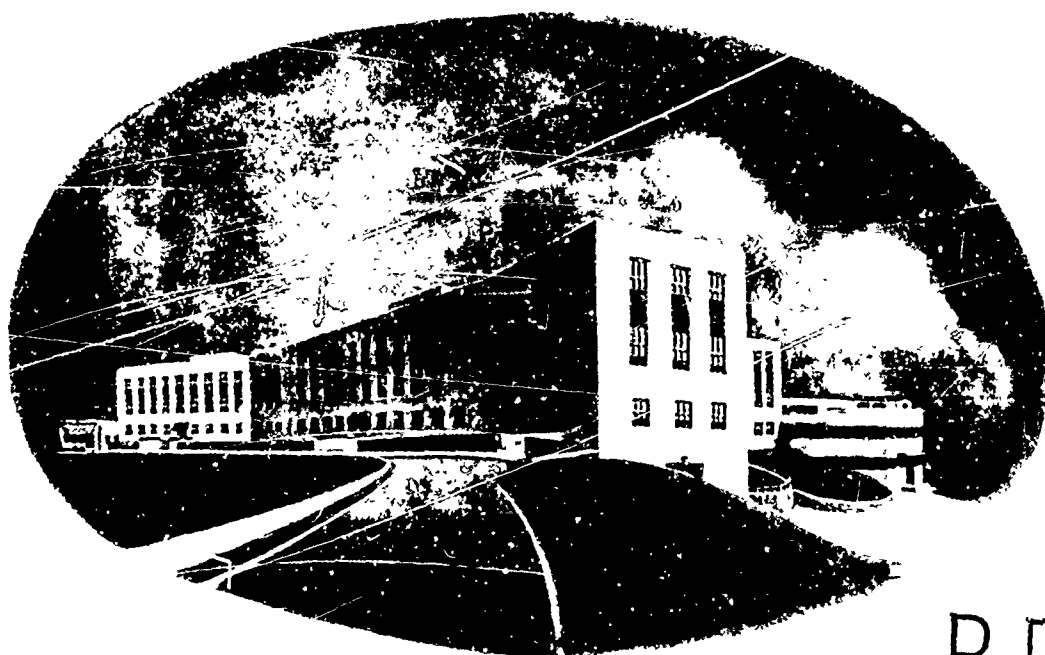


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Project ARGUS

1967: Five Year Review and Preview

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Project ARGUS

1967: Five Year Review and Preview

by

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Research Report

MF 022.01.03-1002

Report No. 31

August 1967

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I. INTRODUCTION

The Navy's program of research on the effects of isolation and confinement on the social emotional well-being and performance effectiveness of small groups of men (Project ARGUS) is approaching the end of its first five years, during which time initial staffing and facilities acquisition have been completed and an active program of both laboratory and field research established. The background, establishment, and first three years of research progress were summarized in the preceeding progress report (Third Annual Progress Report, October 1965). This report will describe progress since October 1965 and present an updated five year plan for further work relating to group isolation and confinement.

The main lines of research detailed in the last progress report have been pursued during the last eighteen months, with most of the studies in progress at that time being completed and new studies initiated. In addition to the completion of work then in progress, the principal activities herein reported

were the initiation of a major study of seven days of sensory deprivation (silence and darkness) and the initiation and completion of the data collection phase of a study of isolated pairs of men. Specific research progress in each of the several study areas are described below.

II. RESEARCH PROGRESS

(a) Pairs-in-Isolation I: The first groups-in-isolation study undertaken under the Project involved pairs of men isolated and confined to a small room for ten days, and was addressed to determining (1) the effects of isolation and confinement on the performance effectiveness and social emotional well-being of the subjects, and (2) the degree to which these effects were modified by group composition considerations. Pairs of men were selected such that one-third of the pairs were homogeneously high, one-third heterogeneous, and one-third homogeneously low with regard to each of four personality dimensions: dogmatism, need achievement, need affiliation, and need dominance. Seven reports have been published describing various aspects of the study, and all data except the free-interaction protocols of

verbal behavior have been analyzed. The results indicate that isolation and confinement were experienced as stressful by subjects and that this was significantly modified by compatible versus incompatible dyadic compositions (Haythorn, Altman, and Myers, 1966); that isolated pairs of men exchanged more varied and more intimate personal information than did nonisolated pairs (Altman and Haythorn, 1965); that both isolation and group composition significantly affected task performance, with subjective stress apparently acting as an intervening variable, consistent with the hypothesis that moderate degrees of stress enhanced performance but performance impairment was incurred at higher levels of stress (Haythorn and Altman, 1967; Altman and Haythorn, in press; Haythorn, 1966b); that incompatible pairs in isolation tended to withdraw from each other socially and to establish more clear-cut territorial preferences in confinement (Altman and Haythorn, 1967; Haythorn and Altman, 1967b); and that significant perceptual changes were associated with dyadic isolation and confinement, consistent with the expectation that such confinement may result in increased sensitivity to external stimuli

and decreased "inner resources" (Cole, Machir, Altman, Haythorn & Wagner, in press). Attempts have been made to integrate these results and relate them to possible applications in the design of future vehicles for operation in exotic environments such as the deep ocean or outer space (Haythorn and Altman, 1967b; Haythorn, 1966a; 1966c) and to the composition of work groups generally (Haythorn, 1966d). Continuing analyses of data collected in this study are devoted to content analysis of free interaction verbal behavior of subjects, and are methodologically oriented to developing a computerized capability to analyze such verbal protocols. To date, it has been possible to generate dictionaries of word frequency by subject by time period automatically, and efforts are currently underway to classify verbal content into thirteen content areas of interpersonal exchange (see below), and to apply semantic differential scaling to individual words to determine the degree to which differential experimental conditions produced differential sampling of the semantic space in the determination of word usage.

b. Pairs-in-Isolation II: The second study of isolated pairs of men focused on the identification of some of

the factors responsible for the effects of isolation and confinement, and on evaluating the potential of certain environmental modifications for mitigating the deleterious effects of such situations. Specifically, the study varied the degree of contact subjects had with the outside world, the degree of privacy available to them, and their expectations regarding mission duration (four days versus twenty days). The data collection phase of this study has been completed, and analyses are underway. Preliminary analyses indicate that the more extreme monotony and boredom of conditions imposed in this study were associated with a remarkably high abort rate (53% of the pairs were unable to complete the assigned number of days in isolation), and the frequency of aborts was associated with the experimental manipulations. Data on subjective states, physiological responses, task performance, interpersonal information exchange, social interaction, territorial behavior, and other aspects of joint living were collected and are currently being processed.

c. Social Penetration: In order to understand better the development of interpersonal relations in isolated groups, a program of research on the social penetration process has been undertaken. To facilitate our ability to quantify the nature and degree of interpersonal information exchange, a large bank of stimulus statements was developed and scaled for intimacy of content using the Thurstone procedure. These 671 statements are now available for self-disclosure questionnaires, stimuli for studies of overt interpersonal exchange, computer analysis of free interaction, etc. Each item has been assigned to one of thirteen content areas and assigned a scale value by both Navy and college students describing the degree of intimacy of interpersonal exchange represented by the item (Taylor and Altman, 1966a; 1966b).

