrument is currently not useful as a screening and selection device either by itself or in conjunction with self-report measures. It is much too labor intensive to be used alone and it has not been found possible to predict PAS profiles from MBTI data. In addition, any type of screening use would require the testing of more high-quality remote viewers than are available to the project at present. Use of the PAS as a descriptive tool has continuing merit and it is recommended that we continue to test persons who show psychoenergetic abilities on laboratory psychic tasks.

9. (U) Objective D, Task 1 (see Objective G, Task 1)

10. (U) Objective D, Task 2 (see Objective H, Task 3a)

11. (U) Objective E, Task 1--RA Effects on Marine Algae

(U) In FY 1986, SRI International awarded a subcontract to the College of Marine Studies of the University of Delaware to conduct remote action experiments using marine algae as target elements. Protocols were developed during that year that would enable SRI to test, with a living system, the Intuitive Data Sorting model. During FY 1987, significant improvement was made to stabilize the data so that standard analysis techniques (e.g., ANOVA) might be used. While much progress was made toward that end, significant auto-correlations persist. Regardless, an attempt was made to generate successful RA. SRI analyzed the data of four participants and found no evidence of RA.

12. (U) Objective E, Task 2--RA Effects on Human Blood

(U) An experiment was conducted by the Mind Science Foundation to study the possible relationship between intent to remotely influence a biological system and actual changes in the system. Three phases of the investigation were conducted, including a pilot study, an intermediate study, and a confirmation study. The first two were used to test and refine the protocol for the third and final study. As a result of these preliminary studies and further input from various experts, the confirmation study appears to have been extremely well conducted.

(U) Thirty-two subjects participated in the confirmation study. Their task was to attempt to retard the rate of hemolysis (destruction) of red blood cells that had been placed into a tube of distilled water and saline in a distant room. Each subject participated for one hour, broken into four fifteen-minute periods. Of these four periods, two were identified as control periods and two as protect periods. The experimenter measuring the rate of hemolysis was blind to this condition. During the protect periods, subjects used visualization and other intention strategies to try to protect the blood cells. During the control periods, subjects were to try to think of other matters. In one control and one protect period, eight tubes of blood were processed, and in the other periods two tubes were processed. Subjects were blind to this condition. It was used to attempt to ascertain whether observed effects could be attributed to causal relationships, or to intuitive data sorting. To see whether or not blood source was important, fourteen of the subjects were trying to protect their own blood, and eighteen were trying to protect that of another. Both subject and experimenter were blind as to the source of blood.

(U) Results showed that 9 of the 32 subjects were able to achieve a significant difference in the rate of hemolysis for the control periods versus the protect periods. The probability of such an extreme result by chance alone is 1.9×10^{-5}. There was no significant difference between those trying to protect their own blood and those trying to protect that of another.

(U) The study was designed to try to determine whether causal forces or intuitive data sorting were responsible for any observed psi results. The extreme heterogeneity in the data made it impossible to make that determination. It is recommended that future studies of this type be designed in such a way that data from each subject can be analyzed separately. It appears that level of psychic functioning, whatever the underlying mechanism, is highly individualized, so that it is difficult to test a specific theory using data combined across subjects.

13. (U) Objective F, Task 1--Fundamental Parameters of RV

(S/NF) Two different precognition experiments were conducted during FY 1987. The first of these involved a well-calibrated viewer (Viewer 372) and used natural Bay Area sites as targets. Ten real-time and ten precognitive trials (counterbalanced) yielded no statistical evidence for remote viewing. In the second experiment, 4 viewers contributed approximately 30 trials each in a similar counterbalanced real-time versus precognition protocol. In this experiment, however, the target material was photographs from a national magazine. No statistical evidence for remote viewing was observed in this experiment. In a third experiment designed to explore the role of feedback upon remote viewing quality, two of four viewers produced independently highly significant evidence for remote viewing. There was no correlation between the quality of RV and the intensity of the feedback for either of the significant viewers. These data do not generally support the precognition model. To confirm this, we must examine the validity of the assumption that the actual feedback is related to the consciously perceived feedback. In other words, we question what constituted "enough" feedback to saturate the RV signal.

14. (U) Objective F, Task 2--Video Disk Training Technology

(U) The FY 1987 effort was aimed at developing a technology for enhancing the acquisition of remote viewing skills. One important factor in the development of a new skill is the ability to practice the skill under conditions similar to a test situation. Until now, practice was a time-consuming effort that required the services of a monitor and an assistant in order to ensure a double-blind protocol. With the advent of video disk technology coupled with the random number capability of a personal computer, it has become possible to develop the capacity to do multiple RV sessions at a single sitting as well as work on specific target features with the ease and timeliness of a forced choice task.

(U) Assembling the components of the system involved the purchase of a video camera, a video disk recorder, and a MacIntosh computer. The heart of the system is the video disk recorder, a specialized machine making possible the recording of both static and dynamic targets from a variety of video inputs. Access to any target is on the order of one-half second. Each 10-inch disk can store 24,000 still targets or up to 15 minutes of a motion target.

(U) Random access to any single target was programmed via the computer, and a tutorial program was constructed that walked the practicing viewer through an RV session. Using these tools, an individual can randomly select a target from the pool, do a remote viewing session, and receive immediate feedback.

(U) The first step in exploring the use of video disk RV training technology was to establish a suitable video target pool. It was discovered that because of some deterioration in picture quality inherent in the recording and playback process, a different set of visual criteria had to be applied to obtain targets that, when copied to the video disk, retained acceptable levels of feedback information. Additional considerations included, for example, finding appropriate target materials to fit within frame parameter constraints, achieving acceptable color, granularity, and focus, etc. After some experimentation, 243 *National Geographic* Magazine targets were photographed frame by frame onto the video disk to serve as a pilot target pool.

(U) One of the best novice viewers from the FY 1986 training group was used to demonstrate the capability of the system. Viewer 137 produced two sets of eight RV responses to each of 16 targets selected randomly by computer. The responses were judged by comparing each response to the eight targets in the set and ranking the response according to the visual correspondence between the response and the eight targets. Analysis of these rankings showed that significant RV occurred in one of the two sets. We concluded that significant RV functioning could be obtained using the video disk format and propose that in coming years this device be employed in conjunction with any proposed training program. In addition to using the video disk technology as a training device, we also formulated a way of applying it to a screening and selection task (see Objective F, Task 7).

15. (U) Objective F, Task 3--Develop and Test RV Training Hypotheses

(U) During FY 1987, an informal group of advanced remote viewer trainees and researchers was organized to: (1) discuss variables that may affect the quality limits of RV, (2) conduct practice sessions to maintain the in-house viewers in a state of readiness for formal RV experiments, (3) provide a setting for reinforcing the positive psychological set necessary for consistency of viewers' effort, and (4) develop experimental protocols designed to test hypotheses generated during discussions. This effort was exploratory in nature and it was agreed that any formal experiment proposals generated would be reviewed by the appropriate primary investigator and the SOC before any formal experimental trials were conducted.

(U) The group met weekly during the first half of the year. On the basis of discussions and informally conducted RV sessions, three experiments were proposed. The first

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was designed to test the hypothesis that several RV sessions could be conducted over a period of time without feedback after each session. The purpose of this proposed experiment was to examine what effect lack of feedback would have on subsequent viewing attempts, given the possibility that post-session feedback may not always be available.

(U) A second proposed experiment dealt with the issue of different types of target material. Some viewers have reported subjectively different impressions when the task is to view an actual outdoor scene (after which the viewer goes to the scene for feedback) than when the task is to view a photograph of an outdoor scene (following which the viewer is shown the photograph). The specific opinion is that the RV impressions are richer, more varied, and not as limited to visual for actual scenes than for the photographs. It follows that viewer responses might also be more detailed and not as limited to visual impressions. This hypothesis could be tested by conducting a series of viewings where targets are randomly chosen from a pool of outdoor sites and photographs.

(U) A third proposal reached the stage of a formal written protocol. It was to test the idea that experienced viewers could perform just as well without a monitor as with a monitor present in the RV session. This experiment was rated as a high priority because if it were successful it would (1) reduce the resources necessary to conduct an RV experiment, (2) eliminate potential monitor cues, and (3) allow multiple viewers to work on the same target at once.

(U) Formal work on experiments previously proposed and approved preempted further efforts on these proposals. Advanced viewers spent the second half of the year participating in several experiments with large numbers of remote viewings. Weekly meetings of the group ceased for the remainder of the year.

16. (U) Objective F, Task 4--Develop RV Training Hypothesis

(U) This task, originally intended to be fulfilled through a subcontract with Consultants International (CI), was converted to a consulting relationship with the founder of CI, Mr. Gary Langford. During FY 1987, Mr. Langford provided consulting services in two areas:

- Remote Viewing
  - During the year Mr. Langford served as a viewer in approximately 100 RV sessions including practice, exploratory, and pilot work, and served as subject in two major experiments: (1) the Real-Time versus

(U)

Precognition experiment and (2) the Feedback experiment (see Objective F, Tasks 1a and 1b).

- Hypothesis Generation
  - Mr. Langford participated in the meetings with other viewers and researchers contributing to the formulation of testable RV hypotheses.

17. (U) Objective F, Task 5--Investigate RV Stimulus-Response Times

(U) Experienced monitors of remote viewing sessions have often come up with hunches as to how to tell when a particular session might be more successful than another. One such hunch has to do with the length of the response latency following the writing of the stimulus word "target." The hypotheses tested in this pilot study were (1) shorter response latencies produce relatively better RV responses, and (2) better responses are produced when less time is spent producing them.

(U) Twenty-four RV sessions from a separate experiment were videotaped. An independent analyst viewed the tapes and measured the response latency following each presentation of the stimulus word "target" with a stopwatch. In addition, the total time elapsed from when the viewer began his response to when he stopped to take a break was recorded. The RV responses were analyzed by figure of merit analysis. The average response latency and the average production time for each presentation of the stimulus word were calculated for each session. Results showed a significant tendency for higher quality viewings both when response latencies were relatively short and when production times were relatively brief.

(U) These results also add confirmatory evidence that RV impressions are relatively brief and easily subject to modification by the associational processes of memory and experience.

18. (U) Objective F, Task 6--Investigate Hypnosis as an RV Debriefing Tool

(U) It has been assumed that remote viewing information is mediated through subconscious processes and is therefore not readily available to conscious retrieval. Hypnosis has been found to increase the ability of observers to recall information acquired in a variety of circumstances where conscious recall has been blocked (i.e., material was presented subliminally, trauma was associated with the initial perception, or information overload occurred). In the present study, hypnosis was used in an attempt to enhance the data of an RV session.

(U) The specific hypothesis examined in this study was that hypnotizing a subject following an RV session and giving instructions to recall all the information associated with the just completed RV experience would facilitate the recall of subconscious information blocked from awareness during an RV session. It was hypothesized that hypnosis could provide a significantly better aid in the recovery of unconscious, target-related material following a standard RV session than only a second try at the same target. To test the hypnosis hypothesis (hypnosis condition), a subject was hypnotized following a standard RV session (before feedback was given) and given instructions to remember everything about the target from the just completed session. A second RV session followed. The hypnosis condition was compared to a control condition (proofread condition) where the subject was asked to proofread technical report material following a standard RV session. A second RV session followed the proofreading period.

(U) An SRI employee with previous remote viewing and hypnosis experience was used as a viewer in the demonstration. Remote viewing experience included more than one hundred monitored experimental sessions. In addition, the viewer had received certified formal training in the practice of hypnosis. In preliminary testing, the viewer was found to rank in the 92nd percentile equivalent on the Standford Hypnotic Susceptibility Scales suggesting high hypnotizability.

(U) Targets were individually selected just before an experimental RV session and, while aware of the general nature of the pool, the viewer and experimenter remained blind to the target until after each trial was completed. Twelve targets were randomly selected for 12 experimental trials from a group of 200 *National Geographic* photographs of natural scenes previously chosen as a pool of potential targets for RV experiments.

(U) RV sessions were conducted in the standard way with a monitor present. After the conclusion of the RV session, a computer randomly assigned the session to one of two experimental conditions. In the hypnosis condition, the viewer was assisted into trance by an experienced hypnotist. When appropriate trance depth was achieved, the viewer was guided through a re-experience of the just completed RV session and given post hypnotic suggestions to recall all the information acquired during the session. The trance was terminated after 30 minutes and a second RV session using the same target was conducted. In the proofread condition the viewer was given a technical report to proofread for 30 minutes before a second RV was conducted. Feedback followed the second RV session for each condition. This protocol is shown in Figure 4.

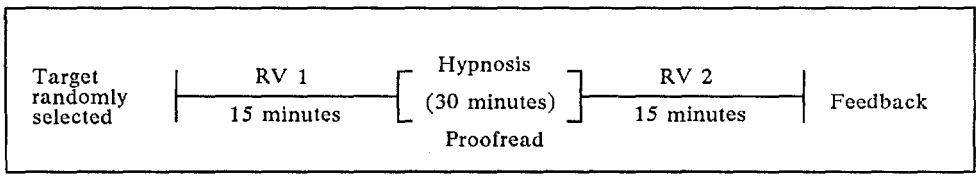

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FIGURE 4 (U) HYPNOSIS-RV PROTOCOL

(U) Two analyses of the responses were performed. The first involved a visual judging of the 24 responses with each response blindly ranked by independent judges against a subset composed of six randomly generated targets from the pool and the actual target.[1]* Exact p-values from the sum of ranks were then calculated. Under the pre-treatment condition (RV1), the RV quality failed to reach significance. However, the post-treatment sessions (RV2) were independently significant ($p < 0.029$). Further analysis showed that all the significance was due to the 6 trials in the hypnosis condition ($p < 0.025$; $n = 6$). There was not a significant difference between the proofread and hypnosis conditions.

