Phenomenological Research and Analysis

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I OBJECTIVE

The object of this document is to provide an interim technical report on tasks 6.2 "Basic Research," 6.3 "Applied Research," and 6.4 "Research Methodology" as listed in the 1991 Statement of Work. This report covers the time period from 4 February 1991 to 31 December 1991, and includes all subtasks.*

* This report constitutes the combined (i.e., first two) deliverables DI-MISC-80508 under contract number MDA908-91-C-0037.

II INTRODUCTION

Under Statement of Work items 6.2, 6.3, and 6.4 in contract MDA908–91–C–0037, the Cognitive Sciences Laboratory of Science Applications International Corporation is tasked to conduct phenomenological research and analysis.

This document details the activity accomplished under these items and constitutes the interim report covering the period from 4 February to 31 December 1991.

III PROGRESS TO DATE

This section describes the progress to date for each of the sub-tasks listed under items 6.2, 6.3, and 6.4 (basic and applied research and research methodology, respectively). The section numbering corresponds to the numbering in the Statement of Work.

6.2 Basic Research

6.2.1 Magnetoencephalography (MEG) Investigations

From 8 through 22 September 1991, the first of a three-part MEG investigation was carried out using receivers from a variety of populations. Details of the protocol may be found in a separate document, which has been approved by the Scientific Oversight Committee (SOC).[1*] It is beyond the scope of this report to describe the protocol in detail; however, we provide a brief overview here.

Each of twelve receivers contributes ten blocks of data. Each block consists of ten two-minute runs each of which contain approximately 100 remote and 100 pseudo stimuli. Each block of data is accompanied by a control block of equal length during which the conditions are identical to the experimental block; however, no receiver is present under the MEG. The dependent variable is the average effect size of the RMS relative phase shift (i.e., prestimulus to poststimulus) of the dominant alpha rhythm.

Table 1 shows the results in the experimental condition for the first six receivers. The shaded receiver number indicates those that were specified *a priori* as being among the formal participants. The average effect size, the total number of stimuli and the p-value, which was determined by Monte Carlo techniques, are shown as $\bar{\varepsilon}$, N, and p, respectively. The differences between the remote and pseudo stimuli are shown as t-scores with df degrees of freedom and an associated p-value of p.

Table 1.

Preliminary Results for the Experimental Condition

Receiver	Remote Stimuli			Pseudo Stimuli			t(RS−PS)	df	p*
	$\bar{\varepsilon}$	N	p*	$\bar{\varepsilon}$	N	p*			
708	0.110±0.053	578	0.74	0.050±0.071	575	24.10	1.615	8	7.24
308	0.086±0.059	577	1.94	0.056±0.032	576	8.95	0.970	8	18.03
172	0.081±0.052	445	5.86	0.030±0.037	431	20.66	1.596	6	8.07
538	0.009±0.033	449	38.82	−0.038±0.049	468	78.04	1.600	6	8.04
329	0.0002±0.014	449	49.33	−0.043±0.011	476	99.99	4.920	6	0.13
041	−0.080±0.037	414	98.55	−0.069±0.047	481	92.57	−0.376	6	63.99
Total	0.057±0.028	2053	1.81	0.011±0.027	2095	34.43	2.415	6	2.61

* Times 10^{-2}

* References may be found at the end of this document.

We see in Table 1, that formal receivers 708 and 308 produced individually significant results in the absolute magnitude of the effect size (i.e., compared to zero). The totals shown in Table 1 do not include the data from receivers 172 or 041, but do account for 45% of the expected data from the remaining receivers.

Nonetheless, trends are evident. Averaged over the formal participants, the absolute effect size is significant (i.e., $p \leq 0.018$) and the difference between remote and pseudo stimuli is significant (i.e., $t = 2.415$, $df = 6$, $p \leq 0.026$).

Table 2 shows the same data for the control blocks (i.e., no receiver present).

Table 2.