An earlier study of the social penetration process in college roommates (Taylor, 1967), indicating significant relationships between self-reported tendencies to self-revelation and both breadth and depth of interpersonal exchange, led to a study of personality correlates of

self-disclosure. This study involved administration to 300 Naval recruits of a battery of personality tests and a measure of self-disclosure to various targets. Correlational analysis indicated certain relationships between self disclosure and social adjustment, and also suggested the importance of situational and interpersonal relationship factors. The apparent importance of situational factors led to the initiation of a series of studies which include the manipulation of reward/cost schedules in interpersonal interactions, situational features (from stranger on the train to forced, non-voluntary relationships), and confirmed and disconfirmed expectancies about future interactions. Data collection and analysis have been initiated on this series of studies, with early results supporting the expectation that the social penetration process can be brought under experimental control, thus laying the foundation for the management and training of interpersonal behavior in isolated groups.

d. Ecological Aspects of Behavior: The earlier pairs-in-isolation study reported above indicated that territorial and alone versus together behavior were significantly

associated with isolation and interpersonal incompatibility (Altman and Haythorn, 1967). The paucity of available research on these aspects of behavior and their apparent importance in human affairs dictated the need for a systematic review of available information and the development of a conceptual model for relating various aspects of human ecology to individual characteristics on one hand and the resulting behavior and adjustment on the other. This review (Altman and Lett, 1967) was prepared and presented at a conference on social and psychological factors in human stress held at the University of Illinois under Air Force sponsorship. This review summarized available information on ecological aspects of behavior and suggested a framework for the conduct of further research.

In an effort to cross-validate the ecological results of Pairs-in-Isolation I above, a study was undertaken in collaboration with Dr. Ralph Exline at the University of Delaware using college roommates as subjects. In the pilot stage of the study, instruments have been devised for describing the degree of social interaction and territorial

behavior characterizing the roommate pair, and an effort has been initiated to obtain semantic differential scaling of various possible room arrangements. Data collection has been completed on the pilot study. Analyses are currently underway to evaluate the new instruments and to determine the desirability of a more extensive study of entering Freshmen in the fall of 1967.

e. Sensory Reduction: Since isolation and confinement typically involve a high degree of stimulus reduction, an important aspect of the Project ARGUS Program has been devoted to research on the nature of and the reasons for the effects of extreme degrees of stimulus reduction. These effects have been studied by confining subjects to completely dark, silent rooms for periods of twenty-four hours and of seven days (cf Smith, Myers, & Edmondo, 1967). Performance effectiveness and adjustment criteria of stimulus-reduced subjects have been compared with subjects confined to comparable rooms but provided with a wide variety of stimulus material including television, AM-FM radio, two channels of recorded music, reading and writing material, ad lib access to lights, and conversational access to a

similarly confined subject in another room. The results of the twenty-four hour isolation study indicated that the sensory enriched condition significantly decreased stimulation seeking behavior, and in general greatly mitigated the deleterious effects of sensory reduction (Smith and Myers, 1966; Myers, Smith and Johnson, in preparation). A great deal of methodological progress was made in this study in the development of instrumentation for automatic experimental control and behavioral monitoring. These developments included a technique for automated presentation and scoring of multiple choice tests (Smith, 1966a); development of a time-shared, perceptual motor skills task for administration to sensory deprived subjects (Smith, 1966b); and a Ten-Event Tone Control System for automatic programming of experiments (Smith and Edmondo, 1966).

Previously collected data from a study of 96-hour periods of sensory deprivation yielded evidence of restlessness early in the experimental period being predictive of inability to endure the experimental conditions (Smith, Myers, & Murphy, 1967b), and evidence of increased vigilance during periods of extreme sensory reduction (Smith, Myers, & Murphy, 1967a).

A seven-day study of sensory reduced versus sensory enriched subjects was also undertaken during this reporting period (Smith, Myers, Johnson, Milstein, Walsh, Marlow & Kushner, 1967). This study (Project COMONOT, for Comparative Monotony) had as its major goals a comparison of the effects of sensory deprived and normal stimulation environments on performance, affective and symptomatology reactions, and biochemical states; and the study of relationships between various personality variables and criteria of reaction to extreme monotony. The specially developed performance measures included simple auditory vigilance, auditory thresholds, perceptual motor skills, intellectual skills, and ability to remain nonredundant and creative. Tests of time orientation, need for stimulation, daily measures of affective state, and isolation symptomatology indices were used particularly as a means of tracking individual differences in reaction to the dearth of stimulation. A broad range of personality and life style measures were collected in an attempt to predict these individual differences. In addition, biochemical indices of reactions to stress were obtained to

determine the existence of physiological correlates of psychological stress under conditions of reduced stimulation. The principal control condition in Project COMONOT was one of affording various sight and sound stimuli and communication with another subject in the "enrichment" condition. The initial data collection phase of this study has been completed, with the stimulus reduced condition generating approximately a 50 percent non-completion (abort) rate while the stimulus-enriched condition produced only one abort for twenty subjects. A second data collection effort in Project COMONOT is planned in order to provide more stable indices of relationships between personality variables and isolation tolerance.

Analyses of the stimulation-seeking behavior of COMONOT subjects shows highly significant differences between stimulus-reduced and stimulus-enriched subjects (Smith, Myers, & Johnson, in press). Analyses of perceptual motor skills performance have also been completed, indicating a performance decrement over seven days of sensory reduction (Smith & Myers, in preparation).