(U) A second analysis of the 24 responses was conducted by another judge to compare the calculation based on a 133-item descriptor list with the results of the visual ranking analysis. The FM for each pre-treatment session (FM1) was subtracted from the FM for the corresponding post-treatment session (FM2) and the resulting difference, ΔM, was plotted versus FM1. A regression line was computed for both conditions. An F test was performed comparing the "full" model which allows two separate lines, to the "reduced" model in which the lines are the same.[2] The general linear test comparing the two models showed no significant difference between the two conditions--likely due to the small sample size.

(U) The results confirm previous findings that hypnosis can facilitate the acquisition of information not available to sensory processes. Its efficacy may be due in part to the general state of relaxation produced by the process or to the greater right hemisphere involvement thought by some to be a part of the hypnotic experience. These questions should be addressed by continued research in this important area.

19. (U) Objective F, Task 7--Develop Mass Screening Protocol

a. (U) Introduction

(U) Current efforts for establishing a core group of talented remote viewers have focused primarily on two major approaches: (1) enhancing RV abilities through the use of

* (U) References may be found at the end of this report.

(U)
specified training procedures, and (2) screening the population for RV abilities using performance-based psychological instruments (e.g., PAS and the current research into neuropsychological testing).

(U) In the first approach, the emphasis has been primarily on enhancing whatever latent RV abilities might be extant in a given subject pool. Talented performers in this context have been largely defined as those who continue over time to demonstrate stable accuracy and reliability in remote viewing *within the confines of a single, highly specific RV technology*. Therefore, selection of talented subjects is relative to the specific training procedure being employed and may not be related to identifying those individuals who are best on an absolute scale.

(U) In the second approach, psychological profiles for known talented viewers are obtained using two methods of psychological screening technology--i.e., the PAS and a battery of neuropsychological tests. In principle, these star subject psychological profiles can then be used as templates for future subject selection. The major limitation of the psychological screening approach centers on the labor-intensive nature of test administration. Unless a meaningful second-order correlation with self-report tests can be effected, the potential for using these methods for screening large populations appears circumscribed.

(U) Therefore, a third approach for locating talented individuals is suggested, through the deployment of a standardized and automated procedure that would screen directly for RV abilities in a large population. The following discussion advances some preliminary ideas as to how such a pilot mass screening technology might be optimally designed and deployed.

b. (U) Hardware Configuration

(U) Initial design considerations for mass screening hardware would include the following:

(1) Portability, i.e., the screening unit should be easily deployable in a variety of settings; it must also be durable enough to withstand frequent relocation;

(2) Efficiency, i.e., a variety of RV target materials should be rapidly accessible, in order to exercise the range of a given subject's abilities as efficiently as possible,

(U)

(3) Cost effectiveness, i.e., individual subject session times should be kept manageably brief to facilitate rapid turnover; this approach would also tend to sustain the subject's interest in the task, thereby maximizing the potential for success in the screening process.

(U) A preliminary survey of the extant technology for attaining these objectives indicates that the most feasible option would include a video camera, a video disk recorder, a video monitor, and a MacIntosh computer. The video camera would be used to photograph a variety of target materials for frame-by-frame inclusion on the video disk. Random access to the target photographs would be computer-controlled and therefore very rapid--i.e., on the order of 0.5-second display time. The disk, monitor, and computer would comprise the equipment actually deployed to the screening site. Overall, this equipment is relatively inexpensive, portable, and durable.

c. (U) Target Selection

(S/NF) A wide variety of target materials should be incorporated onto the disk to exercise the full potential range of the subject's abilities. Candidate target materials would include photographs drawn from the following categories: (1) natural scenes, (2) alphanumerics, (3) technical sites (for operational site simulation), (4) Zener cards, and (5) the Maimonides target set. A selection of dynamic (i.e., moving video) targets has also been suggested.* A small subset of approximately five targets would be selected from each category for inclusion on the disk: this would tend to minimize the potential for deviation from prescribed screening procedures; it would also enable greater standardization for RV performance across the screened population.

d. (U) Subject Populations

(U) Judicious selection of candidate subject populations is recommended over the less-efficient and more labor-intensive "shotgun" approach. One possible guideline, which has been derived primarily from the observations of RV monitors, is that a certain richness of the subject's vocabulary may be important for a comprehensive debrief of the RV signal. This would

* (U) This is not intended to be a comprehensive list of target categories: some may be deleted or others may be added as the mass screening protocol is developed, deployed, and refined. The same caveat applies to other research items mentioned in this discussion.

(U)
tend to imply that subjects should be sought out from groups that have members with superior verbal abilities.

(U) Other candidate populations might include groups whose members exhibit superior skills in drawing, draftsmanship, or other visual abilities. This approach is suggested because pictorial representation is another rich modality for debriefing the RV signal.

(S/NF) A third approach might center on drawing from populations whose members excel at pattern recognition or in the ability to discern a tenuous signal line in a noisy background. Such groups might include Photo Interpreters (PI's) or other Intelligence specialists, for example. Also subsumed under this category are groups whose members show an aptitude for institutional decision-making--i.e., what might be referred to in the vernacular as "playing hunches." Such groups might include, for example, police detectives, businessmen who make consistently correct decisions in risky or problematical ventures, or individuals with a special proclivity for locating oil.

(U) These are but a representative few of the kinds of populations that might be targeted for screening initially. It is anticipated that other promising populations will emerge empirically as the screening system is deployed on a pilot basis.

e. (U) Methodology and Deployment

(U) Research issues pertaining to screening methodology and deployment fall into two principal categories: (1) manipulation of *intra*-session variables for arriving at the most meaningful and efficient screening procedure, and (2) standardization of *inter*-session guidelines for deploying that procedure in a variety of settings. The first area focuses primarily on the most profitable use of the hardware, while the second area emphasizes standardization across screening sessions.

(U) Primary research issues concerning the design of the optimal screening package include (1) determination of feedback conditions (e.g., whether there should be a "no feedback" target in each screening session), (2) identification of the optimal number of targets per session and their randomization (e.g., whether targets should be presented on a gradient of complexity, or whether they should be randomly selected), and (3) determination of the analysis techniques to be employed (e.g., forced-choice guess by the subject versus detailed verbal and

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visual assessment by an independent analyst). Recent developments in the uses of fuzzy set theory and cluster analysis show promise for affording "on-line" analysis of RV on *National Geographic* Magazine targets.

(U) In the second major area of investigation, several preliminary guidelines have emerged with respect to optimizing *inter*-session standardization. First, screening settings must be chosen with the aim of mitigating a subject's performance anxiety: a one-on-one private or semi-private session with a trained monitor is indicated. Second, a series of general instructions must be devised that serve to inform the naive subject as to what the RV task entails. These instructions must be specific enough to elicit RV performance without biasing the subject towards any particular RV technology. Third, monitors must be thoroughly conversant with a standard set of screening procedures, in order to minimize idiosyncratic variability in such areas as feedback to the subject. Monitors may be required, for example, to memorize *scripts* that dictate the nature of subject/monitor interactions for each target. Scripts might also serve the function of providing the framework for the systematic elicitation of RV data along a number of predetermined dimensions--e.g., visual, conceptual, functional, depending on the nature of the target material. Fourth, a standardized questionnaire must be devised to address psychological parameters. It would include a section for standard biographical data and a section for questions drawn from the MBTI and the Psychophysical Research Laboratory's PIF. The purpose of the form would be to investigate, across a large population, whether psychological self-report correlates with RV ability. If such correlations were obtained, then the questionnaire might profitably be used as an initial pre-screening device.

(U) All of the research issues presented in this discussion will be most profitably determined and refined from actually using the system. If possible, the optimal approach would entail successive pilot deployments of the screening device in a variety of settings.

20. (U) Objective F, Task 8--Host Physiology Conference

(S/NF) On 28 July 1987, SRI International hosted a classified physiology conference. In attendance were D. Arthur, Ph.D., and E. Flynn, Ph.D from Los Alamos National Laboratory; S. Kornguth, Ph.D. from the Neurology Department of the University of Wisconsin; R. Murray, M.D., Chairman, the Department of Medicine, Michigan State University; R. Dickhaut, Spectra Research Institute; M. Hecker, Ph.D., SRI International,

(S/NF)
T. Piantanida, Ph.D., SRI International, E. May, Ph.D., SRI International; and Colonel P. McNelis, DSW, USAMRDC.

(S/NF) The goal of the conference was to determine the proper direction for investigating possible correlates to psychoenergetic functioning, and to recommend specific experiments to search for correlates. The primary emphasis was on neurophysiology. Attendee comments are available upon request.

(S/NF) After an overview of the Enhanced Human Performance Investigation project by May, the discussions centered upon metabolic measurements (PET) and possible physiological indicators of psychoenergetic functioning with visual evoked response.

(S/NF) Other topics that were discussed were other possible physiological areas of investigation, including technical voice analysis. It was generally decided, however, that except for PET, and certain button-pressing experiments, physiological correlates to the subtle forms of psychoenergetic functioning would be difficult to find.

(S/NF) As a direct result of the conference, the Los Alamos group will use visual evoked response techniques with the MEG to replicate earlier successful experiments demonstrating physiological responses to a remote stimulus.

(U) A number of the participants responded to the conference in letter form. These letters are contained in Appendix B.

21. (U) Objective F, Task 9--Neuropsychological Assessment

(U) During FY 1986 exploratory work was begun to attempt the discovery of neuropsychological correlates of psychoenergetic function. As part of that effort, Dr. Ralph Kiernan of the Stanford Medical School developed a battery of tests designed to test the function of the frontal lobes which he hypothesized to be involved in psychoenergetic function. As a follow-on to his theoretical formulation and hypothesis generation, Dr. Kiernan tested 37 subjects who had participated in previous RV and Search/Dowsing studies. His test battery was composed mainly of scales from Guilford's measure of intelligence, and scales were combined to give a score for productive ideation, a component directly related to positive frontal function.

(U) Analysis of the results showed evidence that the factor of productive ideation was partially related to measures of psychoenergetic function. Subjects who showed significant computer dowsing ability in the time condition of the Search/Dowsing study showed a tendency to have higher scores for productive ideation while subjects scoring significantly in the space condition showed a tendency to have lower productive ideation scores.

(U) Two groups of remote viewers were tested: (1) a group consisting of four experienced viewers who had shown significant remote viewing ability in previous experiments, and (2) a group of novice viewers from the FY 1986 training program. Two of the experienced viewers (009 and 372) received the highest productive ideation scores of all the individuals tested. The nine novice viewers were ranked in order of performance on the last six sessions of the novice training. The best novice viewer had one of the lowest productive ideation scores of all the persons tested. The other eight showed a pattern of increasing productive ideation scores as average measures of RV function increased.

(U) The scores on two of the tests, Sketches and Possible Jobs, showed high correlation with the total scores on all ten tests. Since these tests require about 15 minutes to perform and can be done in a group setting, it may be possible to use them as part of a screening effort.

22. (U) Objective F, Task 10--Investigate RV of Analytical Information

(U) In the pilot phase of the exploratory analytics program, we have continued to research some of the fundamental mechanisms of RV. The goal of these analytic experiments is to identify the internal mental processes and other variables that enhance and/or inhibit psychic functioning in forced-choice RV. We used one viewer. As during FY 1986, the FY 1987 experiments have been long distance; Viewer 002 was in New York City, and the experimenters were at SRI International in Menlo Park, California.

(U) During the first half of FY 1987, we conducted a series of approximately 300 trials of the forced-choice format where, before declaring his response, Viewer 002 stated how he felt about his contact with the target. Specifically, for each trial, he declared one of three conditions: (1) "yes," he had contact with the target, (2) "no," he did not have contact with the target, or (3) "?," he was unsure whether or not he had contact with the target. For these trials, the viewer and an experimenter communicated by telephone. Targets were objects, Zener cards, or words or numerals written on 3" x 5" cards. The experimenter, who worked in an office with a computer, chose two possible targets and described them to the viewer. Using a random number generator (RNG), the experimenter selected one of the two possible targets for the trial,

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placed it on a small empty table, and then rang a bell into the telephone, signaling to the viewer to perceive the target. The viewer than declared "yes," "no," or "?" and gave his response; he then received immediate feedback from the experimenter. For every trial, the experimenter made a written record of the possible targets, actual target, declared condition, and viewer response, as well as date and time of the trial.

(U) The hypothesis being tested was whether Viewer 002 is able to recognize "contact" with the target. If this hypothesis is true, we would expect above-chance, below-chance, and chance results in the "yes," "no," and "?" conditions, respectively. The reason that we would expect below-chance results in the "no" condition is that psychoenergetic functioning is required by the viewer if he "knows" that he is not in contact with the target. In other words, the viewer is willing to declare that he is likely to be wrong.