Preliminary Results for the Control Condition

Receiver	Remote Stimuli			Pseudo Stimuli			t(RS−PS)	df	p*
	$\bar{\varepsilon}$	N	p*	$\bar{\varepsilon}$	N	p*			
708	−0.010±0.037	573	60.67	0.034±0.036	588	17.05	−1.906	8	95.35
308	−0.020±0.031	573	73.01	−0.006±0.030	588	57.54	0.726	8	75.59
172	−0.004±0.036	476	58.61	0.076±0.056	470	5.46	−2.394	6	97.32
538	0.053±0.061	462	19.14	0.020±0.055	466	35.58	0.796	6	22.80
329	0.112±0.020	436	10^{-6}	0.014±0.067	500	41.70	2.800	6	1.55
041	0.026±0.039	427	25.22	0.023±0.045	441	30.61	0.118	6	45.47
Total	0.027±0.030	2044	17.99	0.015±0.009	2142	38.83	0.779	6	23.29

* Times 10^{-2}

The totals are for the formal participants only. The average absolute effect size and the difference between remote and pseudo stimuli are well within mean chance expectation.

Table 3 shows the comparison between the experiment and control conditions. The differences are shown as t-scores with their associated p-values for the remote and pseudo stimuli, respectively. Receivers 708 and 308 show individually significant differences between the experiment and control condition for remote stimuli, and a trend is evident for the combined data of the formal participants (i.e., $t = 1.464$, $df = 6$, $p \leq 0.233$). The combined result for the pseudo stimuli is within mean chance expectation (i.e., $t = -0.314$, $df = 6$, $p \leq 0.618$).

Table 3.

Comparison between Experiment and Control Conditions

Receiver	Remote Stimuli			Pseudo Stimuli		
	t (E−C)	df	p*	t(E−C)	df	p*
708	4.592	8	0.09	0.448	8	33.28
308	3.526	8	0.39	3.161	8	0.67
172	2.701	6	1.77	−1.359	6	88.86

* Times 10^{-2}

Table 3. (continued)

Comparison between Experiment and Control Conditions

Receiver	Remote Stimuli			Pseudo Stimuli		
	t (E−C)	df	p*	t(E−C)	df	p*
538	−1.263	6	87.32	−1.580	6	91.73
329	−9.273	6	99.99	−1.681	6	92.87
041	−3.946	6	99.62	−2.794	6	98.43
Total	1.464	6	23.29	−0.314	6	61.81

* Times 10^{-2}

We have collected and analyzed 15% of the total expected data. With a small sample it is difficult to speculate about the final result; however, if the trends shown in Tables 1-3 continue, then we can expect to replicate the earlier MEG result. Additionally, the new result would provide circumstantial evidence that a technical error may have occurred in the original study. We believe that we may have mislabeled remote and pseudo stimuli for one half of all of the data in the original study. This would account for the overall significant result for the pseudo stimuli in that study.

The absolute magnitude of the effect size resulting from the neuromagnetic response to remote stimuli is consistent with a "medium-sized" behavioral phenomenon according to accepted definitions.[2]

6.2.2 Data Patterns/Correlations

6.2.2.1 AC/Target Feature Correlations

We have reviewed our standard static target pool of 100 *National Geographic* magazine photographs and a set of 30 clips of popular video movies and documentaries and analyzed them with regard to the total change of Shannon entropy (ΔS). The complete details of that analysis can be found in the technical protocol, which is pending approval from the SOC.[3]

We identified eight clusters of static targets. Each cluster is comprised of photographs of near-constant ΔS, but the clusters are significantly different from each other. From these eight clusters, we constructed ten packets of five targets each. The targets within a packet were drawn from the same entropy cluster; however, they were selected on the basis of visual dissimilarity to provide a basis for visual rank ordering in the analysis of the AC data.

We identified four clusters of dynamic targets. Each cluster is comprised of video clips of near-constant ΔS, but the clusters are significantly different from each other. From these four clusters, we constructed four packets of five targets each. The targets within a packet were drawn from the same entropy cluster; however, they were selected on the basis of visual dissimilarity to provide a basis for visual rank ordering in the analysis of the AC data.

Figures 1 and 2 show the cluster diagrams for static and dynamic targets. In both cluster diagrams, only the selected targets are shown with their associated ΔS, and dashed boxes indicate the cluster boundaries.* Targets that were not included in the analysis packets are indicated by truncated cluster diagrams.

* Because two different technologies were used to digitize the static and dynamic targets, the scale of ΔS is not accurate between static and dynamic targets. This scale factor does not affect the relative clustering and the differences will be normalized before formal analysis of the AC begins.