In a continuing effort to summarize and integrate existing knowledge of isolation and confinement phenomena,

two review articles have been completed for publication in a forthcoming book on Sensory Deprivation. The first article reviews and summarizes available research regarding isolated groups (Smith, in press), while the second reviews extensively the existing research regarding individual tolerance for conditions of sensory reduction (Myers, in press).

f. Affect Measurement: Studies of the nature and measurement of affective states have produced point scales in each of five affect categories (fear, anger, happiness, depression, and arousal), usually administered either by adjective checklist format or by choosing most characteristic descriptors from short word lists. The Primary Affect Scale (PAS) Technique (Johnson and Myers, in preparation) has proven its sensitivity in the SEALAB II Study, in measuring apprehension of dental treatment, in a study of aggression, and in the twenty-four hour sensory deprivation study described above. It was also used in the Pairs-in-Isolation II and COMONOT Studies described above. The brief testing time required and the asocial reference of the items make the technique applicable to a wide variety of experimental situations.

g. Comparative Monotony Studies: Analytic study of Isolation Symptoms Questionnaire (ISQ) data from previous sensory deprivation studies have yielded three stable clusters, each of which was separately related to ability to tolerate stimulus deprivation for four days. Tentatively termed tedium stress, unreality stress and positive contemplation, these patterns seem to represent varying typologies of adverse or adjustive reaction to severe monotony. An important implication of this multiplicity of symptom patterns is that they may prove to be more effectively predicted by personality variables than the grosser and more heterogenous measure of sheer endurance customarily employed as an index of deprivation tolerance.

Cooperative data collection with a number of research laboratories studying isolation and confinement has provided ISQ measures of these three clusters under widely varying conditions of comparative monotony. Work is now complete on ten different experiments, affording both within-study and across-study experimental comparisons. In studies of individual confinement, it appears that: (a) increased duration of sensory deprivation is associated with greater

symptomatology; (b) confinement without further stimulus reduction produces monotony effects of its own, which increase with duration but do not match those of severe sensory impoverishment; and (c) tedium stress and unreality stress are positively associated with early release from deprivation, whereas positive contemplation is positively associated with ability to endure the treatment. In addition, a recent analysis of data from Pairs-in-Isolation I (see above) has shown that the expected personality compatibility of pairs of men placed in ten days of confinement markedly influenced the extent of reported isolation symptoms.

h. Activity Measures: Analysis of various measures of personality, sensation seeking, thrill seeking, and life styles as regards activity has produced four factors descriptive of differing facets of an individual's engagement with his environment. Sociability, impulsive thrill seeking, vigorous activity need, and cognitive complexity generation may provide "profile" scores of an individual that are predictive of his intolerance of an environment that effectively deprives him of at least the first three of these needs. Analysis of a more limited set of questionnaire data produced similar factors which proved to be

related to volunteering for and endurance of prolonged dark quiet sensory deprivation (Myers, Smith, & Murphy, in preparation).

i. Social Comparison Processes: The importance of social comparison processes in self evaluation has been well established in previous research. Research reported in the previous progress report, indicating that deviations in performance feedback in either direction from the apparent group average resulted in less stable and less accurate self evaluations, was completed and final reports published (Radloff, 1966). To facilitate further work on social comparison, an extensive bibliography was prepared (Radloff and Bard, 1966), and research regarding the role of social comparison processes in affiliative behavior was reviewed and summarized (Radloff, in press).

The social comparison framework was used in a study of the reactions of Navy enlisted men to the carnage of a commercial airliner crash. Those men independently classified as emotionally non-responsive sought social comparison after the experience, while emotionally responsive men avoided talking to others about the experience

(Lacane & Wheeler, 1966). Another social comparison experiment dealt with the self-evaluation of personality traits. It was found that when individuals perceive a personality trait as being positive, they compare themselves to individuals whom they believe to be slightly higher on the trait and that they assume similarity with these individuals. Both effects were higher to the extent that Ss wanted, for instrumental purposes, to be high on the personality trait (Wheeler, 1966).

j. Behavioral Contagion: An important determinant of behavior in any social situation is the nature of the behavior one observes on the part of other people. Under certain circumstances, the contagion of undesirable behavior can seriously disrupt group effectiveness. Since the restraining influences of the larger society are less visible in isolated groups, it has seemed likely that the contagion of undesirable behavior would be highly probable in such situations. For this reason, a significant part of the Project ARGUS effort has been devoted to determining the conditions under which behavioral contagion occurs. The early effort was on contagion of aggressive behavior,

but more recent emphasis has been given to agreeing and generous behavior.

An early study in this problem area found that aggression was most likely to occur when the instigation to aggression was high and another person was seen to aggress. The results supported the hypothesis that observing aggressive behavior on the part of another individual reduces the observer's restraints against such behavior, thereby increasing the likelihood that such behavior would occur when instigation was high. Responses of the recipient of the aggression -- counter aggression, apology, or quiet acceptance -- did not seem to affect the aggressiveness of the subject significantly (Wheeler & Caggiula, 1966). In another study, similarity between the initial aggressor and subsequent aggressors was shown to be of importance (Wheeler & Levine, 1967). Specifically, it was shown that if there were not much similarity in terms of background and demographic variables, there tended to be more contagion of aggression than if there were strong similarity. Further evidence that contagion of aggression is based on restraint reduction was provided by

a study showing that censure of the initial aggressor under certain circumstances reduced or eliminated subsequent aggression within the group. Censure by the Experimenter, whom subjects believed to be a Commander, eliminated subsequent aggression. Subsequent aggression was not reduced, however, by censure from another group member or by the initial aggressor's self-censure. These results suggested that censure by an appropriate authority figure reinstated inhibitions against aggression that might have been reduced through observing another subject behave aggressively and get away with it (Wheeler & Smith, 1967).

In a submarine or similar undersea weapon system in which available information about the environment comes to the sense organs only after it has been transformed by instruments, one would expect high uncertainty. Uncertainty about the accuracy and completeness of the information and uncertainty about how the information should be interpreted both play a part. An exploratory investigation of the contagion of agreeing behavior under conditions of uncertainty indicated that restraints against agreement can prevent rapid

acceptance of the most plausible definition of the situation. When the first agreement occurs, however, the consequent lowering of restraints may cause rapid acceptance of whatever definition is under discussion, regardless of its plausibility (Wheeler & Arrowood, 1966).