(S/NF) The trials took place at approximately the same time every day between January 5 and February 20, 1987, with a varying number of trials per day. Of 147 trials in the "yes" condition, 88 were hits, where 74 would be expected by chance. Of 59 trials in the "no" condition, 23 were hits, where 30 would be expected by chance. Of the 121 trials in the "?" condition, 66 were hits, where 61 would be expected by chance. The p-values for these three conditions are 0.01, 0.05, and 0.23, respectively. From p-values alone, it appears that the hypothesis is supported. The trend in the psychological sciences is to use some measure of "effect size" in conjunction with p-values. The reason is that p-values are sample-size dependent and, therefore, may mask important results. The "effect size" for the three conditions is 0.20, 0.21, and 0.09, respectively. This result indicates that the equivalent amount of psychoenergetic functioning was used by Viewer 002 to determine his degree of contact with the target. We are encouraged by this result because it represents a modest success toward the goal of recognizing the source of "noise" in forced-choice experiments.

(U) During the second half of FY 1987, we conducted another series of trials of the forced-choice format, using the same protocol as described above but with slightly different conditions and testing a slightly different hypothesis. These trials took place from 23 February through 21 September 1987, a total of 82 sessions (one session per day at approximately the same time every day), with a varying number of trials per session. Before each session the viewer declared how he felt, and he assessed how successfully he would contact the targets in the coming

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session. Specifically, his pre-session self-assessment would be to declare one of three conditions: (1) "a plus day," if he felt that he would make a significant number of contacts with the targets, (2) "a minus day," if he felt that he would not make a significant number of contacts with the targets, or (3) "a so-so day," if he was not confident that he would be able to contact a significant number of targets.

(U) The hypothesis being tested was whether Viewer 002 is able to assess, immediately before a series of trials, his ability to contact the targets for those trials, based on self-knowledge of his physical, emotional, and mental well-being at that time. If this hypothesis is true, we might expect above-chance, below-chance, and chance results (on the average) in the "plus day," "minus day," and "so-so day" conditions, respectively.

(S/NF) Of 311 trials conducted on "plus" days, 174 were hits, where 156 would be expected by chance. Of 484 trials conducted on "minus" days, 243 were hits, where 242 would be expected by chance. Of 546 trials conducted on "so-so" days, 322 were hits, where 273 would be expected by chance. The sum of trials in all three conditions was 1,341, with 739 hits, where 671 would be expected by chance. The p-values (with continuity corrections) for these three conditions are 0.02, 0.48, and 1.3 x 10^{-5}, respectively; the p-value for the sum of all three conditions is 0.0001. From the p-values alone, it appears that the hypothesis is supported for the "plus" days, and that the viewer did better than expected for the "minus" and "so-so" days. The z-scores (with continuity corrections) for the three conditions are 2.04, 0.045, and 4.15, respectively; the z-score for the sum of all three conditions is 3.71. The effect size for the three conditions are 0.12, 0.002, and 0.18, respectively; the effect size for the sum of all three conditions is 0.10. At this time the interpretation of these results is difficult. Since the best effect size seen in these series is of the order of 0.20, a saturation effect might be in force (i.e., the best Viewer 002 can produce in a binary experiment is an effect size of 0.20).

23. (U) Objective F, Task 11--MDS and RV Data Analysis

(U) In experimental studies of remote viewing, the analysis of the resulting data for accuracy and information content has used techniques based on rankings by judges and encodings of targets and responses with sets of descriptors. Geographical locations have

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frequently been used for targets, few studies have investigated what attributes of such material are preferentially conveyed or how such perceptions are represented. Elucidation of these questions might permit the construction of improved methods of judging remote viewing experiments. The analogous problems in normal perception have been investigated by studying the structure of similarity measurements. In this study these methods were applied to the case of remote viewing.

(U) In this pilot study, subjects estimated the global similarity between pairs of photographs of geographic locations. The resulting matrix of similarity values was analyzed by multidimensional scaling to give two- and three-dimensional representations of the psychological data. A method of estimating the deviation from chance expectation was developed. The results for the remote viewing pilot study were compared with structures derived by multi-dimensional scaling from a comparison study using the same targets viewed with normal visual perception. The remote viewing study shows no deviation from chance by the criterion developed here but the resulting two-dimensional semantic structure shows parallels with that from the comparison study and gives weak evidence for the existence of the underlying semantic dimensions of predominantly man-made scenes versus predominantly natural scenes and the presence versus the absence of land-water interfaces in the scenes.

24. (U) Objective G, Task 1, and Objective D, Task 1--Computer Search and Dowsing

(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, a computer-assisted search (CAS) experiment was conducted in FY 1984 and again in FY 1986. Participants scanned a computer graphics display and attempted to locate a hidden computer-generated target. In each experiment, two conditions were randomly interchanged in a balanced protocol: (1) the target was fixed in space (space condition), and (2) the target was randomly shifting locations several times each second (time condition). Both the subjects and the experimenter were blind to the condition on each trial.

(S/NF) In FY 1984, five of seven participants demonstrated an above-chance ability to find targets in one of the two conditions: three in the time condition and two in the space condition. Of the 36 participants in the FY 1986 experiment, 2 showed above-chance results in the space condition and 6 in the time condition. No participant in either experiment was able to find targets in both conditions independently.

(S/NF) In FY 1987, an experiment was conducted which successfully replicated this finding. Of eight participants (six experienced and two novices), one scored significantly in the space condition, and none in the time condition. However, the two subjects who scored the best in the space condition had previously been successful in that condition, and the subject who scored best in the time condition had previously been successful in that condition. This suggests that participants are likely to consistently do well in one condition or the other, but not both.

(S/NF) Since this is the third successful laboratory replication of this experiment, it suggests that this technique for finding a hidden target may be robust enough to use in military applications for which such information is needed, such as locating a kidnap victim in Beirut. The best subject in the FY 1987 experiment showed a reduction in the area that would need to be searched in 72% of the trials in the space condition, with an average reduction in area of 33%. Previous experiments showed even greater reductions. In real-world applications, this could represent a substantial savings in resources.

(U) A second search experiment was conducted in FY 1987 to see if self-proclaimed dowsers could find a lost ship by searching a grid overlaid on a map. The object of the search was a sunken Spanish galleon called The Atocha, which was actually found in 1985. The experiment was preceded by a real-world search in which one of the participants successfully located another sunken ship by choosing the correct locations on an unmarked grid. Accompanied by SRI personnel, the participant was in a vessel anchored over the site of the wreck at the time of the experiment. The Atocha experiment was carried out with two sets of 25 trials for each of five participants, but failed to produce a single significant result.

25. (U) Objective H, Task 1--RA Effects on Single Alpha Particles

(U) Due to unforeseen circumstances, the alpha particle experiment never reached a point where it was stable enough to collect data from human participants. After careful consideration of the cost to continue and the results of the other RA experiments for FY 1987, it was decided to stop work on this task. What follows is an engineering summary of the state of the system at close-out.

(U) During FY 1987, SRI developed a novel, position-sensitive system to detect alpha particles. In order to reduce the cost and complexity of the system, we elected to employ

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off-the-shelf components whenever possible. In particular, we chose a Hamamatsu silicon microstrip radiation detector as the key element. Although charge-sensitive preamplifiers are usually selected when using a semiconductor detector, such preamps are awkward to use in large numbers. Because we required 48 active strips, a compact LeCroy current-sensitive preamplifier and discriminator unit (2735B) was purchased. The 2735B cards were originally designed for use with wire chamber detectors but we were assured by the manufacturers that the cards could be mated with a semiconductor device. As we have learned, a substantial development effort was required to reduce the noise of the system and create an interface between the detector and the 2735B. The balance of this note describes the work which was necessary to eliminate sufficient noise to observe the alpha particles.

a. (U) Initial System

(1) (U) Connector Noise

(U) The discriminator card is a current-sensitive preamplifier that allows the noise floor to be adjusted using the threshold control. The system uses this threshold control to calibrate the magnitude of the current pulses. One volt on the threshold line will discriminate against 2 μA of signal. If all 48 channels are high until the threshold voltage is increased to 10 volts, then the noise floor will be 20 μA. As was determined later, the alpha particles produce 40 μA pulses, not visible in the original system which exhibited 48 μA of noise. The discriminator was on the outside of the vacuum chamber and was connected to the strip detector by twisted-pair ribbon cables and two vacuum feedthroughs. The contacts on the feedthrough connectors contributed 10 μA of noise each. Because there was a connector on each side of the feedthroughs, the noise contribution was 20 μA. This was determined by unplugging the connectors on each side of the feedthroughs, one at a time, and watching the threshold voltage go down 5 volts per connector (10 μA). This noise was reduced by relocating the discriminator cards inside the vacuum chamber and eliminating the feedthroughs in this part of the circuit. Now, only logic signals pass through the feedthroughs in the base plate, not the low-level, current-sensitive lines.

(2) (U) Hybrid Preamplifiers

(U) The wiring between the strip detector and the 2735B was originally coaxial cables below the base plate and twisted pair ribbon cable inside the chamber. To reduce the noise, the twisted pair was replaced by coax inside the chamber. When it became evident that the wire was not the problem but rather that connectors were making the noise, we decided

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that the 2735B cards had to be placed inside the chamber. We resisted doing this initially for several reasons:

- The 2735B cards may be damaged in a high vacuum.
- Overheating may occur.
- The system may be contaminated through outgassing.

(U) The heart of the 2735B is four custom hybrids called HILs. We were concerned that these sealed hybrids would not work under high vacuum, but LeCroy guaranteed us that they could even be used in deep space. The HILs require 1.5 amps at −5 volts and thus produce a great deal of heat. Without convection cooling in the vacuum chamber, overheating could make long runs impossible. To solve this, we used the strip–detector mounting plate as a heat sink and mounted the 2735B cards on it backwards, with the HILs sandwiched in between the PC board and the plate. A leaf of indium foil was inserted between the HIL and the plate to provide better heat conduction. Using the mounting plate as a heat sink, we stabilized the temperature of the HILs to 50°C. Our last reservation about mounting the HILs in a vacuum was our concern for outgassing. This would lower our vacuum pressure and distort the path of the alpha particles. However, no outgassing has yet been detected.

b. (U) Pulse Processing

(U) The 2735B performs to its specifications and the system noise is only 2 μA with no input. Our next task was to find out why the alpha particles were not visible at this time. Detailed analysis of the detector preamplifier circuit revealed a subtle problem not addressed by any vendors.

(U) We have shown the bulk silicon of the device to be N–type, as it is in the Hamamatsu detector. When such a device is reverse–biased, a positive dc voltage is applied to the highly doped N+ contact. An alpha particle that enters the depletion volume (the bulk of the silicon) will generate a cloud of holes (positive charges) and electrons (negative charges) in its path. Fundamental semiconductor physics dictates that the holes will be collected at the negative–biased contact and the electrons will collect at the positive–biased contact.

(U) In our microstrip detector, the fabrication of the device determined that we bias the entire unit through the N+ substrate and make individual connection to the 48 signal inputs from the P+ contacts. Therefore, the 2735B input signal was in effect biased negatively with respect to the substrate. However, as described above, the holes (i.e., positive charge) are

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collected at that contact. As a consequence, a positive current pulse was being transmitted to the input of the 2735B.

(U) LeCroy's specifications state that the 2735B card is designed for negative current pulses and will reject opposite polarity pulses up to 50 μA.

(U) Using a single-channel charge-sensitive preamplifier and a nuclear spectroscopy shaping amplifier, we were able to carefully examine the alpha particle pulses generated by the microstrip detector. We determined that the charge pulse should be equivalent to a 40 μA positive current pulse. Given the rejection characteristics of the 2735B, it was clear that our positive alpha particle pulse would not be detected.

(U) We elected to design a pulse-inverting circuit. Two custom PC boards with 24 pulse-inverting transformers were made and installed on the output of the strip detector. Because the current pulse's duration is 10 ns, we selected an RF pulse transformer so the signal would not be attenuated.

(U) These transformers have an output impedance of 75 ohms, which effectively short-circuited the input of the 2735B. It was necessary to add a 0.1-μF ac coupling capacitor to the circuit. At this point, the alpha particles became visible as a normal distribution on the computer screen for the first time.

c. (U) Present System Performance

(U) After these modifications were made to the system, the noise floor was brought down to 24 μA and discriminated away. Only signals larger than 24 μA will be seen by the computer. The system can now see the alpha particles in real time, and is sensitive enough to use as a tool to see any system noise. The noise has been greatly reduced; however, noiseless performance outside of the alpha particle beam has not yet been attained. Two types of noise have been found and need to be eliminated for an infinite signal-to-noise ratio. These types are as follows:

- Spurious, intermittent, random noise.
- Parallel noise pulses.

(1) (U) Random Noise

(U) There is a rare, random event that shows up intermittently in random places. In the data presented at the end of this paper, the alpha particles are very visible

(U)
in the middle with a few single noise pulses randomly dispersed. This random noise is produced by defects in the silicon strip detector. Detectors can be specially selected for their low noise characteristics and a new detector could be purchased to eliminate these sporadic, individual noise pulses.

(2) (U) **Parallel Noise**

1. **DC Line Noise**

(U) Another anomaly in the system is a dc noise pulse that intermittently pulses every channel simultaneously. This is referred to as a parallel noise pulse and it can be caused only by an event that affects all 48 channels in parallel. The discriminator power supplies, threshold voltage supply, and the strip detector high voltage supply are all connected to the 48 lines and could be a common source of noise. A noise pulse on one of the voltage lines could induce this type of noise pattern. Such noise is found when the telephone is used. If the telephone is lifted off the hook, it induces several parallel noise pulses in the system and increases the count on each channel. A ringing telephone will not affect the experiment but, as a precaution, the telephones were forwarded whenever data was collected.