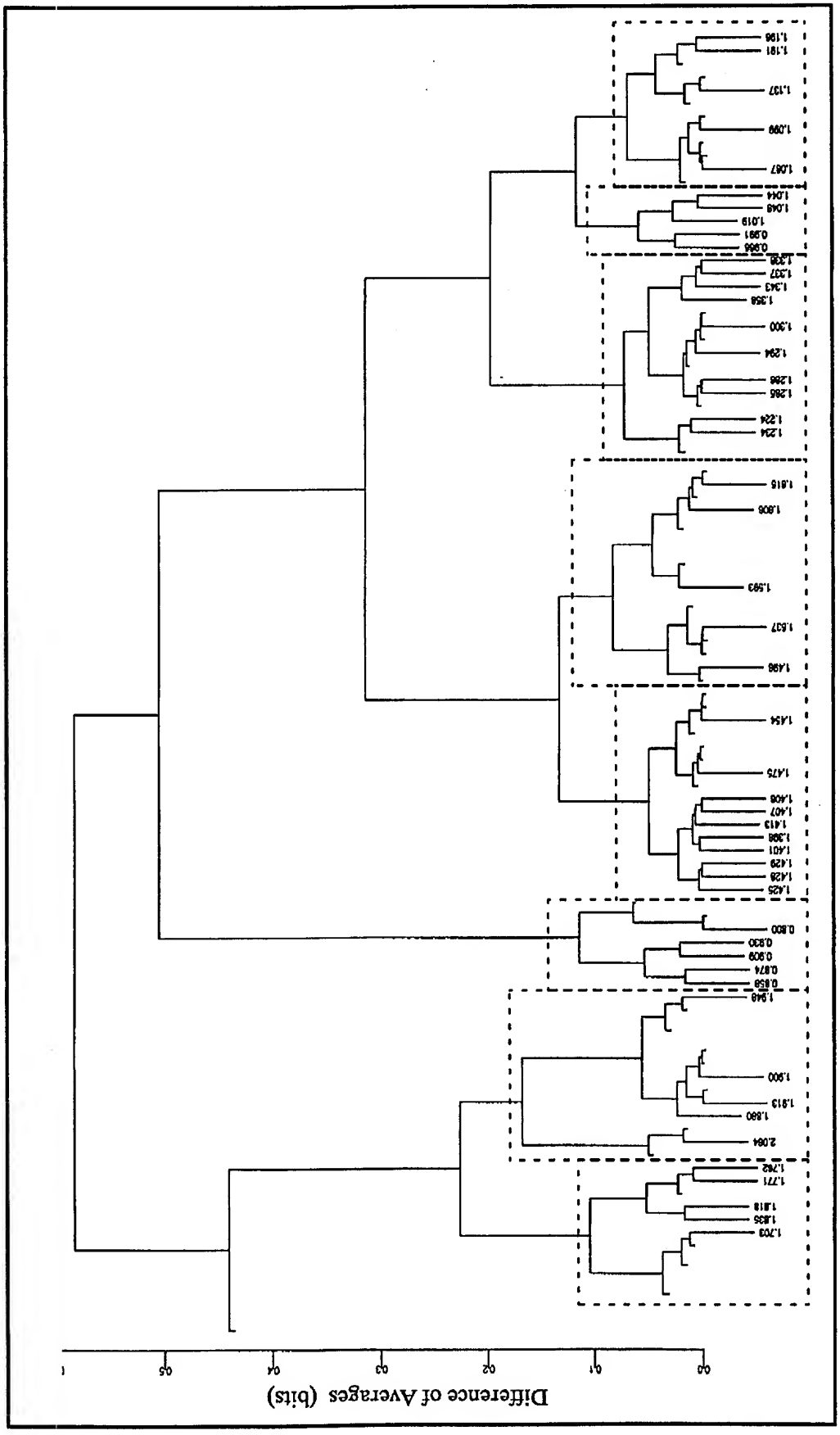

Figure 1. Cluster Diagram for Static Targets

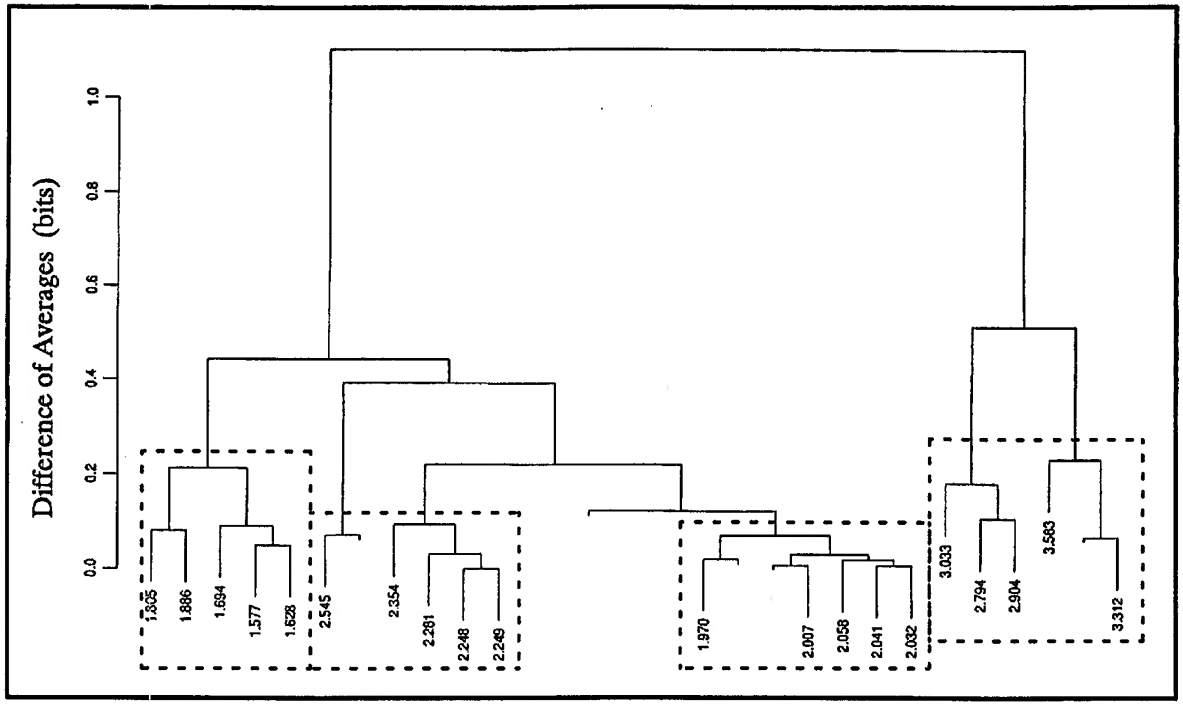

Figure 2. Cluster Diagram for Dynamic Targets

6.2.2.2 Experiments Testing AC/Target Feature Correlations

Eight individuals will participate in an experiment that is scheduled to begin in early February. Each receiver will participate in 40 trials that will be counter-balanced between sender and no sender conditions and static and dynamic targets. The trials will be conducted remotely and will be unmonitored. The AC responses will be sent by facsimile to the principal investigator, and will be analyzed using the standard rank-order technique.

6.2.2.3 Geomagnetic Activity Correlations to AC

Background. Persinger, Tart, Krippner, and others have reported an association between AC performance and indices of geomagnetic field (GMF) fluctuations. This work has shown that both anecdotal reports of spontaneous AC, as well as higher-scoring laboratory AC trials, tend to occur at times of relatively low GMF activity. The published evidence is not entirely compelling. The anecdotal AC data are contaminated to an unknown extent with confounding factors of reporting bias, timing errors, and the difficulty of establishing the veracity of such reports *post hoc*. The retrospective studies of laboratory AC data, while largely free of these problems, have demonstrated only small correlations to GMF indices. There is, however, increasing interest in the possibility of biological effects of small amplitude magnetic field variations. Recent work has shown that melatonin and serotinin levels are modulated by GMF activity both in vivo and in vitro. Other research is exploring the physics of possible mechanisms whereby low-amplitude magnetic field variations could interact with cells.

Anomalous Cognition. To investigate the relationship between scores in laboratory AC experiments and GMF fluctuations, we are combining various experimental databases. Currently, we have assembled a database of approximately 1000 free-response AC trials from several laboratories. There is a very small (i.e., $\varrho = -0.05$, $p \leq 0.09$) correlation between trial scores and GMF fluctuations in the ex-

pected direction in this database. The correlation, however, is much larger (i.e., $\varrho = -0.40$) in those experiments where significant AC was demonstrated. We hope to extend the free response database to include more trials from SRI International's extensive collection of trials where significant AC was exhibited. We will complete a meta-analysis of all this material.