Another study addressed to the contagion of positive behavior (generosity in this case) has been undertaken to determine whether or not the restraint reduction hypothesis advanced in the case of aggression also explains the contagion of generous behavior. Early results have failed to find a significant contagion effect, but further efforts along this line are planned.

k. Project SEALAB: Since the basic concept of Project ARGUS envisions the eventual validation of laboratory findings in field situations, and conversely, the identification in field situations of problems requiring laboratory investigation, efforts have been made to establish effective liaison with field research programs. A major effort has been made to obtain psychological and behavioral data in Project SEALAB II. As reported earlier, personality, interest, and life history and experience

characteristics of SEALAB Aquanauts were measured and behavioral data on the performance of SEALAB II crews were obtained. Analyses of these data identified a highly stable criterion measure representing a variety of measures including objective performance measures, objective indices of social behavior, supervisory ratings of performance, and subjective reports by Aquanauts regarding their emotional reactions. Personality and interest measures proved to be of little value as predictors of this criterion measure, but the demographic variables of birth-order and size of home-town produced significant correlations. Specifically, later born divers from small towns adjusted best to the multiple stresses of the SEALAB environment. The Aquanauts' self-reports of mood (particularly happiness and well being) proved to be highly correlated with adjustment criteria. The three teams which lived together under water became significantly more cohesive after submersion. Work performance measures indicated successful coping with this highly stressful environment.

Other results obtained through analysis of the SEALAB II behavioral data bear on issues of leadership,

relationships between subjective reports by Aquanauts and objective performance measures, relationships between measures of gregariousness and objective performance, and so on. Interviews with Aquanauts following the period of submersion have been examined for what they may contribute to an understanding of the stresses men face under such conditions and their typical reactions to those stresses. Various aspects of the study have been reported at professional meetings (Radloff, 1966b; Radloff and Helmreich, 1966) and elsewhere (Helmreich, 1966). Other aspects of this work have been included in a report edited by Pauli and Clopper (Miller, R., Radloff, R., Bowen, H., & Helmreich, R., 1967). A final report covering all aspects of the study is under preparation for publication in book form (Radloff, R. & Helmreich, R., in preparation).

A continued research effort relating to man-in-the-sea is planned. Current efforts are underway to lay the groundwork for psychological research in SEALAB III. Rating forms for collecting relevant material and a test battery for administration to SEALAB III candidates is currently being developed.

1. Expectancy Confirmation: Among the major determinants of an individual's desires for and expectations of acceptance in a new group, training program, or occupational specialty such as may exist in future Navy systems, are the task difficulty and task related rewards they encounter in the selection or evaluation process. An understanding of these determinants would provide the basis for an exploratory and advanced development program leading to better control of changes in attitudes toward the Naval service arising from personnel assessment procedures. An initial research effort in this problem area has been completed, indicating that changes in affective response to differing amounts of task related reward depends on the initial optimism or pessimism of subjects, as well as upon a particular level of task related reward (Wagner, 1966).

In a more specific context, the extent to which expectancies people have about interpersonal relationships are confirmed or disconfirmed, or are rewarded positively or negatively, significantly affects the social penetration or acquaintance process. To tap this aspect of developing relationships, shown in previous studies to be significant in isolated groups, a review and integration of directly and indirectly relevant literature has been undertaken.

In addition, a series of laboratory investigations of expectancy confirmation-disconfirmation in the social penetration process has been designed and data collection initiated.

m. Stress: Over the past eighteen months, the Psychiatry Division of the Behavioral Sciences Department has been involved full time in the investigation of the psychophysiological aspects of isolation and confinement studies conducted in the Small Crew Effectiveness Division. Attempts have been made to predict the ability of subjects to tolerate the stress of isolation based on findings from a brief psychiatric interview. An effort was also initiated to attempt to find psychophysiological measures which would predict ability to tolerate such stress. Laboratories were equipped so that urine samples could be collected from subjects during isolation without intruding or disrupting the isolation paradigm or affording time cues to the subjects. Liaison was established with Pathology Department, USNH, Bethesda, and arrangements were made for analysis of urine for 17OH-CS, 17KS, and 5HIAA. These biochemical assays have been done on 24-hour specimens at the termination of the

experimental period. Comparisons are being made among the various groups of subjects to determine differential changes between early release subjects, long staying subjects, confined but not stimulus deprived subjects, and ambulatory controls.

Blood samples were also obtained before and after the experimental period. These samples were also analyzed at the hospital laboratory for determination of serum uric acid, BUN, glucose, and PBI. Comparisons among experimental samples are being made, with initial results suggesting that preisolation serum uric acid significantly differentiates the early release from the long staying subjects.

Furthermore, it appears that low serum uric acid concentration is correlated with initial psychiatric personality assessment, i.e., low uric acid seems to relate to those perceived as having tendencies approaching the impulsive, thrill-seeking, acting-out characteristics commonly associated with psychopathy.

Also during this period, ground work was laid for the determination of catecholamines in this department. Furthermore, an initial capability has been acquired to record EEG

and EKG from two of the experimental rooms. The attempt will be made in the second stage of Project COMONOT (see above) to assess EEG changes during isolation (Prescott, Calatayud, Myers, & Pierpoint; 1966).

Pursuing earlier evidence that interpersonal stress might be significant in isolation, the data collected in the Pairs-in-Isolation I study (see above) were examined for evidence of the role interpersonal stress may have played in determining the responses of dyad members to the isolation and confinement conditions of the experiment. In this examination, it seemed that the concept of interpersonal stress served a useful function in integrating the performance, social penetration, territoriality, subjective stress, and social interaction data obtained in the study (Haythorn, 1967).

n. Classification of Scientific Knowledge: In connection with a symposium at Rutgers University on the classification of scientific knowledge, an attempt was made to draw on principles of taxonomy in various disciplines and to derive implications for integrating research information in the Behavioral Sciences (Altman, 1967). This is part of a

continuing effort to develop a more usable classification of psychological knowledge, one that will make it possible to identify information relevant to particular problems and to derive meaningful implications of such information.

