ANNUAL PROGRESS REPORT

for the contract

"SCIENTIFIC COMMUNICATION RESEARCH IN SPACE BIOLOGY"

Contract Number - NSR 09 010 027

to the

Bioscience Programs Division
Office of Space Sciences and Applications
National Aeronautics and Space Administration

from

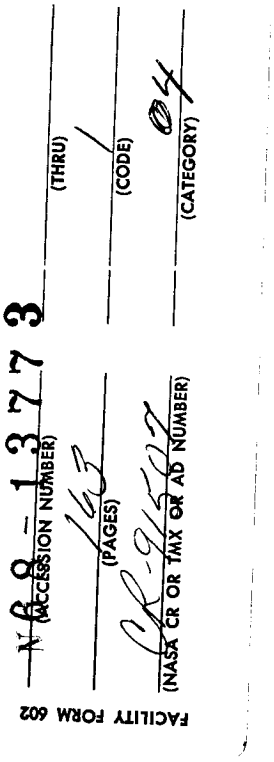
Biological Sciences Communication Project
The George Washington University

for the period

January 1, 1967 - December 31, 1967

submitted

December 29, 1967



GPO PRICE $ _____

CFSTI PRICE(S) $ _____

Hard copy (HC) 3.00

Microfiche (MF) .65

ff 653 July 65

C. W. Shilling, M.D.
Director, BSCP

The George Washington University

BIBLIOGRAPHY

on

PLANETARY QUARANTINE

VOLUME I

POLICY

by

DONALD E. WRIGHT

Manuscript

Mary Hourican
and
Lydia Homann

C. W. Shilling, M.D.
Director, BSCP

Work performed under NASA contract

NSR-09-010-027

TABLE OF CONTENTS

I. Preface

PREFACE

The citations listed in these bibliographies were compiled from the files of the Biological Sciences Communication Project for their relevancy to the areas of interest of the National Aeronautics and Space Administration's Office of Planetary Quarantine.

Volume I, Policy, includes references related to analysis of the sterilization requirements, conference proceedings and background information on NASA's position concerning spacecraft sterilization and planetary quarantine.

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III. Permuted Index

Key words in the title of each of the articles referenced in this work have been rotated to the beginning of the title and alphabetized.

Thus, if one should search for "U.S. space science program" it would appear alphabetically at the beginning of the line for all titles in which it actually occurs.

The number at the right refers to the bibliographical citation number.

IV. Author Index

The following is a listing of all authors, whether sole or one of multiple authors whose works are cited in this bibliography. The numbers at the right refer to the bibliographical citation number.

AUTHOR INDEX

BIBLIOGRAPHY

on

PLANETARY QUARANTINE

VOLUME II

ENVIRONMENTAL MICROBIOLOGY

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Mary Hourican
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II. Bibliography on Environmental Microbiology

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III. Permuted Index

Key words in the title of each of the articles referenced in this work have been rotated to the beginning of the title and alphabetized.

Thus, if one should search for "survival of Gram-negative bacteria in the environment" it would appear alphabetically at the beginning of the line for all titles in which it actually occurs.

The number at the right refers to the bibliographical citation number.

IV. Author Index

The following is a listing of all authors, whether sole or one of multiple authors whose works are cited in this bibliography. The numbers at the right refer to the bibliographical citation number.

AUTHOR INDEX

November, 1967

communiqué

PLANETARY QUARANTINE

VOLUME III

ENGINEERING PARAMETERS

BIBLIOGRAPHY

on

PLANETARY QUARANTINE

VOLUME III

ENGINEERING PARAMETERS

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DONALD E. WRIGHT

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Director, BSCP

Work performed under NASA contract

NSR-09-010-027

TABLE OF CONTENTS

I. Preface

PREFACE

The citations listed in these bibliographies were compiled from the files of the Biological Sciences Communication Project for their relevancy to the areas of interest of the National Aeronautics and Space Administration's Office of Planetary Quarantine.

Volume I, Policy, includes references related to analysis of the sterilization requirements, conference proceedings and background information on NASA's position concerning spacecraft sterilization and planetary quarantine.

Volume II, Environmental Microbiology, is concerned with citations involving microbial growth, detection, identification and monitoring throughout spacecraft fabrication. Citations involving contamination control are relatively few, since this area was covered in an earlier bibliography.

Volume III, Engineering Parameters, incorporates material on air sampling, development and testing of spacecraft components, instrumentation, sterilization and decontamination procedures and spacecraft design.

These three volumes, together with two previously published (CLEAN ROOMS, ETHYLENE OXIDE), comprise over 1,200 citations bearing on the spacecraft sterilization problem. Their purpose is to provide essential background material for the further development and publicizing of the planetary quarantine program in the United States.

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III. Permuted Index

Key words in the title of each of the articles referenced in this work have been rotated to the beginning of the title and alphabetized.