Epilepsy. We may discover more about the impact of GMF fluctuations on AC performance by research on other behaviors that are modulated by very low frequency magnetic fields. Some literature suggests a connection between idopathic and epileptic seizures and GMF fluctuations. Currently, we are assembling a database of approximately 4000 seizures and seizure-related mortalities. Preliminary analysis of a subset of this database suggests that both seizures and mortalities associated with seizures are weakly correlated with elevated GMF noise levels. GMF noise might be depressing the melatonin level, resulting in an increased probability of seizure. We will examine this database with respect to recordings of precise power levels in the ULF/ELF spectrum to clarify what region of the EM spectrum is responsible for the effect.

6.2.2.4 AC Correlations Literature Search

Mr. Charles Honorton of the Psychophysical Research Laboratories (PRL) has been subcontracted to conduct a detailed key-word parapsychology literature search for potential correlations of AC performance and external variables (e.g., personality, IQ), and to perform meta-analyses where appropriate. The meta-analyses potion of this task has begun.

6.2.3 Theoretical Issues

6.2.3.1 Assessment of Theoretical Constructs

Currently, one senior research physicist has been identified who is anxious to explore thermodynamic and general relativistic models to formulate hypotheses for the mechanism of AC.

6.2.3.2 Targeting

As part of the subcontract, the Psychophysical Research Laboratories are nearing completion of a detailed design to explore the potential of a beacon as a targeting mechanism. In addition, the experiment, which is described in Section 6.2.2.2 above, also explores the role of a sender in AC experiments.

6.2.3.3 Communication

We have designed a computer-based binary AC experiment that uses sequential analysis to enhance AC effects. The details of the experimental design can be found in our technical protocol, which is under review by the SOC.[4] Sequential analysis will improve a sample hit rate from 60 to 85%. We show in the technical protocol that this enhancement is 21% better than a one-in-three majority vote procedure. We expect to begin the experiment in early March 1992.

6.2.4 Altered States

6.2.4.1 Lucid Dreaming

The Lucidity Institute has been subcontracted to conduct a pilot experiment to study AC in lucid dreams. The details of the experimental design can be found in our technical protocol, which is under review by the SOC.[5] Experienced receivers and lucid dreamers will individually be given carefully double wrapped and

sealed targets drawn randomly from our standard set of *National Geographic* magazine photographs. With the aid of a DreamLight, a device to help induce a lucid dream, the experimental task is to:

- become lucid in a dream
- open the sealed envelope (i.e., while still dreaming)
- study its content
- wake up and record the dream impressions.

Analysis of the responses will follow the standard protocol for rank order judging.

As an introduction to lucid dreaming, the Lucidity Institute has conducted a three-day workshop for the participants in the experiment. We expect to begin experimental trials by March 1992.

6.2.5 Energetics

6.2.5.1 Anomalous Perturbation Protocol

There has been no action on this item during the reporting period.

6.3 Applied Research

6.3.1 MEG Developments

6.3.1.1 Identification

Preliminary analysis of responses to direct light stimuli shows a qualitative correspondence with native AC ability. Other factors, such as motivation or ambition, may also play an important role in identifying high-quality receivers.

If the preliminary results from the MEG phase-shift measurements are true, then that variable may be a more reliable indicator of native AC ability.

6.3.2 Correlations/Pattern Analysis

6.3.2.1 Correlations

There has been no action on this item during the reporting period.

6.3.2.2 Beacon Conditions

PRL has been subcontracted to conduct a test of the sender/no sender condition in Ganzfeld experiments. A protocol is currently being prepared for review by the SOC, and the laboratory is nearing completion for the experiment. Computer equipment is in place and computer programs, which are to be used in the experiment, were demonstrated to a visiting SAIC employee in September 1991.

6.3.3 Training

6.3.3.1 Empirical Training Analysis

An in-depth analysis of one in-use training procedure has been initiated by Professor Daryl Bem, of the psychology department of Cornell University. Analysis has not yet been completed.

6.3.3.2 Potential New Methods

There has been no action on this item during the reporting period.

6.3.4 Applications

6.3.4.1 New Approaches

We were asked to use AC search techniques to locate a missing student pilot. While two receivers suggested similar locations, the pilot was eventually found in a different location than suggested by our receivers.