Five-Year Plan

Fiscal Year 1968 - 1972

I. GENERAL

The general direction of Project ARGUS over the past five years will be maintained, with some change in emphasis during the next five years. The major effort will continue to be on the identification of sources of stress in future isolation and confinement situations, the determination of individual differences underlying tolerance for such stress, and the identification and evaluation of potential design and management counter measures. With a considerable amount of basic and exploratory research already accomplished, there will be an increasing emphasis on exploratory development efforts preparatory to establishing a basis for advanced development efforts leading to direct application of research results. This will mean an increased emphasis on more veridical representation of Navy tasks and populations anticipated in future systems, more attention to the definition and evaluation of environmental restructuring efforts, the development and evaluation of training procedures aimed at relieving the stresses of isolation, and an expansion of

research conducted in operational or near-operational settings. These general guidelines will dictate a change in the direction of conducting research on larger groups with more mature subjects than has been the case heretofore. Concurrently, an intensive basic research program will be conducted in an effort to build a body of knowledge necessary for bringing isolated group phenomena under management and training control. An intensification of the continuing effort to relate personnel subsystem events to overall systems cost effectiveness criteria through the construction of a computer model is also planned.

II. RESEARCH PLANS

A. Groups in Isolation: The current groups-in-Isolation study (Pairs-in-Isolation II, above) will continue to occupy a significant amount of research attention over the next eighteen months. This effort will consist of data analysis, interpretation, and report writing. Several specific areas of analysis are underway and/or planned, including analyses of performance effectiveness, subjective mood, biochemical changes, territorial behavior, interpersonal exchange, social interaction, indications of

desocialization, failures to complete the period of assigned duty, pre/post experimental perceptual changes, and so on. The results from this study will provide the best available information for estimating the degree to which deleterious effects of isolation and confinement can be mitigated by provisions for privacy, intrusions designed to remind the group of its membership in a larger society, and providing information regarding expected mission duration. In addition, it will contribute to a further understanding of group composition effects in isolation, the subjective reactions of subjects to various conditions of isolation and confinement, the importance of territorial behavior in adjusting to closed ecologies, and other questions relevant to the adaptation and performance of men in isolated groups.

A third groups-in-isolation study (Project RIM) is scheduled to begin in FY 1968. This study will deal with more mature subjects than the recruits used in previous studies, and will take a first step towards research on larger groups by comparing two-man with three-man

groups. In addition, Project RIM will be concerned with the independent variables of amount of space available (crowded versus uncrowded), stress tolerance training (trained versus untrained groups), and group compatibility (compatible versus incompatible groups). A wide variety of criterion measures developed in previous studies to assess subjective moods, psychomotor performance effectiveness, cognitive effectiveness, social emotional adaptation, and physiological stress responses will be utilized. Preparations for this study are currently being launched. The data collection phase is expected to begin approximately April 1968, and to be completed by October 1968. Data collection and reporting should continue to occupy a considerable portion of staff effort at least through fiscal 1969. This study should lay the ground for an advanced development effort in training for adaptation and performance of men in isolated groups. It should also provide guidelines for determining the space requirements in the design of closed ecological systems. In addition, it will contribute to an understanding of variations in crew size, and to the development of a rational crew

composition procedure for future Naval systems.

Specific plans for groups in isolation studies beyond Project RIM have not yet been formulated. However, the research strategem in Project ARGUS is to begin formulating the next major isolation study while the data collection effort of a current study is underway. This enables a smooth transition from one data collection effort to another, and increases the effective utilization of laboratory facilities. Following this principle, a fourth groups-in-isolation study will be planned to commence data collection in the winter of 1968-1969 or early spring of 1969. In pursuing a step-by-step improvement in scientific understanding and management control of future Navy crews, it seems likely that this fourth groups-in-isolation study will be concerned with larger crews than the three-man crews of Project RIM, that they will be maintained in isolation for longer periods of time, that traditional Navy military structure will be provided, and that attempts will be made to evaluate the best procedures identified in previous research for maintaining a viable group in isolation and confinement. These procedures would include ecological design considerations,

training, selection, crew composition, and perhaps other management interventions such as external contacts, changes in leadership style, and others as yet unidentified. A continuing program of groups in isolation studies is foreseen throughout the remainder of the five year period.

B. Sensory Reduction: Since a reduction in stimulus variety is usually associated with conditions of isolation and confinement, a continuing program of research in this area is contemplated. In Fiscal 1968, the final data collection effort of Project COMONOT (see above), involving individuals isolated in silent dark rooms for seven days compared with equally confined subjects with a wide variety of stimulus inputs, will be completed as will the data analysis and a substantial part of the report writing. The final reporting of Project COMONOT, however, is expected to run through the first half of Fiscal 1969. Completion of this study should provide evidence of the efficacy of stimulus-enrichment procedures for removing the boredom and monotony of otherwise stimulus-poor environments. It should also provide considerable information regarding the

personality correlates of isolation tolerance, thereby laying the groundwork for further development of crew selection procedures for isolated duty assignments. It will also provide the most comprehensive examination of the effects of stimulus reduction on performance that has yet been accomplished. By tracking affective state during isolation, a better understanding of adaptation to stimulus reduction will be acquired, thereby providing a basis for the development of training procedures and other steps for preparing men for duty assignments in stimulus-poor situations.

Project COMONOT will also provide the basis for further development of a research program in stimulus-enrichment procedures. It seems clear that long-duration missions of an isolated, stimulus-poor nature (such as a bottom sitting sonar post, an Antarctic weather station, a submerged deterrent system, or an interplanetary probe) will require some attention to offsetting the effects of boredom and monotony. Data currently available suggest that stimulus material can be devised which will substantially aid in off-setting deleterious reactions to the

situation. Further research to determine the important characteristics of such stimuli is planned. Such research will examine the relative importance of different sense modalities, the effects of subject versus experimenter control of stimuli, the amount of stimulus-enrichment needed to offset the effects of various degrees of stimulus reduction, the point of diminishing returns in stimulus enrichment, the effects of stimulus repetition versus stimulus reduction, and other related matters. It is expected that work along this line would continue throughout the five-year period, oriented to providing guidelines for system design engineers. These studies will also provide additional information for personnel selection and training procedures.

A more precise theory of stimulus dependence would probably require increasingly finer study of the deprivation state to include closer attention to psychophysiological concomitants. For example, an arousal interpretation of the impoverishment state as it interacts with response to task stimuli may require very detailed consideration of bodily states, perhaps relating them to specific affective

responses. Determination of the degree to which further development along these lines is indicated must await completion of Project COMONOT in late FY 1968.