2. **AC Line Noise**

(U) The power line was the next suspect point for ac line noise getting into the system. All electronic equipment was plugged into a single power line filter/conditioner, including the computer, CAMAC crate, and the discriminator power supply. When overloading the conditioner reduced its effectiveness, the computer and CAMAC crate were removed from the conditioner and plugged into the wall. The discriminator power supply and voltage threshold supply were left on the power-line conditioner to reduce any noise to the charge-sensitive electronics. To help filter low frequency noise on the high-voltage bias line of the strip detector, an RC filter was used with a time constant of 100 ms.

d. (U) **Electro-Magnetic Noise**

(U) The sensitive inputs of the discriminator make it vulnerable to electro-magnetic pickup. The presence of a large electro-magnetic field could account for the induction of a parallel noise pulse being induced in the output wire that connects to the discriminator input and acts as a receiving antenna. Shielded coaxial cables were used at first, but their capacitance affected the charge-sensitive inputs of the discriminator. Shielding the bell jar of the vacuum system, where all the charge sensitive electronics are held, helped shield the

(U)

discriminator inputs from the environmental noise. Using the metal mesh cage around the glass bell jar as a Faraday shield and covering it with aluminum foil helped to increase the noise immunity to high-frequency noise injection inside the chamber. To reduce emitted EMI, the computer and printer were removed from the CAMAC rack and placed 15 feet away from the experiment. This did not change the system noise and the computer was put back in the rack.

e. ECL Logic Levels

(U) Another problem that could be causing the parallel noise pulse is a weak ECL logic level on the discriminator outputs. The ECL output voltage is lower than specified but is just within operating range. There is a 200-mV, 60-Hz ac sine wave riding on the logic output. Combining the low logic level with the 60-Hz noise puts the logic level right on the edge of the threshold between a logic 1 and 0. A very small signal on this line, such as an environmental event, could be just enough to lower all logic levels. The weak logic level on the discriminator output is not being caused by the coincidence register or the parallel OR gate loading it down. The logic levels do not change when the registers are disconnected; loading the 2735B has no effect.

f. (U) Ground Loops

(U) As the system noise diminished, it became apparent that ground loops were being created by a grounding strap connecting all pieces of the system together. Eliminating this strap reduced the noise floor another 4 μA.

g. (U) Alpha Particle Distribution

(U) The uneven distribution of the alpha particles is not inherent in the system, but rather in the curium 244 source. Tests were performed to verify that the detector strip numbers 1-48 are the same as computer channels 1-48. This indicates that the lines are properly matched. When the source is moved a couple of millimeters, the alpha particle pattern moves as well. This indicates that the strip detector is still functioning correctly. The two collimating screens inside the curium source, or the curium itself, could have shifted slightly inside the housing. This could explain the uneven distribution of alpha particles shown in the data.

(U) The following data represent a sample of each type of noise. The data were taken over a period of one-half hour with threshold voltage set at 15 volts and the curium source set at a distance of 1 cm.

Spurious, intermittent, random noise

1-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-32	0	0	0	0	0	0	0	30	36	833	3	4	78	0	14	0
33-48	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0

Parallel noise pulses

1-16	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
17-32	1	1	1	0	1	2	0	40	22	848	0	8	71	1	13	1
33-48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

The following is a chart of eight, one-half-hour sessions compiled with all the random noise pulses displayed on the same histogram, and with the curium source present but subtracted from the data:

1-16	0	0	1	3	0	1	0	1	0	0	0	1	0	0	1	2
17-32	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-48	0	0	0	1	1	0	0	0	0	0	0	0	1	0	6	0

h. (U) Proposed System Testing And Modifications

(U) We are now able to demonstrate the presence of the alpha particle beam well above the noise floor. Three different software packages have been debugged and can be used to give us maximum flexibility in the way we collect and display the data. Both types of noise still exist but we now have a better understanding of the noise and the limitations of the system. In order to meet the requirements of the RA experiments, the alpha particle system must be noiseless except for the beam. In order to examine and, if possible, exclude all remaining noise, the following tests and modifications are suggested:

(U)

- Separate vacuum system and CAMAC crate/electronics by 10–20 feet.
- Monitor outlying random noise channel with charge-sensitive (pulse shape) electronics.
- Retest, examine, and, if necessary, modify 2735B to increase the ECL logic to –2 volts.
- Purchase a new, microstrip detector selected for low–noise characteristics. Price $3,000, with delivery in 3–6 months.
- Slowly and carefully move detector connections on present microstrip device to examine the noise performance of all 48 strip combinations.
- Using EMI equipment and appropriate spectrum analyzers, retest the ambient electro–magnetic noise environment.

(1) (U) Detector Instrumentation

(U) During FY 1986, all necessary detector apparatus was specified and purchased, or was fabricated. During the first half of FY 1987, this equipment was tested for use in the proposed RA experiment and modified or improved where necessary. The radioactive source has been verified using a separate detector system, and was found to be in the range of ~ 100 counts per second, which will be adequate for the experiment. The operation of the multiple–strip detector system has also been tested using a single–channel preamplifier unit and found to be functioning properly when the system noise has been filtered by an appropriate amplifier time constant. Principal difficulties encountered in the pilot work with the detector centered on proper alignment of 48 parallel channels and suppression of electronic noise pickup from the environment. The first problem was solved by careful checking and rerouting all wires, vacuum feedthrough connectors, and computer register inputs. Noise interference has been suppressed by several techniques, including identifying and removing ground loops, establishing a substantial ground plane next to the detector, supplying a shielded connector inside the vacuum chamber, and replacing twisted pair wires with coaxial cable.

(2) (U) Data Display

(U) With the help of an SRI Geoscience and Engineering Center specialist in real–time computer systems, the LSI 11/23 computer, the Computer Automated Measurement and Control (CAMAC) interface, and data inputs have been made operational. We now are able to identify which of 48 possible detector strips have been activated, save those data, and rapidly reinitialize the system for another cycle. The information is then transmitted via the CAMAC interface to the LSI 11/23 computer, where it is stored in a memory buffer, then

(U)

shown on a video-display screen. In parallel, the pattern of activated strips for all 48 locations is printed for later inspection. At present, this process is repeated each time any detector strip has been enabled.

(3) (U) Artifactual Influences

(U) We have initiated environmental measurements of potential sources of artifact, which may influence the flight of the particles or may add extra noise to the electronics. The room in which the apparatus is located also contains a transmission electron microscope (TEM), with its attendant high-voltage power supply and typical industrial fluorescent lighting--as well as the video-display terminal and other computer equipment. Measurements of magnetic-field transients indicated a need for some shielding near the detector apparatus. This shield will served to suppress ambient electric fields. A TOPAZ power conditioner was purchased and installed to suppress or eliminate power line surges resulting from switching of other nearby apparatus such as the TEM mentioned above. The unit meets severe IEEE and Mil-Std specifications for noise and transient suppression, and appears to have successfully eliminated such problems.

26. (U) Objective H, Task 2--RA Effects on a Few-Photon Quantum System

(U) We have used a single-photon interferometer to examine the role of consciousness in the state vector collapse. The result was that an "irreversible act of amplification" does not require consciousness. The implication is that RA is, at least, not a necessary condition in nature.

27. (U) Objective H, Task 3 and 3a--RA Effects on Strain Gauges

(U) In FY 1986, a joint venture was begun to examine possible remote action (RA) effects on piezoelectric transducers. Participants were recruited, evaluated, and trained, by researchers from John F. Kennedy University. SRI International developed an experimental RA system, and prepared a well-characterized environment for formal experimental sessions.

(U) During the pilot phase, transducer signals were observed under sufficiently controlled conditions to warrant continued investigation. During FY 1987, significant improvements were made to the protocol, system hardware and software, and control environments. A separate report reviews the FY 1986 pilot study and details the elaborate and necessary precautions undertaken during FY 1987 to prevent or understand the sources of artifact. No evidence for RA was observed in this experiment.

28. (U) Objective I, Task 1--Meta-Analysis of RNG Data Base

(U) This work is being conducted under subcontract with Psychophysical Research Laboratories (PRL) in Princeton, New Jersey. The PRL Purchase Order Contract was let August 4, 1987 with the first deliverable due at the end of the first quarter of FY 1988.

29. (U) Objective I, Task 2--Test of IDS Model with "Dynamic" Systems

(U) A computer test of the Intuitive Data Sorting (IDS) model has been carried forward from the FY 1986 tasking. The primary reason for this delay was that only one out of the 100 individuals tested was able to demonstrate psychoenergetic ability during the FY 1986 screening phase. Because the IDS model is such an important model for the program at large, we will continue to screen for talented participants.

(U) A modification to the computer program was made in order to provide information about the details of the button-press timing. Because of the nature of pseudorandom number generators, adjacent seeds do *not* produce nearly identical sequences. Thus, the remarkable 1-ms timing reported by Radin and May[3] appears to be a methodological artifact. We incorporated a simple seed transformation in order to have the significant seeds be evenly spaced in time. Thus, the IDS experiment is expected to yield results with regard to the model, as well as with regard to human timing ability under psychoenergetic conditions.

30. (U) Objective I, Task 3--Host Theory Conferences

(U) No theory conference was held during FY 1987.

31. (U) Objective I, Task 4--Princeton Conference

(U) In FY 1987, SRI International awarded a subcontract to the Princeton University Engineering Anomalies Research Laboratory (PEAR). The purpose of that subcontract was to organize and host a conference of SRI Cognitive Science Program staff, subcontractors, and designated consultants. The conference was held at Princeton's Scanticon Conference Center on April 9-10, 1987, to discuss the topic "What constitutes proof of a controversial claim?" Thirty-one persons attended the conference. There was also an after dinner speaker each evening. A separate report contains an SRI assessment of the conference. Following the conference, the PEAR staff prepared a conference proceedings.[4]

32. (U) FY 1986 Objective E, Task 1--PMT Final

(S/NF) 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 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* 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 or 40:1. In the present experiment (FY 1987), 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.

(S/NF) Our analysis of the PMT data shows no evidence of any anomalous high-count-rate pulses, no evidence of any effect on the PMT output during the RV session, and no evidence of any significant correlation between RV performance and PMT output. We conclude that (1)

SG1B [redacted] and (2) suggest that the significant correlation observed in our 1984 study is either a statistical anomaly or the result of Intuitive Data Sorting on the part of the experimenters.

33. (U) Objective J, Task 1--Administrative Support

(U) There are no deliverables required for this Task.

34. (U) Objective J, Task 2--Publications

(U) There are no deliverables required for this Task.

35. (U) Objective J, Task 3--Computer Hardware/Software Maintenance

(U) SRI has negotiated a contract with Sun Microsystems that offers software maintenance and support coverage at a greatly reduced rate to all Sun users at SRI. The overall

(U)
cost of the contract will be shared by those requesting coverage, and thus the cost to the project is not yet known. Nonetheless, the cost will be at least 50% less than previously paid.

(U) Since the beginning of FY 1987, approximately $7,000 has been spent for hardware repairs to monitors, video controller boards, and power supplies. In the past, it has been more expensive to buy hardware maintenance coverage than to pay for individual repairs. Currently, SRI is negotiating a hardware maintenance contract with Sun to cover all Sun systems at SRI; this contract is expected to be as advantageous as the software contract. Once this agreement is in place, key nodes in the system will be placed on a hardware maintenance contract.

(U) Of the 13 Sun Microsystems workstations used by the group, all are in working order, and only one is off line--pending the completion of software and hardware modifications to the tachistiscope experiment.

(U) When the Sun 3/280 file server was brought on line in mid-March, the most recent version of the UNIX operating system (Version 3.2) was installed. The most recent version of the Unify data base program (Version 2.0), along with a new window-based interface (SunSimplify), will be installed in mid-April. Unlike the old data base system, which was slow and complex, the Unify system will provide rapid and easy access to data from any workstation on the network.

36. (U) Objective J, Task 4--Upgrade Computer Hardware

(U) No new computer upgrades were made during the second half of FY 1987.

37. (U) Objective J, Task 5--Additional RA Experimental Hardware

(U) No new substantial RA hardware was purchased during the second half of FY 1987.

38. (U) Objective J, Task 6--Travel

(U) There are no deliverables required for this task.

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IV ADMINISTRATIVE COMMENTS (U)

(U) Peter J. McNelis and Edwin C. May separately set priorities for the Statement of Work for FY 1987. McNelis set priorities on an Objective/Task basis, while May prioritized on a level-of-effort basis for deliverables. The assignment definitions, which were formally agreed upon, are as follows:

McNELIS		MAY	
A	Must do	1	Major formal report
B	Should do	2	Pilot, exploratory, approximately 3 to 5 pages
C	Postpone	3	Wild guess, few paragraphs
		0	Postpone.

(U) Table 3 summarizes the assignments on a task-by-task basis.

Table 3
(U) PRIORITY/DELIVERABLE ASSIGNMENTS FOR FY 1987

RV

Rating	Task	Name
B3	A4	Physical Correlation
B3	D1	Dowsing
A1	F1a	RV/Precognition
A1	F1b	Feedback + SL Tachistoscope
A2	F2	Video Disk
A2	F3	Advanced Training
B2	F4	Training Concepts
B3	F5	Stimulus/Response Correlation
B2	F6	Hypnosis
A3	F7	Special Targets
B3	F9	Neuropsychology
B2	F10	Analytics
A1	G1	Computer Search

RA

Rating	Task	Name
A1	E1	Delaware
B2	E2	Mind Science
A2	H1	Alpha-Particle
A1	H2	QM Photon
A1	H3	JFK
A1	I1	IDS-Dynamic
A2	J2	RA-Hardware
A1	H3a	SRI Part of JFK

TECH SUPPORT

Rating	Task	Name
A1	A1	SOC Design
A1	A2	SOC Assessment
A1	A3	RV Analysis
B2	B1	Library
A2	C1	Med/Psych Baselines
A1	C2	MARS
C3	C3	PAS Review
A2	F11	MDS
A1	I1	PRL
A3	J3	Computer Maintenance
A3	J4	Computer Hardware

GENERAL

Rating	Task	Name
A3	I3	Theory Conference
A1	I4	Subs Conference
A1	J1	Administration
A3	J2	Publications
A3	J6	Travel
A3	J7	Additional SRI Staff
A1	F8	Physiology Conference

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(U) In a separate memorandum, several FY 1987 task changes and task interpretations were formally authorized. These changes are summarized in Tables 4 and 5.