6.3.4.2 Communications

We have developed a technical protocol, which is currently under review by the SOC, that applies standard Bose-Chaudhuri-Hocquenghem (BCH) codes to AC analysis.[6] The BCH code that was selected includes two message bits and three check bits and will correct for all single errors and some double errors.

Table 3 shows AC-target attributes whose presence corresponds to a binary one and whose absence corresponds to a binary zero. We have constructed ten target packs of four targets, each according to the following binary words: 00000, 0110, 10101, 11011. For example, a target in pack eight that corresponds to 11011 would only include people, natural setting with vegetation, and buildings. A jungle village scene would be an example of an appropriate photograph.

Table 3.

Attributes for Ten Target Packs

Pack	Bit Position				
	0	1	2	3	4
1	Repeat Motif	Action	Mountains/Cliffs	Vehicle	Manmade Structure
2	Towers	Vehicles	Mountains/Cliffs	Water	Buildings
3	Vehicle	Arch/Dome	Stepped	Buildings	Vegetation
4	Building	Circle	Rectangle	Triangles	Repeat Motif
5	Square/ Rectangle	Mountains/ Cliffs	Action	Natural	Arch/Dome
6	Mountain/ Hill	Water	Action	Building	Natural
7	Action	Water	Industrial	Vehicle	people
8	People	Natural	Vehicle	Vegetation	Buildings
9	Water	Mountains/ Hills	Buildings	Rural	Road/Bridge
10	People	Industrial	Mountains/Hills	Tower	Vehicle

For each trial, the protocol calls for one randomly selected target to be available for one week. During that time, six receivers will individually record their impressions of the intended target and send their responses by facsimile to the principal investigator.

The analysis will proceed in three steps:

(1) An SAIC employee, not otherwise associated with the experiment, will conduct a rank order analysis against the remaining targets in the selected pack.

(2) From the response, the SAIC analyst will answer an appropriate set of yes/no questions that are keyed to the target pack.

(3) The receivers will also be asked to answer an appropriate set of yes/no questions that are keyed to the target pack.

The rank order technique will be used to assess the magnitude of the AC in the study, and the binary answers will be use to assess the enhancement resulting from the BCH code.

6.3.4.3 Enhancement

There has been no action on this item during the reporting period.

6.3.4.4 Analysis

There has been no action on this item during the reporting period.

6.4 Research Methodology

6.4.1 Scientific Oversight Committee

The Scientific Oversight Committee (SOC) consists of five members drawn from academia. The membership includes a physicist, an astronomer, a psychologist, a statistician, and a neuroscientist. All of the protocols shown in the References Section are either under review or have been approved by the SOC. We anticipate that the first meeting of the SOC will be during the second week of July 1992.

6.4.2 Institutional Review Board

The Institutional Review Board (IRB) consists of seven members. They include a biostatistician, a Buddhist priest, a neuropsychiatrist, an ear-nose-and-throat medical doctor, a neuroscientist, a lawyer, and a retired military medical officer. The human-use portions of all of the protocols shown in the References Section have been approved by the IRB.

IV GLOSSARY

Not all the terms defined below are germane to this report, but they are included here for completeness. In a typical anomalous mental phenomena (AMP) task, we define:

- Anomalous Cognition—A form of information transfer in which all known sensorial stimuli are absent. That is, some individuals are able to gain access, by as yet an unknown process, to information that is not available to the known sensorial channels.
- Receiver—An individual who attempts to perceive and report information about a target.
- Agent—An individual who attempts to influence a target system.
- Target—An item that is the focus of an AMP task (e.g., person, place, thing, event).
- Target Designation—A method by which a specific target, against the backdrop of all other possible targets, is identified to the receiver (e.g., geographical coordinates).
- Sender/Beacon—An individual who, while receiving direct sensorial stimuli from an intended target, acts as a putative transmitter to the receiver.
- Monitor—An individual who monitors an AC session to facilitate data collection.
- Session—A time period during which AC data are collected.
- Protocol—A template for conducting a structured data collection session.
- Response—Material that is produced during an AC session in response to the intended target.
- Feedback—After a response has been secured, information about the intended target is displayed to the receiver.
- Analyst—An individual who provides a quantitative measure of AC.
- Speciality—A given receiver's ability to be particularly successful with a given class of targets (e.g., people as opposed to buildings).

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