C. Group Processes:

1. Behavioral Contagion. Earlier work under Project ARGUS produced a start on a theory of behavioral contagion which provides a framework for bringing the contagion of undesirable behavior under experimental control. Preliminary attempts have been made to extend this theory to the contagion of socially-desirable behavior such as contributing to a worthy cause or helping a fellow crewman. Early results suggest that the dynamics of contagion for socially desirable behaviors may differ from those for socially undesirable behaviors. For aggression, for example, the empirically supported theory holds that the principal contagion effect operates through a reduction of restraints against the undesirable behavior. For generosity, however, the contagion effect may be more a function of augmentation of the behavioral instigation. Further research to examine this possibility is planned. A greater understanding of the conditions under which either desirable or undesirable

behavior may evince contagion effects will contribute to an ability to develop group leadership and management procedures for controlling such effects. It will also provide the basis for training procedures aimed at preparing crew members for resisting deleterious contagion effects in isolated groups. A series of studies in this area during the next five years is planned, aimed at further development and refinement of a theory of behavioral contagion, with an increasing emphasis over time on the development and evaluation of group management techniques. For example, should individual acts of aggression be immediately and severely punished, slightly censured, ignored or merely brought to the crew's attention as potentially dangerous, and by whom should this be done? While severe censure by an officer did reduce aggression in one of our experiments, it also created a significant amount of depression among the subjects.

Plans are now being made for producing a training film designed to alert men to the occurrence of contagion and to its unfortunate consequences. The efficacy of the film and the types of training will be tested in Project

RIM (see above). The expectations are that such an experiment will result in an improved film which can be tested further in actual submarine tours or in SEALAB.

2. Social Penetration. Previous research under Project ARGUS and elsewhere has demonstrated that interpersonal conflicts and frictions occur in groups socially isolated from society and in which members are forced to deal with one another on an extensive basis. It has also been demonstrated that one route to such conflicts is the mutual exchange of information about the self (social penetration processes). In fact, data indicate that the process of learning about one another is accelerated in isolation, yielding potentially explosive and fragile interpersonal relationships. It is planned to study this process further, with the objective ultimately of providing diagnostic techniques for crew management to determine when relationships are progressing toward or have already reached potentially disruptive levels of social penetration, and to develop information which can be used in training long-duration mission crews to assess and control the process themselves. The research effort in this area will include

continuing work on the integration of existing literature and the development of a general theoretical model, the conduct of short-term laboratory studies addressed to the reward/cost aspects of social penetration, the identification of stages of interaction, comparison of different situational demands on interpersonal exchange, improvement of measurement techniques for assessing the nature of interpersonal exchange, assessment of the role of personality, etc. In addition to laboratory studies, longitudinal studies in operational Navy field settings are also planned. An increasing emphasis in this program will be given to the deterioration and breakup of interpersonal relationships, particularly as this occurs in isolated groups.

3. Interaction Process Analysis. Computer analysis of freely occurring verbal interaction will occupy a major effort during the coming five years. This will involve analyses of existing free interaction protocols collected in the two major pairs-in-isolation studies reported above (Pairs-in-Isolation, I and II). Attempts are being made to construct computer programs to analyze social penetration

processes, conflict and aggression, evidences of need-related behaviors such as dominance and affiliation, stress reactions to isolation, sampling of semantic space for determining general attitudes and moods and integrative versus dissociative interpersonal relations. It is expected that the analysis techniques developed with regard to current verbal material will be applied to data from later experiments, and that further refinement and development of an ability to analyze the content of verbal material will result. This program will provide a basis for subsequent development of automatic procedures for monitoring interpersonal relations in groups for purposes of providing responsive feedback to crew leaders regarding potentially disruptive intragroup interactions.

4. "The Trouble Maker" - Studies of Anti-Social Behavior. It has been recognized for many years that the existence of character and behavior disorders constitutes a major problem for small crew effectiveness in every branch of the military. While it has not been quantified, the ineffectiveness and passive-aggressive rejection of military routine characteristic of such men are generally well-known.

Not only are they less effective themselves than the other men, but they also reduce the effectiveness of others by the example they set and by the difficulties they cause fellow crewmen. It is therefore intended to establish a program of research addressed to the anti-social behavior of such men in the Navy setting generally, but more particularly in the setting of group isolation and confinement.

Much inadequate functioning of character and behavior disorders in a military setting may be classified as some type of active or passive aggression. Passive aggression includes refusals to learn, to perform duties energetically, to maintain one's self and one's gear at military standards, and so on. This "trouble maker" behavior will be the focus of a developing research effort, the early emphasis of which will be on determining differences between trouble makers and normal individuals in aggressive behavior. Most acts of open interpersonal aggression or passive aggression include instigation to aggression, a target having certain characteristics, an audience, some probability of censure from someone, and in many

cases another person who models the aggressive response. Knowing that trouble makers engage more frequently than others in such aggression, an important research question is the degree to which they do so under conditions differing from those under which people "normally" aggress. This research program will determine differences in susceptibility to contagion of aggressive behavior, reactions to censure, differences in instigation thresholds for triggering aggressive behavior, the importance of immediate versus delayed gratification of needs, differences in subjective cost/reward expectations, and so on. The goal of the research will be the identification of methods by which the trouble maker can be taught that he lives in a predictable world in which punishments and rewards are related to his own behavior. This program is planned for initiation in FY '69 and will continue for the remainder of the five-year period. If successful, it will contribute greatly to an understanding of antisocial behavior and to the ability of the Navy to use the very large number of character disorder individuals who are now considered unsuitable for military duty.

5. Social Comparison. Previous research has indicated that social comparison processes are important in determining the stability and accuracy of an individual's self-evaluation. It has been shown that comparisons of one's own views with those of others are, under certain circumstances, of considerable significance in testing reality. In fact, under certain circumstances experimental subjects have shown a preference for social reality over physical reality, i.e., a tendency to agree with erroneous group judgment on tasks involving complete freedom of error when the individual is judging alone. A current study is addressed to the question of the degree to which such social influence coercions are modified by majority opinion rather than unanimous opinion of other group members, and by the correctness or incorrectness of group judgment on tasks involving substantial error when the individual judges alone. This problem is particularly relevant to the small isolated group where there may be a tendency for strong group norms to develop in the absence of contact with outsiders to provide alternative interpretations of available data.