Table 4

(U) AUTHORIZED TASK CHANGES TO FY 1987 STATEMENT OF WORK

TASK CHANGE					
ORIGINAL SOW			CHANGED SOW		
Old Task	$ K	Activity	New Task	Activity	Justification
D-2	35.0	E&M correlates to dowsing	H-3a	SRI portion of JFK	Provide recognition of significant SRI participation in the JFK project
F-7	30.0	"Applications" targets for novice viewers	F-7	Develop video "mass" screening	Augment talented viewer pool
F-8	16.2	MEG with Los Alamos	F-8	Physiology Conference	More effective search for physiology correlates

UNCLASSIFIED

Table 5

(U) AUTHORIZED INTERPRETATIONS OF FY 1987 STATEMENT OF WORK

TASK INTERPRETATION				
Task	$ K	Activity	Interpretation	Justification
F-1a	87.5	Precognitive RV	To include real-time RV	Balanced protocol
F-1b	87.5	Subliminal Perception	Continue FY 1986 feedback experiment	Experiment contains SL
G-1	100.0	Abstract to real-world target link	Continue FY 1986 computer search activity	Necessary pilot phase for link investigation

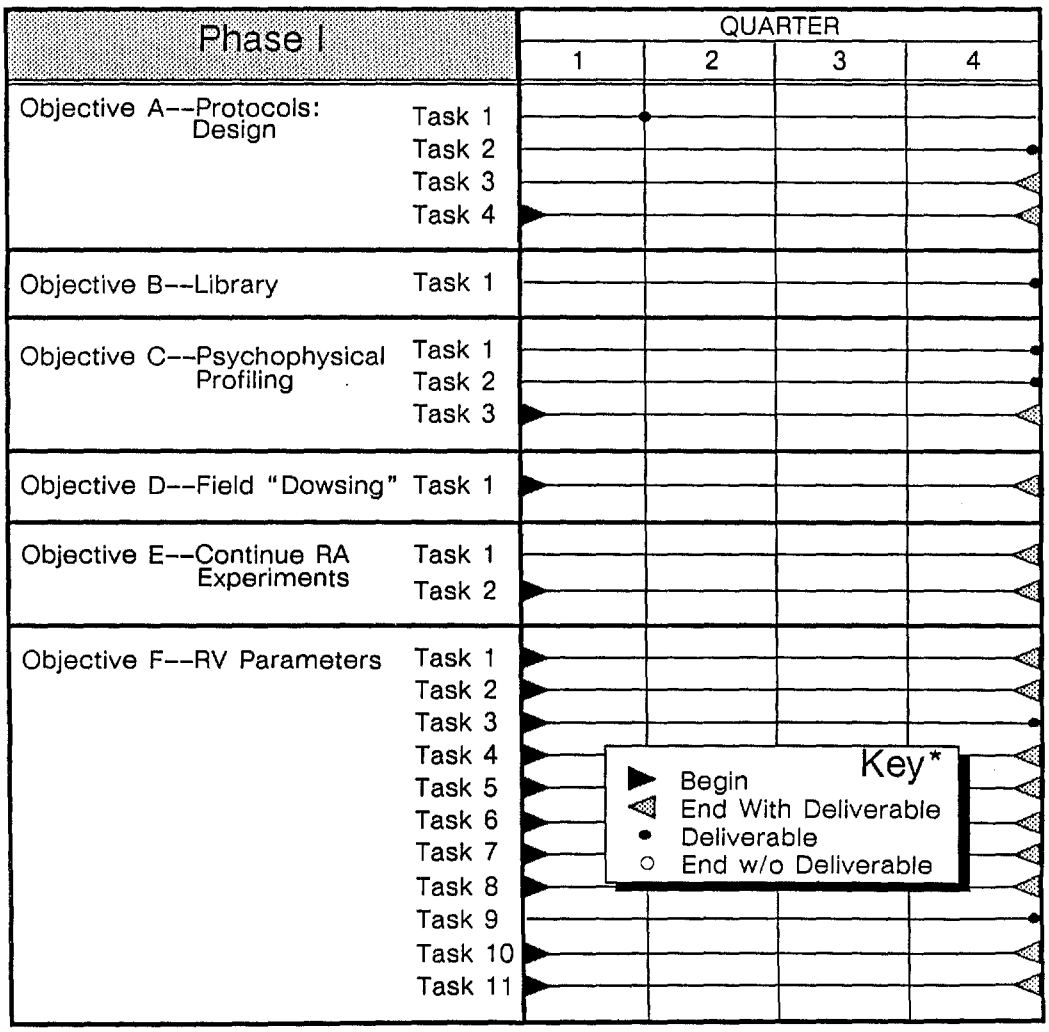
UNCLASSIFIED

V PROJECT MILESTONE CHART (U)

(U) Table 6 is the overall project milestone chart for FY 1987.

Table 6

(U) ENHANCED HUMAN PERFORMANCE INVESTIGATION--FY 1987

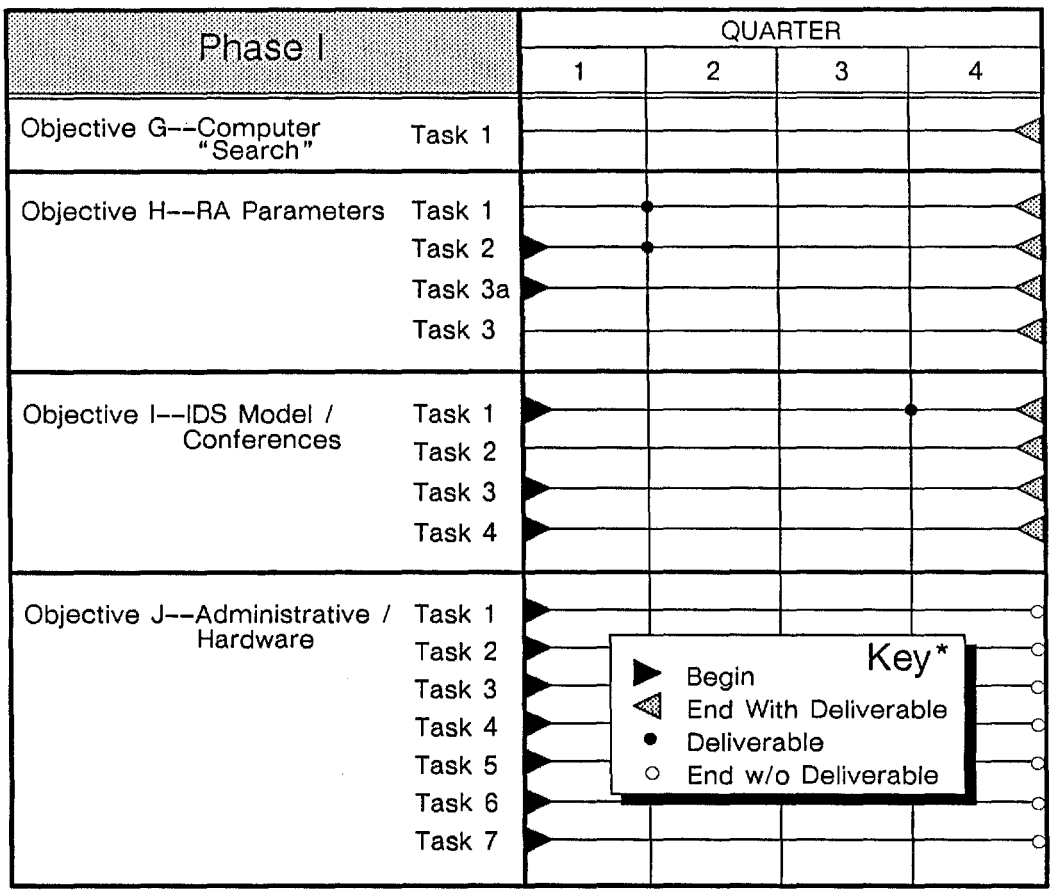


UNCLASSIFIED

* Tasks with no beginning indicator (▶) are continuations of an FY 1986 effort.

Table 6 (Continued)

(U) ENHANCED HUMAN PERFORMANCE INVESTIGATION--FY 1987



UNCLASSIFIED

* Tasks with no beginning indicator (▶) are continuations of an FY 1986 effort.

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REFERENCES (U)

1. Humphrey, B. S., May, E. C., Utts, J. M., Frivold, T. J., Luke, W. W., and Trask, V. V., *Fuzzy Set Applications in Remote Viewing Analysis,* Final Report, Objective A, Task 3, SRI Project 1291, SRI International, Menlo Park, California (December 1986) UNCLASSIFIED.

2. Neter, J., Wasserman, W., and Kutner, M. H. (1985), pp. 94–96, *Applied Linear Statistical Models,* 2nd Edition, Richard D. Irwin, Inc., UNCLASSIFIED.

3. Radin, D. I., and May, E. C., "Testing the Intuitive Data Sorting Model with Pseudorandom Number Generators: A Proposed Method," *Proceedings of the 29th Annual Convention of the Parapsychological Association,* pp. 537–535, Sonoma State University, Rohnert Park, California (August 1986) UNCLASSIFIED.

4. Hubbard, G. S., *The SRI International Cognitive Sciences Conference at Princeton University,* Final Report, Objective I, Task 4, Project 1291, SRI International, Menlo Park, California (December 1987) UNCLASSIFIED.

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.

REVIEWER'S COMMENTS

The attached report titled:

_____

_____

has been reviewed by the undersigned.

My assessment of the research design, statistical protocols employed, the analyses of the data, and conclusions reached in this report is as follows:

Additional comments:

_____

SIGNED

_____

DATE

SOC Reviewers' Comments, Objective A, Task 3

(Fuzzy Set Applications In Remote Viewing Analysis)

(verbatim transcription--not edited)

NAME: S. James Press

Comments:

1. The research is very interesting and is clearly very fruitful. It is so promising it should continue to be pursued with vigor.

2. Page 12, line 10. "Lowest p-values" - should be deleted. It's not necessary for the argument--"figures of merit" is enough. Then you're not involved in the issue of interpreting p-values.

3. Page 13, line 1. You should include $0 \leq \mu \leq 1$. I would put the 5th paragraph about "the assigned μ's,..." up with line 2.

4. Page 12, bottom line. Explain how the consensus decision was made. What happened when there was disagreement? Were they ever at an impasse? How far apart were they to start? Did you record this information? Would 5 analysts make a difference? Would 2 analysts make a difference? What was the variance in assessments?

5. Page 14. In the equations, R_J and T_J are not defined; fuzzy set intersection is not defined; how would we set the weights, W_k? Are the equations correct?

6. Page 14, last paragraph. It would be substantially clearer if you gave a numerical example, with a threshold, to show how α - cuts are used, and how Accuracy and Reliability are actually computed.

7. Page 16, line 8. How stable is the value "37," the average number of non-zero values? If you did the evaluation many more times what would the variance in the 37 be?

8. Page 17. Formula is not correct.

9. Page 19, paragraph F. "Ground truth" is a term appropriate in "remote sensing." Since RV is a kind of remote sensing, the term seems entirely appropriate. This might be explained.

10. Page 21. I would not know how to record my answer to the "Belief in ESP" question, nor do I know how to interpret other's responses to that question. To me, the biggest issue is binary belief: it it possible at all? I don't know what degree-of-belief means here? What does "complete" mean?

11. Page 22, line 6. How do you know the scores are normally distributed? Do you need them to be normally distributed?

12. Page 22, Figure 5. Aren't the 6 subjective evaluations by a single analyst correlated? All biases of a given analyst are bound to influence each of the 6 assessments

13. Page 23, line 4. What are the definitions of "experienced," "expert," and "novice" analysts?

14. Page 23, Figure 6. I am confused by this figure. Are the entries correlations? If they are correlations, why are some numbers greater than 1.0 and less than -1.0? I am not clear what the entries in Figure 6 are.

    Line 7 asserts that 15 differences were computed. I'm not sure, but I guess these are differences between figures of merit for each response-target combination and degrees-of-correspondence obtained from the PMT series. If so, the numbers aren't really comparable.

15. Page 24, line 3. The correlation coefficient computed is only meaningful for significance computations if the data are normally distributed. But are they? It is not likely.

16. Page 28, References. Why not delete "unclassified" for references 1, 2, 4, 6 and put "classified" for the remainder? It calls less attention to the classified nature of this work.

Recommendation: Yes 11-24-87

NAME: **Brian Skyrms**

Comments:

1. This is a careful and well-thought out use of fuzzy set theory. I agree that the important point is the identification of "orthogonal" target sets.

2. I doubt if use of fuzzy sets with fuzzy elements (page 26) would really lead to greater accuracy.

3. The suggestion made in session that RV subjects use descriptors to do their own classification after drawing, is a good to isolate fewer experimenter effects.