Thus, if one should search for "temperature gradients within component parts" it would appear alphabetically at the beginning of the line for all titles in which it actually occurs.

The number at the right refers to the bibliographical citation number.

IV. Author Index

The following is a listing of all authors, whether sole or one of multiple authors whose works are cited in this bibliography. The numbers at the right refer to the bibliographical citation number.

AUTHOR INDEX

SYNOPSIS OF ACTIVITIES

The following paragraphs describe the major activities of the BSCP during the contractual period of January 1 - December 31, 1967.

1. During this contractual period, "Scientific Publications of the Bioscience Programs Division" has been compiled in six volumes and distributed to more than 400 NASA associated bioscientists. These reports contain bibliographic citations of publications resulting from activities supported by this division of the NASA. Appropriately, author and permuted title indexes, the organizational affiliation of the senior authors, and in some cases, a literature analysis of the subject fields were also included. These six volumes issued as five reports were previously submitted to NASA as they were completed.

2. A compilation of the NASA contractual listings of publications was made for the convenience of four of the Bioscience Programs Division's Branch Chiefs. The projects were indexed according to principal investigator, performing organization and contract number. These four reports, compiled to provide some assistance in the constructive appraisal of the research activities in the respective fields of pursuit, were previously submitted to the NASA as they were completed.

3. Five issues of the Bioscience Capsule have been sent to more than 450 contractors and grantees of the Bioscience Programs Division and other NASA related bioscientists. These issues emphasized the activities of the various program branches and have been especially well received by the professional community. The October 30 issue describing the activities of the Advanced Programs and Technology Branch is enclosed with this report. Earlier issues have been previously distributed to NASA.

4. The Biospace Data Bank has been subjected to continuous updating. All references in the bibliographic file were subjected to review and a large number of them have been discarded because they were not sufficiently pertinent to the interests of the Bioscience Programs Division of NASA. To date, there are 11,100 abstracted references in the Termetrex System. The directory of space biologists and laboratories participating in research related to space bioscience has also been subjected to continuous updating. The depositary of all the publications and reports supported totally or in part by the Bioscience Programs Division has continued to expand.

5. In cooperation with the University of Virginia transcriptions were made of various presentations of the Biospace Technology Institute held at Wallops Station in October of 1965 and 1966. All material

regarding this activity has been transmitted to the Behavioral Biology Branch chief and this transaction completed the BSCP's committment in this regard to date.

6. The BSCP has responded to a large number of queries for information concerning space bioscience from academic, industrial, governmental, and other institutions. These queries have averaged in number about eight a month. Although they have been somewhat less, frequent in the last few months this is normal for this time of the year. In response to these queries both general and technical information was provided to the extent that seemed most appropriate.

7. Critical reviews of Dr. J. P. Henry's manuscript "The Role of Cultural Change in the Increase of Blood Pressure with Age" were obtained from appropriate authorities in the fields of anthropology and medical science. These comments were forwarded to the chief of the Behavioral Biology Branch.

8. Services have been provided to the Advanced Programs and Technology Branch consisting of a system designed information processing procedure to provide assistance in the surviellance of developing technology, programming, scheduling, and other factors related to the scientific and technical efforts of the Bioscience Programs Division. This specific information service was designed to assuage the difficulties and problems concerned with the planning of in-flight bioscience experiments and related activities with the assistance of the Tri-Delta Corporation.

9. At the request of Dr. Bernard Newsom, the BSCP has provided the collaborators of the Monograph Series #19 with eighteen basic references pertaining to their interests and compiled a bibliography on Radiobiology containing 514 references taken from the bibliographic section of the Biospace Data Bank. In this report, only papers from 1959-1967 were included. An author index and a permuted title index with appropriate descriptors added, were also included to permit rapid entry to the more specific items of interest to the reader. It was felt that this report would also be helpful to the compiler of Monograph #7 and, accordingly, copies were also sent to him. Dr. Newsom seemed sure that this work would be of considerable help in the preparation of his manuscript, and he has been assured that should he so desire, the BSCP would make any reasonable attempt to obtain hard copies of any of the documents cited to assist him. This work is illustrative of the type of services the BSCP can render in support of this activity.

10. Outlines have been received for three monographs (#2, #9, and #15) to date and Dr. Roth, compiler of monograph #8, has promised his completed draft manuscript by early January 1968. All outlines received have been approved by Orr Reynolds and the first payment to these compilers is being processed.

Contracts were negotiated during the past three months with Claude Zobell (co-author with Dale Jenkins for monograph #3) and with Gerald Silverman (one of several co-authors with Larry Hall for monograph #6). An outline has been received from and a contract is being negotiated with Ralph Rohweder for a separate monograph, "Two-way Feedback Between Experimental Biology and the Applied Biological Sciences of Medicine, Agriculture, and Conservation".