It is important to determine the major variables affecting an individual's judgment of the validity of his opinions, the adequacy of his performance, and the appropriateness of his emotional reactions. Previous research and theory have indicated that social comparisons play an important role in all three areas. It is not known, however, what the effects of various group compositions, provisions for objective reality testing, provisions for feedback from an external source, and other kinds of variables may have on these processes. Reliable answers to these questions would provide a base for the development of improved crew management techniques, better evaluation and feedback procedures, improved crew composition procedures, and better preparation of individuals for assignment to isolated group situations.

D. Affect, Mood, and Symptomatology. Previous research leading to the Primary Affect Scale (PAS) technique has raised many basic questions as to the nature and measurement of affective states. Ongoing studies of the semantic space embracing our "Basic English" of affect, dealing with questions of the dimensionality of affect space, are incomplete and will be continued. The question of the relation

of momentary feeling states to more lingering mood states and to personality traits are also of interest, as is the possibility of developing an ability to appraise affective tone of interpersonal communication utilizing computer technology. The discovery of considerable consensus in the symbolic communication of affective state, the existence of general agreement regarding the semantic connotations of common words, and the role of reinforcement concepts in behavior theory combine to suggest that the affective tone of interpersonal communications might importantly relate to interpersonal attractiveness. Studies pursuing this line of reasoning are currently under consideration, as are applications of the Primary Affect Scale to stress situations other than those for which it was developed.

Data from previous Project ARGUS studies as well as from other laboratories suggest a wide applicability of the symptom phenomena measured by the Isolation Symptomatology Questionnaire. Further refinements and simplifications of the ISQ may yield measures applicable to field research situations. Conceivably these measures might

provide a basis for monitoring of individuals in such situations and as signs of the need for remedial attention.

E. Ecological Studies. Studies of the ecology of interpersonal relations in confinement will progress at an even pace during the coming five years. A start has been made on a review and integration of existing literature, with the aim of developing a general conceptual framework for relating various studies in the area to each other. This includes the identification of relevant topics such as territoriality, use of space, gestures and body movements, need for privacy, and eye contact. A continuing effort to synthesize clinical, psychological, anthropological, and ecological aspects of behavior is planned.

The next phase of work under consideration in this area involves the convening of a conference of research specialists in the area to provide guidance for a long-range attack on the problem of ecological aspects of interpersonal relations. This could lead to an expansion of current plans, a separate development of a large independent program in the area, or the continuation of work on a relatively

small scale. Later phases in the program will probably involve experimental, field observational, and perhaps computer-modeling of ecologically-relevant group behavior.

F. Training. As the body of fundamental knowledge regarding the effects of isolation and confinement on crew performance and social-emotional well-being grows, it becomes increasingly feasible to consider the development of a training program to prepare men for such duty assignments. With nearly five years of work under Project ARGUS now completed, the development and evaluation of such a training program now seems reasonable. With this in mind, Project TAPMUSIC (Training for Adaptation and Performance of Men Under the Stress of Isolation and Confinement) was developed and tentatively approved for funding to commence in FY 1969. This program envisions the identification of relevant sources of performance decrement, specific interpersonal skills, measurement techniques for assessing these, training techniques for modifying them, and a program of research aimed at exploratory development and evaluation of the efficacy of training men to monitor their own social-emotional

and work effectiveness, perform quasi-therapeutic functions for each other in groups, and take corrective steps to offset potential decrements in performance effectiveness or emotional health. This exploratory development program has been incorporated in the technical development plan of BuMed's Education and Training Development project, MP43-03X, Subproject 15.

G. SEALAB III. A continuing program of research addressed to the Navy's Man-in-the-Sea project is contemplated, aimed at identifying individual differences associated with successful SEALAB performance, isolating sources of stress in a SEALAB environment potentially disruptive of effective performance, examining the relevance of laboratory studies of isolation and confinement to the SEALAB environment, identifying aspects of SEALAB crews amenable to laboratory investigation, and generally laying the basis for later development of a more effective personnel subsystem for large-scale utilization of SEALAB-type habitations. It is expected that behavioral data collected from SEALAB III will be of the unobstrusive type collected in SEALAB II. Results from SEALAB I

concerning criterion measurements, predictor measures, and general observations of adaptation and performance under such conditions will be cross-checked in SEALAB III. The stresses of SEALAB III are expected to be more severe than was the case in SEALAB II, and the rewards less since the uniqueness of the experience will be diminished. Beyond SEALAB III, current plans envision a continuing involvement in the Man-in-the-Sea program, contributing to the development of capsule design information, personnel selection procedures, training procedures, and crew management techniques. It seems especially useful to determine the characteristics of effective leadership under the conditions of a SEALAB habitation. Preliminary results from earlier SEALABs suggest that social integration in the crew is especially important, and is closely related to performance effectiveness. Future SEALAB research may be concerned with the determinants of social acceptance, with a view to establishing eventually a higher degree of management control over this process than is now possible.

H. Computer Modeling of Crew Behavior. Preliminary efforts to integrate and synthesize the various pieces of data generated by Project ARGUS have laid the foundation

for the development of a Monte Carlo model of crew behavior. Earlier work by Applied Psychological Services, and current work under way at Arizona State University in collaboration with the Project ARGUS staff, have indicated the feasibility of constructing such computer models. Considerable progress towards the establishment of such a model is anticipated in FY 1968. The model will incorporate findings from studies conducted under Project ARGUS and elsewhere and elaborating on the earlier conceptual model relating group compositional, environmental, and management intervention variables to intragroup processes, and these in turn to criteria of performance effectiveness and social-emotional well-being. It now appears feasible to incorporate in the model considerations of the social penetration process, the intervening effects of psychological stress, territorial and social interaction behavior and the effects of various degrees of isolation and stimulus reduction, relating these to certain group compositional considerations as initial inputs and both task performance and tendencies to escape the situation as criterion outputs. Further elaboration of the model is intended to incorporate considerations of

behavioral contagion, social comparison processes, additional group compositional variables, and additional environmental variables such as degree of privacy and mission duration. It is anticipated that a working model will be available by FY 1969, and that it will provide a vehicle for testing the sensitivity of system cost/effectiveness criteria to variations in personnel subsystem and environmental design changes.