Recommendation: Yes 11-13-87

NAME: **Mike A. Wartell**

Comments:

1. This method* seems to be an extremely powerful means by which to analyze the results of experiments. It is the most promising formalism I have seen for use on ambiguous data of the type provided by these experiments. I am slightly

* Fuzzy sets and cluster analysis and appropriate universe of descriptors and "ground truth" assessment.

concerned (but only slightly) by the small size of the sample used for determining "ground truth."

2. The described methodology *must* be published in some legitimate outlet so that it gains external validation and is made available for other uses. (But I can't overemphasize the need for external validation of every aspect of this project.)

3. Suggest future research directions are appropriate.

4. Also, choice of orthogonal targets as decoys makes analysis more straightforward.

5. This may be the most significant secondary achievement coming from the project.

Response To S. James Press' Comments:

NAME: **Edwin C. May**

1. Most all of Dr. Press' comments have been attended to in the published final report for Objective A, Task 3.

SOC Reviewers' Comments on Objective C, Tasks 2 and 3 (Review of the Personality Assessment System)

(verbatim transcription--not edited)

NAME: **Brian Skyrms**

Comments:

1. This careful review concludes that the PAS will not be useful for the purposes envisioned. The conclusion appears warranted.

Recommend: Yes 11-18-87

NAME: **Mike Wartell**

Comments:

1. Good descriptive report on PAS methodology. Does not really detail usefulness or lack-of same to the project. Does not really report correlation of results, and is, therefore, functionally different from other reports.

Recommendation: Yes 11-11-87

NAME: **Philip Zimbardo**

Comments:

1. This is an excellent review which could be published in a professional journal with minor revision.
2. Need to mention that the PAS has also been rejected by psychologists because it is a *type* theory at a time when typologies are not in vogue.
3. I accept the conclusions reached that there is limited utility of PAS for RV screening.

   It should also be noted that a reason for the obscure status of PAS is the fact that early research was probably classified, since it was part of the CIA's program of identifying target individuals for various mind/behavior modification attempts
4. Five characteristics of individual's that might correlate with RV ability:
   1. Openness to new experiments (paper and pencil test).
   2. Remote associates test (paper and pencil test).
   3. Tolerance for ambiguity.

4. Tolerance for frustration.

5. High self esteem – high ego strength.

6. p. 4 Bem is Daryl not Darrel

Recommendation: Yes 11-13-87

SOC Reviewers' Comments on Objectives D and G, Task 1 (Computer-Assisted Search)

(verbatim transcription---not edited)

NAME: **S. James Press**

1. Results of this work are interesting and encouraging, but much more work needs to be carried out. The underlying phenomena are not yet well understood, and replicability is problematic.

2. Page ii, paragraph 3. Last sentence is an overdrawn conclusion based upon very small sample.

3. Page ii, last paragraph. I don't find that this "effect" is sufficiently well understood as to it being ready to be proposed to the military. For me, we would need large samples, replicated many times with the same subjects – the time and space differential effects are not yet understood. The conclusion is overdrawn.

4. Page 3, line 2. The formula $1-(1-.0001)^{72}$ is based upon independence of trials. But they weren't independent; there was learning.

5. Page 9, last paragraph. This approach to a p-value for an experiment is hokey, ad hoc, and not founded in a scientific basis–or is it? If so, I would like to see a proof of why this procedure is appropriate. It's not obvious.

6. Page 13, middle paragraph. Results in 1987 with completely chance results emphasize more than ever that these dowsing results are nowhere near ready for military application.

7. Page iii, last paragraph. Placing the subject directly over the target (the wreck) is a location that could have been guessed by the subject (just as the combination lock on a suitcase is usually a birth date, a marriage date, etc., and so with a bit of prior effort, the result can be guessed). Strangely, there was no significant result.

Recommendation: Yes 11-13-87

Response To S. James Press' Comments:

NAME: **Jessica Utts**

1. Response to comment 2: It is true that the sample size upon which this statement is based was small for the FY 1987 experiment, but the surprising thing is that this same trend has survived three years of experiments. Also, the sentence was worded as a suggestion of a trend, not as a conclusion.

2. Response to comment 3: Agreed. The paragraph in question has been reworded to reflect a more cautious interpretation of the results.

3. Response to comment 4: Learning would not change the fact that the trials are independent under the null hypothesis, and p-values are always computed under the null hypothesis. The game is set up so that even complete knowledge about *how* it works will not help one's chance for success without the use of psi.

   Response to comment 5: This approach to a combined p-value was the first one used historically for combining results. It is powerful when one or more subjects can produce a large effect, whether or not others can. This seems to be the case in psi experiments, so it seems to be a good measure of the overall significance of a psi experiment. An explanation to this effect has been added to the report.

   Response to comment 6: Agreed. See note (3) and response.

   Response to comment 7: This comment reflects a misunderstanding of the experiment; the report has been reworded to try to clarify that issue. The subject *knew* that they were anchored over the wreck, but did not know which segment of the (unmarked) map corresponded to that spot. The grid used for dowsing was keyed to the map in a random fashion.

NAME: **Michael Wartell**

1. Research design and analysis are acceptable, where CAS is involved. Some aspects of the design of the Atocha experiment are unclear. Analysis of both experiments is sensible.

2. Some parts of preliminary draft are confusing to this reader as marked on report. Writing needs clarification.

Recommendation: Yes 11-13-87

NAME: **Philip Zimbardo**

Comments:

1. The computer-generated Task 1 target procedure is sound.

2. This application of psi has clear operational implications--and should be continued.

3. The results are disappointing, if the prime findings are those on page 11, last sentence. However, operationally, if you are looking for anyone who can enhance search operations for your client, then the individual data for s # 837 is promising. But to be operational, there would have to be more stability of the "dowser" over time, i.e., test situations.

4. Q: Why not use as Ss known "dowser" with some established track record in a laboratory controlled setting?

5. Page 13, paragraph 1. Conclusion: "once again produced significant results." This conclusion again is vastly overstated, and should be tempered by greater scientific cautiousness.

Recommendation: Yes 11-13-87

Response To Philip Zimbardo's Comments:

NAME: **Jessica Utts**

1. Response to comment 4: We have worked with one known dowser (Subject 198), with mixed results. Some of these are reported with the FY 1984 experiments.

   Response to comment 5: While it is true that the experiment produced a significant result using one particular criterion, the overall results were not as good as they were in past years. Thus, the statement in question has been tempered in the report.

SOC Reviewers' Comments on Objective E, Task 1
(An RA Investigation With Marine Microorganisms)

(verbatim transcription--not edited)

NAME: **Michael Wartell**

Comments:

1. I have concern about quality and quantity of data contained within this report. As stated, no conclusions can be drawn. I do feel that the *proposed* experimental design and data analysis were acceptable.

2. Report should simply identify this experience as a "busted contract" and go on from there or drop the subject.

Recommendation: Yes 11-11-87

SOC Reviewers' Comments on Objective E, Task 1
(October, 1985–September, 1987)
(Possible Photon Production During A Remote Viewing Task: A Replication Experiment)

(verbatim transcription--not edited)

NAME: Michael Wartell

Comments:

1. Design and analysis of experiments are acceptable. Experiment appears to have been carefully accomplished.

Recommendation: Yes 11-11-87

NAME: Nicholas Yaru

Comments:

1. I agree with the conclusion that the Chinese experimenters observed the results of transients. This is conclusive data to terminate this experiment. The shielding and signal processing techniques you have evolved should be useful in future work.

Recommendation: Yes 12-21-87

SOC Reviewers' Comments on Objective E, Task 2

(Experimental Protocol For Hemolysis: Confirmation Experiment)

(verbatim transcription--not edited)

NAME: **Herbert L. Ley**

Comments:

1. The report is excellent. There is one variable that I did not pick up in earlier reviews (probably because with 32 subjects the drawing of blood must be staggered) that could be looked at in greater depth. Blood samples were drawn for 14 to 42 hours before the experimental period. This is a three-fold variation in time. Although ACD is a good blood preservative, it does not totally eliminate the effects of aging on red cell fragitity. Therefore, the time between drawing blood and the testing could be influencing results. Critics of this experiment may be expected to focus on this uncontrolled variable.

2. I would recommend, if possible, that the variable of time between drawing blood and testing be tested for significance in the recent test using ANOVA. If no significance can be associated with this variable, fine. Any future testing should include controlling the time variable. Obviously, if the samples are refrigerated sufficient time must pass before the testing to permit thermal equilibrium of all samples. Whether the delay is 24 + 1 hours or 4 + 0.2 hours or some other figure makes no difference. The important thing is that the time variable be controlled in any future tests of hemolysis.

Recommendation: Yes 12-18-87

Response To Herbert L. Ley's Comments:

NAME: **Jessica Utts**

1. Response to comment 1: The differences in time should be at least partially controlled for by interspersing the control and protest periods. A statement to this effect has been added to the report. Also, the suggestion will be passed on to the Mind Science Foundation for their use in designing future experiments.

NAME **Brian Skyrms**

Comments:

1. This appears to be a well-designed experiment, which produced results which are equivocal for the theories under consideration.

Recommendation: Yes 11-18-87

NAME: Michael Wartell

Comments:

1. I am concerned that the protocol became unduly complicated when the "own" blood versus "others" blood was added as a variable. The results remain ambiguous, but the extra variable clouds the issue. I suggest simply allowing this experiment to disappear with the other RA experiments.

Recommendation: Yes 11-12-87

SOC Reviewer's Comments on Objective F, Tasks 1a and 1b

(Feedback and Precognition Dependent Remote Viewing Experiments)

(verbatim transcription--not edited)

NAME: **Brian Skyrms**

Comments:

1. Additional analysis should be done. What is the analysis of the sum total of evidence presented here. We have 3 experiments; two negative and the third with 4 viewings of which 2 are negative and 2 significant. Are the aggregate results significant or not?

Recommendation: Yes 11-13-87

NAME: **Michael Wartell**

Comments:

1. Protocol (page 5) would have been stronger had all time parameters been matched (assistant leaving site and arrival back at SRI).
2. Cluster analysis approach is excellent - othogonal target selection important to efficiency and final analytical approaches.
3. Last statement about Viewer 372 (top of page 11) is inappropriate and should be deleted.
4. Page 11-explanation is marked paragraph (2) inappropriate. Excuses regarding "rushing trials" inappropriate.
5. This experiment provided inconclusive results. I do not believe that inferences should be drawn from the results.

Recommendation: Yes 11-13-87

NAME: **Philip Zimbardo**

Comments:

1. The inconclusive pattern of hits and misses across these 3 experiments is disappointing.
2. I find as an over generalization and not acceptable the statement on page 3, "yet, the evidence strangely suggests the (sic) [that] precognition is a fact of nature."

3. The out-bound protocol is wasteful of time and resources. I recommend substituting "cinema verite" video displays of dynamic "real world" scenes as the target material.

4. Page 8--line 6 from bottom (typo - three experienced viewers).

5. Page 10--line 2 from bottom in other words.

6. Page 11--last line confused/also page 12, line 7, from bottom.

7. The procedure and design and analysis are exemplary, but I am not convinced that they allow for RV versus pre-cognition evaluation as competing theories.

8. Given the predictions, the results for Ss with significant RV, 177 and 009 would have to support real-time RV and fail to support pre-cognition hypotheses.

9. The authors must avoid the stylistic bias of too quickly dismissing null findings with a rush toward explaining them away.

10. Conclusion: more research is definitely needed using the T-Scope procedure. Why not have a set of practice trials to do an initial screening of S's RV functioning on that day. If + then test, if not + then suspend--give a rain check.

Recommendation: Yes 11-13-87

Response To Philip Zimbardo's Comments:

NAME: **Edwin C. May**

1. Response to comments: Conclusions were modified appropriately.

SOC Reviewers' Comments on Objective H, Task 2

(A Quantum Measurement Experiment With A Single Photon Interferometer)

(verbatim transcription--not edited)

NAME: **Brian Skyrms**

Comments:

1. This experiment aims to test the role of consciousness in the collapse of the wave packet. A resolution of this question would be of considerable philosophical importance and would bear on what sort of physical theories are relevant to other phenomenas investigated by this project.

   However, I believe that the interpretation of the experiment is controversial and suggest that the results and discussion be submitted to appropriate physics journal for peer review.

2. Subcontractor's report (page 23) says the results *contradict* quantum theory.

   The discussion under III: summary at results and discussion is better "one of the possible outcomes allowed by q.m."

Recommendation: Yes 11-18-87

NAME: **Michael Wartell**

Comments:

1. Elegant experiment! Design and analysis acceptable. Interesting result and discussion. (Fix report typos.)

Recommendation: Yes 11-11-87

SOC Reviewers' Comments on Objective H, Tasks 3 and 3a
(A Remote Action Experiment With A Piezoelectric Transducer)

(verbatim transcription--not edited)

NAME: **Brain Skyrms**

Comments:

1. The experiment was carefully done, with good experimental design. I visited and inspected the experiment. Sources of noise and artifacts were carefully controlled (much better than in the pilot study!). The conclusion of our evidence for RA should be accepted.
2. This counts negatively on subcontractor JFKU's track record.