A change of authors has occurred with two monographs: monograph #17, to be prepared originally by R. S. Johnston, will be written now by Walton Jones, NASA Headquarters, and monograph #19, to be prepared originally by R. W. Lawton, will be written now by Charles Berry, NASA, Houston. All other items are as previously reported.

11. During the year, three short courses titled, "Environmental Microbiology for Engineers", were held at Cape Kennedy, Huntsville, and the Jet Propulsion Laboratory in February, June, and October, respectively. More than 100 students attended these courses and an even larger number of auditors attended the classes. The professional community continues to express an active interest in this activity and preliminary plans have been made to hold the next course either at Langley Research Center or Kennedy Space Center.

12. There has been a large demand for documents of interest to Planetary Quarantine during this period. During this year, more than 12,000 pages of information have been sent to grantees and contractors and related bioscientists of this program branch. Special information searches were made during the last quarter in the following areas: a) Microbial fallout from human beings, for Fort Detrick, b) Background material for a United Nations Conference on the Peaceful Uses of Space, requested by the Karolinski Institute, Sweden, c) Studies on sterilization by irradiation for Goddard Space Flight Center, d) A ten page report on the implementation of the Planetary Quarantine Program. Large requests made during earlier quarters have already been reported in the appropriate quarterly reports.

13. The BSCP has been functioning as a technical monitor for the preparation of a film, "Planetary Quarantine". Activities on this project included the critical review and editing of part of the script for the film made by the Audio-Visual Facility at CDC. This activity has necessitated many trips to CDC and JPL. This film was reviewed by NASA officials and was found to be in need of further refinement due to the rescheduling of the NASA's planetary exploration timetable. The main item of this film, the Voyager Program, has now been rendered obsolete because of these program changes.

14. A bibliography on the applications of Ethylene Oxide was prepared and distributed to the contractors of the Planetary Quarantine Program. A total of 137 references were cited and appropriately indexed by author and title. This report has already been submitted to NASA at an earlier date.

15. A three volume bibliography containing a total of 750 citations has been compiled to provide essential background material for the future development and enlightenment of the planetary quarantine activities in the U.S. These citations have been separated into three parts - policy, engineering problems, and environmental microbiology. Copies of these documents are enclosed with this report.

16. In support of a presentation on sterilization techniques made by the chief of the Planetary Quarantine Program at the London COSPAR meeting, a bibliography of the pertinent literature has been prepared.

17. At the request of the chief of Bioscience Communications, three weeks was spent at the Wallops Station in participation of the Biospace Technology Training Program. A ninety minute presentation on NASA's policy on Planetary Quarantine and Spacecraft Sterilization programs was made. A small reference library of 100 volumes was also made available to the students for use during this course. A quantity of reprints and NASA publications were distributed to the students and requests for additional publications were referred to the program manager of the Bioscience Communications portion of this contract. A critique of the program has been prepared and sent to the appropriate program chief.

During this contractual period the various endeavors of the BSCP have resulted in the publication of fourteen reports resulting from the activities of this contract. A bibliography of these reports is included herein.

10. KULP, L. A., HONG, F., and ROLLINS, S., comp. Contractual listings of publications supported by the Exobiology Program, Bioscience Programs Division, National Aeronautics and Space Administration. George Washington U., Biol. Sci. Commun. Proj., Washington, D. C., Sept. 29, 1967. 64 p.

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BIOSCIENCE

"CAPSULE"

No. 16 October 30, 1967
Biological Sciences Communication Project, 2000 "P" Street, N.W., Washington, D.C. 20036

ADVANCED PROGRAMS AND TECHNOLOGY REPORT

The Advanced Programs and Technology Branch of the National Aeronautics and Space Administration's Bioscience Programs Division serves various functions within the Division. It seeks out flight space for bioscience experiments, organizes experiments into compatible groups and matches them with mission profiles, schedules, communication and tracking needs. In some instances, usually where small experiments are involved, it will carry out research program management.

Perhaps one of its most important functions is that of making a continuing inventory of the status of research proposals and grants. Here the Branch is expected to maintain visibility into what research ideas are in which formative stages and what is required before a research idea can be flown, and to forecast the volume of future bioscience flight activities that will flow from the research pipeline. It takes about two years for a simple research proposal to mature into a flight experiment, and it takes five to ten years for more complicated ones. This means that long-range "production planning" techniques are needed to insure efficient meshing of valid experiments with flight opportunities.

With a staff that includes representatives from the biological sciences and engineering, the Advanced Programs and Technology Branch is well-equipped to carry out these functions. Moreover, they get support and guidance from an active American Institute of Biological Sciences (AIBS) Regional Council program which effectively injects into the planning the viewpoints of a wide cross-section of the nation's leading life scientists.