References for the Period October 1965 to June 1967

- Altman, I. Choice points in the classification of scientific information. In B. Indik & K. Berrien (Eds.) People, groups, and organizations: an effective integration. Columbia University Press, 1967.
- Altman, I., & Haythorn, W. W. Interpersonal exchange in isolation. Sociometry, 1965, 28, 411-426.
- Altman, I., & Haythorn, W. W. The ecology of isolated groups. Behavioral Science, 1967, 12, 169-182.
- Altman, I., & Lett, Evelyn. The ecology of interpersonal relationships: A classification system and conceptual model. Presented at Conference on Social and Psychological Factors in Human Stress. University of Illinois, April 10-12, 1967.
- Altman, I., & Haythorn, W. W. Effects of social isolation and group composition on performance. Human Relations, In press.
- Cole, J., Machir, D., Altman, I., Haythorn, W. W., & Wagner, C. M. Personality changes in social isolation and confinement, Journal of Clinical Psychology, In press.
- Davis, H., & Wheeler, L. Social interaction between rats on different reinforcement schedules. Psychonomic Science, 1966, 4, 389-390.
- Davis, H., & Wheeler, L. The effect of collateral pre-training on spaced responding. Psychonomic Science, 1967, 8.
- Haythorn, W. W. Isolation, stress, and design of closed ecology. Presented at Human Factors Society Convention, Los Angeles, Calif., Nov. 2-4, 1966(a).
- Haythorn, W. W. The isolated group. Presented at Annual Meeting of the Association of Military Surgeons, Washington, D. C., 9 Nov. 1966(b).
- Haythorn, W. W. Social emotional considerations in confined groups. Presented at NASA Symposium on the Effects of Long Duration Manned Space Flights, Washington, D. C., 17 Nov. 1966(c).
- Haythorn, W. W. The role of compatibility in isolated work-oriented groups. Presented at American Psychological Association Convention, New York City, 6 Sept. 1966(d).
- Haythorn, W. W. Interpersonal stress in isolated groups. Presented at Conference on Social and Psychological Factors in Human Stress. University of Illinois, April 10-12, 1967.

- Haythorn, W. W., & Altman, I. Personality factors in isolated environments. In M. H. Appley and R. Trumbull (Eds.), Psychological Stress. New York: Appleton-Century-Crofts, 1967(a), pp. 365-399.
- Haythorn, W. W., & Altman, I. Together in isolation. Transaction, January/February 1967(b), 18-22.
- Haythorn, W. W., Altman, I., & Myers, T. I. Emotional symptomatology and subjective stress in isolated pairs of men. Journal of Experimental Research in Personality, 1966, 1, 290-305.
- Helmreich, R. Prolonged stress in SEALAB II. A field study of individual and group reactions. New Haven: Yale University, Technical Report No. 1, Grant Nonr (G)00012-66 & Grant Nonr (G)00030-66. 1966.
- Johnson, E. III, & Myers, T. I. The development and use of the Primary Affect Scale (PAS). In preparation.
- Latane, B., & Wheeler, L. Emotionality and reaction to disaster. Journal of Experimental Social Psychology, 1966, Supp. 1, 95-102.
- Miller, J., Radloff, R., Bowen, H., & Helmreich, R. The Sealab II human behavior program, Project Sealab Report, Edited by Pauli, D. and Clopper, G. Office of Naval Research, Washington, D. C., 1967.
- Myers, T. I. Tolerance for sensory and perceptual deprivation. To appear J. P. Zubek (Ed.), Sensory Deprivation: Fifteen Years of Research, New York: Appleton-Century-Crofts, in press.
- Myers, T. I., Murphy, D. B., Smith, S., & Goffard, J. Experimental studies of sensory deprivation and social isolation. Human Resources Research Office, Technical Report 66-8, June, 1966.
- Myers, T. I., Smith, S., & Johnson, E. General report of Icarus study. In preparation.
- Myers, T. I., Smith, S., & Murphy, D. B. Personological correlates of volunteering for and endurance of prolonged sensory deprivation. In preparation.
- Prescott, J. W., Calatayud, J. B., Myers, T. I., & Pierpont, H. Suture electrodes: a solution for long term bioelectric recording. Presented at Psychophysiological Society meeting, Houston, Texas, October, 1965.
- Radloff, R. Future selection of aquanauts, Project Sealab Report, Edited by Pauli, D., and Clopper, G. Office of Naval Research, Washington, D. C., 1967.

- Radloff, R. Social comparison and ability evaluation. Journal of Experimental Social Psychology, 1966, Supplement 1.
- Radloff, R. Selection of Man-in-the-Sea. AIAA Bulletin, 1966(b), 3, 357.
- Radloff, R. Affiliation. In E. Borgatta and W. Lambert, Handbook of Personality Theory and Research, New York: Rand McNally & Co., in press.
- Radloff, R., & Bard, L. A social comparison bibliography. Journal of Experimental Social Psychology, 1966(a), Supplement 1.
- Radloff, R., & Helmreich, R. Individual and group reactions to stress: Measurement, analysis and results. American Psychologist, 1966, 21, 709.
- Radloff, R., & Helmreich, R. Groups under stress: Psychological research in SEALAB II. In preparation.
- Smith, S. A technique for automated auditory presentation and scoring of multiple-choice tests. Naval Medical Research Institute, MF022.01.03-1002, Research Report No. 16, July 1966(a).
- Smith, S. Development of a complex, time-shared perceptual-motor skills task for use in isolation and confinement. Naval Medical Research Institute, MF 022.01.03-1002. Research Report No. 15, August 1966(b).
- Smith, S. Studies of small groups in confinement. To appear in J. P. Zubek (Ed.), Sensory Deprivation: Fifteen Years of Research, New York: Appleton-Century-Crofts, in press.
- Smith, S., & Edmondo, P. M. A ten-event tone-control system for the programming of experiments. Naval Medical Research Institute, Research Report No. 22, Dec. 1966.
- Smith, S., & Myers, T. I. Stimulation seeking during sensory deprivation. Perceptual and Motor Skills, 1966, 23, 1151-1163.
- Smith, S., & Myers, T. I. Time-shared, perceptual-motor skills during 7 days of isolation. In preparation.
- Smith, S., Myers, T. I., & Edmondo, P. M. The NMRI deep isolation laboratory. Bethesda, Maryland: Naval Medical Research Institute Research Report No. 27, May 1967.