Recommendation: Yes 11-13-87

NAME: **Michael Wartel**

Comments:

1. Design and analysis acceptable.

Recommendation: Yes 11-11-87

NAME: **Philip Zimbardo**

Comments:

1. This research represents "state of the art" protocols for the control or suppression of RA sources of artifact.
2. The apparatus and procedural features are impressive.
3. Subjects were rated as very high in psi ability (8/10 were "practitioner-level" psi people).
4. Q: What about using the PIF scores for screening of your RV population?
5. Caveats on pages 16, 17, and ff, are important to note: Anti-scientific personal biases of JFKU research team led to poor research decisions!
6. Post hoc motivatorial explanations are not acceptable (as on page 23) for failure to find effects predicted. Researchers cannot resort to explanations that are based on too much and/or too low levels of motivation, inhibitory and excitatory motivation.

7. In general, this null effect of a well-designed study and protocol seriously questions any continued research on RA with changes in physical/biological systems as the DV.

Recommendation: Yes 11-13-87

SOC Reviewers' Comments on Objective I, Task 2

(Intuitive Data Sorting)

(verbatim transcription--not edited)

NAME: **S. James Press**

Comments:

1. There were no really significant results of this effort although the care taken to obtain scientific results is impressive.
2. I would want to know more about the degree of randomness in these RNG before suggesting the research be continued.
3.. Page 2, paragraph 2, first sentence. I don't agree that we would need to "have access to future events." If we knew the seed and we knew the number generating mechanism, we could state precisely what the entire sequence of digits would be, and it would be the same sequence on every run.
4. Page 2, paragraph 3. All information about the future is probabilistic. We can assign (subjective) probabilities for all future events. Sometimes the events are repeatable and the probabilities are objective. For example, the event that a "six" will appear on a fair die when I cast it, 10 days from now. Are we being given the probabilities of certain events in the future? If so, *whose* probability is it?
5. Page 6. Is there any meaning to the numerical ordering of seed numbers? How are the "random" numbers generated by two successive seed numbers related?

Recommendation: Yes 11-13-87

Response To S. James Press' Comments:

NAME: **Jessica Utts**

1. Response to comment 2: Details about the pseudo-random number generator used in our experiments are being sent to Dr. Press.
2. Response to comment 3: The experiments discussed in this section of the report are based on true random sources, so the sequences are not determined by a seed, but rather are generated *after* the buttons are pressed. Thus, one *would* need access to future events. The experiments we conducted, using a

pseudo-random number generator, would require access to future events only to account for human reaction time to press the button. We have not claimed otherwise in this report.

3 Response to comment 4: The statement in question is a philosophical one. If the future is already determined, and if precognition exists, then one might expect that perfectly reliable information about the future would sometimes be available. However, it appears that precognition does not operate that way. Instead, from the potential futures, those predicted in precognition trials appear to be actualized at a higher rate than expected by chance. This indicates that certain future events may be more likely to occur than others, and that this information is available. An extra sentence has been added to the report for clarification.

Response to comment 5: They aren't related at all.

NAME: **Michael Wartell**

Comments:

1. I do not find any problem with the experimental approach, but I am concerned about the lack of definitive result, one way or the other. I do not favor dropping the experiment--it seems cheap and useful in developing some necessary theoretical framework.

2. Unless some better experimental verification (or anti-verification) of IDS can be developed, I would favor continuing this set of experiments.

Recommendation: Yes 12-03-87

NAME: **Nicholas Yaru**

Comments:

1. The research design and statistical protocols are valid.

2. I agree with the recommendation that the experiment be continued at such a date as the availability of significant performers can be fulfilled.

Recommendation: Yes 12-21-87

SOC Reviewers' Comments on Final Technical Report

(verbatim transcription--not edited)

NAME: S. James Press

Comments:

1. I find the overall approach used scientifically "open." The research staff is open to new ideas and criticism, and anxious to attend to any problems found in the research. Designs are well thought out, and analyses are careful. My only concern is that too many diverse experiments are being pursued. A few narrow areas should be defined and experiments pursued in these areas.

2. Page 5. Are all consultants listed: I'm not for example.

3. Page 10. Under "features" in Figure 3, items are not exhaustive of the category. Also, under "contours," "flat" and "not flat" would improve upon "flat" and "hilly." Factors seem to be equally weighted for DACOS.

4. Page 11 (4). There should be more data given. For example, the water attribute was correctly identified 17 times, but how many cases were there with water present?

   Perhaps instead of asking whether water is present or not, the question should be, was there 50% or more water in the picture? Also, were there clouds and sky in 50% or more in the picture?

5. Page 13, paragraph 2. Distributions of these variables are skewed, so the correlations computed have questionable merit. I recommend first logging the variable and then doing the correlations.

6. Page 13, paragraph 3. Eye movements--we can study change in pupil size by a remote camera focused on the subject's eye.

7. Page 14, last paragraph. Research has shown that while some people make good subjects for hypnosis (and there are specific personality types for this), they are very often inaccurate in their recollections, assessments, and evaluations of situations--their reports under hypnosis are composites of relaxed experience, reality, and fantasies.

8. Page 20, section 17. Again, what is recalled under hypnosis is not reliable. This is all hokey stuff. "Eye witness" accounts are usually wrong!

9. Page 32, paragraph 3. This description of an experiment is complicated unnecessarily by the mention of an earlier experiment which was successful. The earlier one has nothing to do with this one.

10. Page 40, last paragraph. If only one individual was successful, it's not clear from the 1:100 rate that this is more than what would be expected.

Recommendation: Yes 11-13-87

NAME: Brian Skyrms

Comments:

1. If the viewer classifies his or her own drawing using the descriptor list developed using the fuzzy logic techniques, the rest of the statistical analysis can be automated. This has several advantages: (1) it makes the experiment more objective and (2) it eliminates enormous amounts of labor on the part of the analyst. Page 6, this would make the whole expert system project pages 6-12 superfluous. Frankly, the expert system project does not seem worthwhile to me. It's preliminary success is slight, and it will impact all the problems of "_____ logic" into the analysis of experimental design.

2. Screenings. There is no sense trying to find indications of psi ability until a large pool of subjects who reliably demonstrate psi ability is identified. Effort should be to test large numbers of subjects in simple psi tasks, rather than complicated tasks.

3. External contractors. There seems to be bad luck with a lot of external experimentation. It would be better to concentrate on in-house experimentation which can be tightly controlled.

Recommendation: Yes 11-13-87

NAME: Michael Wartell

Comments:

1. Hypnosis experiment shows promise. Some stylistic changes needed in report as noted.

2. Page 22, paragraph 2. Discussion not productive. Simply state that further study is necessary but don't blame lack of significance on small sample size.

3. Screening. For future screening, identify high possible payoff target populations based on intuitively derived characteristics, e.g., successfully dealing with ambiguity. Thus, I would suggest making educated guesses concerning target populations without doing strictly random sampling. Additionally, I am unsure that the psychological profile information provides enough information for aid with the screening process. Automated procedures are not only a good idea, but a necessary one.

4. I am also highly supportive of the dynamic target set option. Add to the parameters for developing a screening mechanism the idea that *extremely* low labor intensiveness is critical. Methodology: I'm not sure standardization is as important as speed and ease of application--after all, this is screening, not research. I can't get over the feeling that the screening protocol discussions describe potential methodologies that border on the baroque.

5. Neuropsychological assessment. Interesting possible correlates, but at which level of screening would they be useful, initial screening, follow–on, etc.?

6. Investigate RV of Analytical Information. I am not convinced about "less than chance expectation" explanation for non–contact with target. Once again, I'm not sure that "one–too–many" variables wasn't added to the variable set (in contact or not in contact) to allow meaningful interpretation of results.

7. RA Effects on Single α–Particles Agree strongly with discontinuation of this experiment.

Recommendation: Yes 11–13–87

NAME: **Philip G. Zimbardo**

Comments:

1. This a valuable summary overview of the project's successes and misses for FY 1987.

2. It is clear, concise and informative.

3. Good distinction between what did not work, what worked and what is mixed.

4. **Worth pursuing further – NExpert system development with:**

   a. Specifications for ways to improve its utility for RV analysis

   b. Find sources of support for resource library

   c. Video disk technology

   d. RV training models

   e. Hypnosis as tool.

5. **Not worth pursuing:**

   a. Gross physical correlates to RV

   b. Skeptical about the value of PAS and a continuing commitment to this task

   c. Objective E, Task 1, RA marine algae

   d. Objective E, Task 2, Hemolysis

   e. All PK research

6. Unclear as to how to interpret the mixed results of Objective F, Task 1 – which is very important.

7. Unclear how much reliance can be placed on the hunches, intuition and introspection of RV subjects. Staff seems to be overly impressed/sensitized to them. Problem is the low correlation between S's experience and the quality of

their RV. (See Objective F, Task 10 – for S's failure to relate +/–/0 days to his accuracy.)

8. Need to clarify mechanism(s) by which hypnosis debriefing enhances RV performance.

   a. Relaxation

   b. Right hemisphere activation

   c. Rid mind of irrelevant noise

   d. Emotional "flushing" other?

9. Need to work further on Objective F, Task 7, mass screening, but do *not* support PAS use or neuropsych testing. Recommend we look for Ss higher: REMOTE ASSOCIATION (RAT TEST) imaginative ability, openness to new experience, field dependence, cognitive flexibility. More work suggest on forced choice format, computer "search" and no more work on Objective H, RA effect.

Recommendation: Yes 11–12–87

APPENDIX B

PHYSIOLOGY CONFERENCE LETTERS

(This Appendix is Unclassified)

Los Alamos
Los Alamos National Laboratory
Los Alamos,New Mexico 87545

August 4, 1987

Dr. Peter McNelis
SRI International, G-206
333 Ravenswood Avenue
Menlo Park, CA 94025

Dear Pete:

Thank you for inviting me to the Physiology Seminar. I really enjoyed myself and I found the project to be quite interesting. I'm impressed by the general quality and thoroughness of the research.

My suggestions for studying physiological correlates and indicators are as follows:

1. Conduct a remote classical conditioning paradigm (a la the Hungarian study that was mentioned, I don't know the reference). Set up a remote light or tone conditioned stimulus (CS) that is predictive of a subsequent shock unconditioned stimulus to the subject. Monitor EEG from scalp electrodes and record the evoked response to the remote CS. You may also want to record the GSR as well. If you find an effect, you have provided strong support for the "informational" hypothesis. Additionally, it would be quite interesting to subsequently monitor the effect using MEG. In this way, one could distinguish the physiological source of a remote conditioned response, as compared to the traditionally evoked conditioned response. Positive results from such a study would be of remarkable scientific interest.

2. It would be fairly straight forward to record motor evoked responses in the computer search paradigm. The digitization of brain activity could be triggered (in a pre-trigger mode) by the subject's press of the mouse (ie., record EMG and use it as a trigger). Single trial data could subsequently be sorted and averaged according to correct and incorrect responses. One would look for differences in the "readiness potential" (the broad negativity that precedes the motor response) that distinguish between the accuracy of the responses. I would predict an enhancement of the readiness potential in trials preceding a correct response.

3. In a similar vein, one could record the premotor activity in the computer based remote action paradigm. However, a difficulty I perceive here is that I'm not so sure a correct versus incorrect response is as well defined as in the computer search game. It is my impression that a positive outcome is determined on a statistical basis. However, there are responses that fall outside of the normal curve, and perhaps the brain activity preceding them is distinct from activity preceding the selection of a normal sequence of random bits.

4. Determining physiological correlates to RV phenomena will be more difficult because of the difficulty in timing the process. While one could attempt to record brain activity evoked by the cue "target", I'm less optimistic about this approach. There are simply too many unknown variables in the situation. As was stated in the meeting, it may be that a less time locked, more global physiological approach than evoked responses would be better. How would the cerebral blood flow (or PET) vary between a remote viewing , an actual viewing of a comparable visual stimuli, and a session where one simply imagines a comparable visual scene?

I would also push the "proof of principle" strategy and continue to forcefully demonstrate the existence of the phenomenon in the absence of known physical cues. I think a demonstration of the effect in a magnetically shielded room would be of value in that sense.

I hope this is of help. I would be more than willing to go into greater experimental detail if any of these ideas are of interest for your program.

Once again, many thanks for the stimulating conference.

Sincerely,

Deborah Arthur

SPECTRA Research Institute
3700 Osuna Rd. NE, #503
Albuquerque, New Mexico 87109
(505) 344-1040

September 2, 1987

Dr. Peter J. McNelis
c/o Ms. Cathy Flowers
SRI International, G-206
333 Ravenswood Avenue
Menlo Park, California 94025

Dear Peter,

I was glad to have the opportunity to speak briefly with you yesterday. As I mentioned, I am sorry for the delay in getting my comments to you. Things have been rather hectic since our meeting and time for quiet reflection hard to come by.

Starting premises

Making my premises explicit seems an appropriate way to begin, starting with an acceptance, at least implicitly implied as a basis for our symposium, of the proposition that there are real behavioral phenomena that correlate with observable events shielded from human senses, and the possibility that a second class of events are produced by humans without mechanical interaction (the notion of time, or the time correlation of these events, will be introduced later). Given this generalized beginning, the premises I wish to introduce are that neuronal activity in the brain determines behavior, that with physiological methods it is possible to look at macroscopic brain state phenomena, and that EEG/MEG techniques provide a window into objective information on brain states. (Other physiological correlates such as GSR and EMG may also yield useful quantitative information, but for now, let the burden of the discussion fall on the EEG). Additionally, it is assumed that pervasive parallel processing obscures (even at one locus) single pieces of information unless special techniques such as time-averaging are used.