Among the flight programs being considered is Bio A. Generally, there are proposals from many potential investigators in various stages of approval or development. Bio A is a group of such experiments that has been proposed but not approved as yet for one of the Apollo Applications Program flights. Bio A experiments would be designed to determine the effects of a 60-day orbital flight with near zero g on monkeys or chimpanzees. The time course and extent of changes in the central nervous, cardiovascular, metabolic, and hemodynamic systems under conditions of prolonged weightlessness and removal from some of the Earth's periodicities would be studied. Some support has already been provided to potential investigators to proceed with their experiment definition work, preliminary design of instrumentation and sensor systems, and further baseline and physiological feasibilities studies -- all necessary steps before the decision is made to fully support the mission.

Basically, the Bio A system consists of four primates, each in its own module that also contains associated instrumentation and life support equipment. One Bio A experiment, proposed by Dr. W. Ross Adey of the University of California at Los Angeles, will make a wide range of electrophysiological measurements on the central and peripheral nervous systems. Both behavior and motor activity of the animals will be monitored. Another Bio A experiment, proposed by Dr. Nello Pace of the University of California, Berkeley, will provide for automated chemical, fluorometric and optical analysis of body fluids. A complete metabolic balance will be made. The flight results should produce information on the causes of various changes observed, internal mechanisms involved, and the adaptation processes. This information will be useful for predicting the long-term effects of space environment on man and also for increasing our basic knowledge about the body's adaptations and reactions to, and dependence upon, certain components of the Earth's environment.

The Bio A experiments will draw heavily from experience with the 30-day Biosatellite flights, but will go significantly beyond the Biosatellite investigations in the number and kinds of measurements. The greater capacity of the manned AAP missions and the astronaut participation will also allow longer flight duration, more and larger animals, and physical enclosures adapted to the specific needs of the different experiments.

Another flight program being considered is BioPioneer. In the proposed automated BioPioneer spacecraft, specimens will be flown in a heliocentric orbit away from the Earth, and periodic rotation around the Earth, thereby totally removing the specimens from all such geophysical periodic influences known and unknown in an attempt to investigate circadian biological rhythmicity. The spacecraft, including 52 pounds of scientific instruments, will weigh about 162 pounds. The spacecraft is designed for six months in solar orbit. Two years is the development time required from "go-ahead" to first launch.

The Advanced Programs and Technology Branch also shares responsibility in the Biotechnology Laboratory studies that are considering the feasibility of flight facility for various life sciences experiments sponsored by the Office of Manned Space Flight, the Office of Advanced Research and Technology, and the Office of Space Science and Applications.

The Laboratory might be an orbiting facility dedicated to the biological sciences and medicine, with a possible orbit of six months or more. Experiments would range from microbiology to those involving higher-order mammals; an integrated medical laboratory for investigations on humans is also planned. Biologically and medically trained astronauts would be used in this flight.

As part of the Apollo Applications Program other experiments are being planned for flight. These plans include flying human liver cells to study effects of weightlessness, and flying pocket mice, vinegar gnat pupae, and potato cells to study circadian rhythms in Earth orbital flight. The potato cell experiment, for example, will investigate the well-studied rhythm observed in the oxygen consumption of a sprouting potato. We will learn if the rhythmicity of the potato cell respiration remains the same, is modified or disappears during orbital flight, thus casting light on a fundamental question in biology. The experiment design makes use of available baseline data and requires relatively simple equipment and monitoring by the astronauts during flight. A flight package consisting of respirometers containing potato plugs will be orbited. Recovery is not required. Identical control respirometers will be operating on Earth, and oxygen consumption will be measured every six minutes for long time periods.

Plans are also being considered for continuing the Biosatellite program after the presently approved six flights are completed. Preliminary examination of the data from the successful three-day Biosatellite recently flown indicates that some of the experiments need not be flown again but that it might be profitable to repeat others. The three-day flight strengthened the viewpoint that Biosatellite is a valuable research tool in planning for future payloads.

BSCP Publications Available

Four BSCP reports are now available, as long as the supply lasts, upon request from Biological Sciences Communication Project, Suite 700, 2000 P St., N. W., Washington, D.C. 20036.

Three of the reports are lists of publications resulting from research supported, sometimes in part, by the Physical Biology and the Environmental Biology Branches of the Bioscience Programs Division. For each project, indexed alphabetically according to principal investigator, the published activity of each contractual endeavor is cited: 137 citations in Physical Biology, more than 300 in Environmental Biology, and more than 400 in Exobiology.

The fourth publication, "Radiobiology: A Selected Bibliography," represents a selection of 514 radiobiology references drawn from the bibliographic section of the BSCP's Biospace Data Bank. Only papers from 1959 to date are included; citations are indexed using both and author index and a permuted title index, thereby "providing rapid entry to the more specific items of interest to the reader."

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