If EEG techniques are used for establishing the existence of physiological correlates and ERP phenomena, close attention should be paid to the experimental design regarding placement of the electrodes, recording, and analysis techniques, presuming more than a crude indicator of an unusual event is desired. I am not so pessimistic as some researchers regarding the existence of some clues as to what the brain is doing. Accordingly, for example, I would not record the usual differential signal between active test electrodes, but rather take the differential between each test electrode and the reference electrode on that hemisphere. Note that by that last statement I am encouraging the researcher not to tie together the reference electrodes from opposite hemispheres. By using the two suggestions above, the chances are increased of observing any unique information that exists from within each hemisphere, and any information that may be in phase between two active test sites is not thrown away. At any rate, these and other questions may be useful

to examine as regards experimental design, including choice and application of data analysis techniques.

Training and screening

As regards experimental RV subjects, I feel a need to be convinced that there is no training effect possible with known adepts. At least with respect to quality of RV responses, I have been exposed to information claiming that enhanced quality of RV responses due to specific physiological training techniques was possible; don't know if the claim is true or not, but I find it conceivable that an induced change in brain state such that a higher percentage of the subject's time can be spent at his/her cortical tone rest frequency (read alpha frequency) under alert, rest conditions would contribute to improved performance. The brief question I raised at the symposium regarding this issue was not really answered or discussed due to the press of time.

On another tack, I believe I remember commentary at the symposium to the effect that to date no personality screening techniques were able to separate RV adepts from non-adepts. My follow-on question to this, given Ed's proposal of time-independence for RV phenomena, is whether PAS or some other test(s) might separate those adepts who are good at precognitive RV from those who are not? If there is a separation, this raises other questions that may impact the experimental design, how the ERP data is taken, and analysis.

ELF and the brain state panorama

Perhaps a physiological screening technique for adepts is possible based on their normal EEG "alpha" rest frequency. The suggestion is that there may be a useful correlation between rest frequency and RV ability (as there may be between EEG rest frequency and EM sensitivity), based in part on some of my other endeavors with which you are familiar. As I mentioned to you at one our breaks, some attention still needs to be paid to the tenability of an ELF hypothesis despite negative glib arguments to the contrary. The Schumann ELF resonances yield a continuous, uniform field operating in a transverse magnetic mode that does not attenuate as the inverse square of distance. It is at least coincidence that the brain is upset sensitive to H-component frequencies outside the first Schumann resonance frequency regime, and will try to decode ELF frequencies or modulations that look like the brain's own signaling system. Conventional shielded rooms should improve performance for remote viewers inside them, as the rooms will diminish EM noise with which the brain may have to contend, but the rooms do nothing to block ELF. RV performed in a specially shielded MEG room may be a tougher test but an H- component attenuation of 2000 at 10 Hz (such as the room at LANL) still may not block RV even on an ELF hypothesis. Further, an ELF hypothesis for RV can be envisioned that does not entail sending/receiving information with a human as its point source and thereby the usual inverse square problem (not to mention power generation and antenna length), but rather coding/decoding by the brain on/from an already continuously existing, uniform field ELF carrier containing information. In addition, known brain architecture reveals millions or tens of millions of potential simultaneous information processing channels rather than a single channel operating under Shannon bit information constraints appropriate to a single ELF input channel. With regard to timing, since we're

dealing with Maxwell's equations, I have no a priori difficulty contemplating advanced potential solutions as part of this information transmission possibility, thereby leading into the precognitive realm or what may be called advanced time (AT) solutions. In fact, the paper by Nelson, Jahn, and Dunne given to us by Ed at the end of the symposium has in it a time event density plot that looks suspiciously as though it might be gaussian if the number of events on an ordinate scale were plotted along the same time axis. The number of events appear to fall off sharply in either direction at about three days but there would still be a small finite probability at longer times in either direction. I suspect such a plot could afford some interesting discussion with respect to Maxwell's theory.

Neuro team member(s)

Some commentary was made regarding having a neurologist aboard as a team member. Most neurologists are trained intensively to look for signs of human pathology and may not be expert in the neurology of the normal, so one would want to be sure of their motivation and expertise as a team member oriented to look at human potential, and perhaps new neurological phenomena. In any case, it would be most desirable if a new person is added that besides the requisite background he/she be thoroughly fascinated with brain states and coding phenomena in the brain, for I think that it is from those issues that the break will come.

Miscellaneous comments on RV and PK

For RV at t = +0, 0, or −0 a known event either existed, exists now or will exist as arranged by some action. The issue is therefore access to an information "channel". If there is a possibility in PK that there is no human instituted action but rather an adept is proficient at picking out anomalies in real, past, or advanced time then we are also left with the issue of information "channel" access, as in RV. In both cases, the EEG experimental design could encompass multiple instances of time-locked events to produce ERP experiments, and time-averaging procedures to extract the signal from the background activities. From just an on-going EEG record of subjects in an experimental situation nothing of any critical significance should be expected to be extracted since the signal being looked for is totally masked by myriad other processing activities. Given a time-locked approach, analysis is suggested for times prior to time zero as well as subsequent to time zero, as will be remembered from my comments at the blackboard. To produce multiple instances of time-locked events of PK, I suggest something akin to the ping-pong ball normal distribution experiment. In this case, time-average those events to the right and left as independent groups, and in the ERP analyses look for significant differences etc.

As a point of curiosity, left-right reversal reported in RV may not be so peculiar after all, since no one is postulating the use of visual channel, and therefore there is no initial reversal as in the case of information from left and right visual fields to opposite cortices.

Potential Spectra Research Institute participation

SPECTRA is willing and interested in participating in electrophysiological correlates research with SRI International, should that be appropriate. Two areas are suggested for consideration:

(1) Computer-controlled ERP remote RV experiments between different rooms with both subject and "outbound experimenter" instrumented. The experimental design is envisioned to be essentially the same approach as I outlined at the blackboard during our symposium.

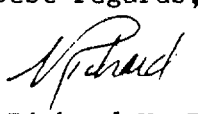
(2) Remote hypnosis experiments between different rooms based on an information access model much as in RV. Instrument both participants and use protocol involving time-locked wake and sleep commands. Monitor wake and sleep EEG brain state onset and time course in subject. (At last, here is some macroscopic and quantitative EEG difference to which most electrophysiologists can agree).

Finis

Hope these few cryptic thoughts provide input for useful reflection. The comments and arguments are not polished nor fleshed out, as is evident. Even if they were, I suspect they are ripe for engendering some controversy and debate. Some or all of these avenues of thought might be useful to explore in greater detail with at least you and Ed.

Thanks again for inviting my participation in a most stimulating symposium. I thoroughly enjoyed all the conversation and points of view.

Best regards,



Richard H. Dickhaut

Los Alamos
Los Alamos National Laboratory
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August 5, 1987

Dr. Peter J. McNelis
Cognitive Sciences Program
Geoscience and Engineering Center
SRI International
333 Ravenswood Ave.
Menlo Park, CA 94025

Dear Peter:

I am responding to your request for possible ways we can help your program. I can see three ways immediately that may be useful to you.

As we discussed in Menlo Park, the magnetic shielded room could be of use for measuring the influence of very low frequency magnetic fields on subjects. We can do this in a variety of ways which could involve repeating of some of your standard RV experiments inside the room, repeating the EEG experiment you did inside the shielded room or looking at the influence of the room on some evoked response studies such as I will suggest below. Obviously such experiments will need to be done at Los Alamos or some other shielded room. (Actually, there is some sort of room at Stanford used for magnetotelluric studies but it is primarily a DC shielded room using iron instead of mu-metal).

A second category of experiments involves the use of evoked responses (ER) for measuring time locked responses. Again, many of these were discussed at the Menlo Park meeting. However, to summarize the discussions as I see them, I would like to make the following comments. The RV experiments could be timed locked to the prompt word or some other type of stimulus. These experiments should be first done with EEG to look for effects and then could be done with MEG to localize physiological features if the EEg results are positive. A more definitive experiment along these lines would be the light or auditory experiment using stimuli from other rooms and time locking the recording of ER's to stimuli presentation. The original stimuli should be local so that the ER's could be examined for their patterns for each subject and the subject would know what the stimuli were. Again these could be done first with EEG although the MEG setup is directly applicable. The EEG could be done at SRI, Los Alamos or another contractor. There are many variations of these experiments which could be examined if they are of interest. Again the effect of the shielded room would be interesting.

The third category of experiments would be the presentation of multiple stimuli with the subject told to pick one out. As we discussed, the subject could press a button in anticipation of the correct stimuli or other procedures could be used. In any case, the experiment would be conducted in a pretrigger mode with data collected before and after each stimulus presentation to examine the ER's for early components. This and the previous experiments have the advantage of time locked signal averaging to improve signal-to-noise. They also have the advantage of allowing many control checks on the data as well as a wealth of existing data both from EEG and MEG. In addition, power spectrum can also be obtained simply be doing FFT's on the ER data if these are desired. Clearly these experiments would want to utilize some of your special subjects. This latter group of experiments would best be done at Los Alamos because we have all of the equipment and paradigms basically available now. This would also have the advantage that we would have the MEG available for localizing the sources of any effects we saw and the subjects would be used to the shielded room environment.

It also occurs to me that if any of the experiments involving the alpha or piezo gadgets work out, it would be desirable there also to monitor the brain for distinctive changes and perhaps establish physiological correlates.

I hope this is of some use to you. I really enjoyed the meeting in Menlo Park and it would be nice to have future correspondence with you. In any case I will be more than happy to assist you in any way possible. Should I have more thoughts on the subject I will communicate them with you. I hope to hear from you in the near future with your response to this letter.

Sincerely,

Ed Flynn

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30 July 1987

Dr. Edwin C. May
Cognitive Sciences Program
Geoscience and Engineering Center SRI International
333 Ravenswood Avenue
Menlo Park, CA 94025

Dear Ed:

I'm writing to thank you and Peter and your colleagues for introducing me to a most interesting field and including me among a fascinating group of participants--and for your warm hospitality. I'm writing also to summarize my thoughts regarding the problems of the present state of development of your program and a few recommendations for future research.

First, some general comments:

- The "science" of the present efforts at SRI International is a welcome finding in a field overloaded with interesting anecdotes and poorly-designed experiments--and apparently some fraud. Your background as a well-trained broadly-experienced and accomplished physical scientist lends great credibility to the work. I liked your open, honest presentation style.

- It's an enormously difficulty field to study well and your interest in moving more deeply into the "basic science" aspects of the phenomena and observations is welcome. My intuition tells me that there won't be much found by physiological research studies the first time around--but the success record of my intuition isn't very good in fields I know little about. Yet, even if that turns out to be true, it should not disuade you from carrying out a series of carefully-designed and conducted studies using the best methodologies and technologies available. You may get interesting and perhaps useful results. You may get some leads that will direct future research efforts that will be successful. And/or you will bring into the field a corps of first-class scientists and graduate students who, over time, may or will come up with answer This last isn't a trivial outcome.

- The scientific quality of the investigators who collaborate with you in the basic science studies is very important, if not crucial. Especially in a field like yours, you need the kind of face-value creditability they will bring, so that their results will be unchallengeable. Getting them to become involved will probably be difficult and expensive and inconvenient for you, but will be worth the effort entailed.

° I would like to suggest for your consideration two groups of extramural scientists, consultants.

- Your present group, if properly constituted could serve as close advisors/collaborators with frequent visits and even participation in design, data assessment, etc.

- Another subgroup of scientists might be impaneled to serve as arm-length, objective evaluators, critics and challengers. I've seen such a division of responsibility and expectations work well elsewhere.

Now, for some more specific suggestions:

° I liked Steve's general approach to the neurophysiological evaluation of RV (and perhaps RA's).

° I doubt very much that there will be any value in studying biochemical or nonneurological physiological changes in humans, but it might be useful to ask the question of a group of sophisticated neurophysiologists working closely in the field of neurochemical--behavioral interactions.

° It would seem to be very important to develop a major effort to create animal models--small animals to start, but later a larger animal, such as monkeys. If successful, this would permit all sorts of useful short-term and long-term investigations.

° Despite the apparent (to me) failures of the past, I feel that a careful assessment of psychoactive drugs of various sorts would be a useful initiative. If one or more performance enhancers or blockers could be found, this could be extremely valuable.

° Although you've excluded children and bizarre-types (for want of a better term) from your study groups, I wonder if it might be useful to seek out from these groups and others all sorts of people who can document strong and consistent performance.

° I realize there have been some studies of primitive organizisms (algae) and even cells, but further studies at these levels of complexity might be productive. For example, a colleague of mine at Michigan State University in the Department of Pediatrics (Dr. James Trosko) is very successful in studying cell--cell communication. It would be useful to know if such systems could be perturbed.

° I agree with you that a high priority ought to be assigned to the discovery of means to screen larger groups to uncover people with high performance capabilities.

Finally, it might be time or organize and carry out a two-four day "idea session", bringing together very creative scientists from a variety of fields who can be stimulated to elicit new and promising approaches to

address your problems. These sessions are difficult to pull off. Such groups must be brought together by one or two very well respected scientists who can recruit other top flight scientists from many fields. They must be introduced to the fields sufficiently, comprehensively, to give them a pretty good understanding of the issues. And, the discussions must be structured to prevent them from being unfocused and nonproductive. Kindling creativity and focusing it into certain directions using brilliant, independent scientists is an awesome challenge--but it is doable sometimes.

I enjoyed my trip. Good luck!

Regards,

Ray

Raymond H. Murray, M.D.
Professor and Chairman
Department of Medicine

RHM/lp