

D R A F T

July 26, 1960

Space Science Board
National Academy of Sciences
National Research Council
2101 Constitution Avenue, N. W.
Washington 25, D. C.

MINUTES
Third Meeting
Committees on Biological Research

Flamingo Hotel
Arcadia, California

June 24, 1960
Morning, Afternoon and Evening
and
June 25, 1960
Morning

In the Chair June 24, 1960: Dr. Hartline

In the Chair June 25, 1960: Dr. Lederberg

Attendance:
(for all or part
of the sessions)

Members:

H. Keffer Hartline; Colin S. Pittendrigh;
Otto H. Schmitt; Richard Davies; Norman Horowitz;
Joshua Lederberg; G. A. Derbyshire, Secretary

Members Absent:

Howard J. Curtis; L. E. Farr; Thomas Francis;
E. F. MacNichol; Edward L. Tatum; Melvin Calvin;
A. G. Marr; Daniel Mazia; Aaron Novick; C. B. van
Niel; Harold F. Weaver; Paul Berg.

Invited Participants:

University of Pennsylvania - C. J. Lambertsen
U. S. Air Force - General Don Flickinger
Ft. Detrick, Maryland - C. R. Phillips
NRC Division of Medical Science - R. Keith Cannan,
Chairman; S. F. Seeley
Space Science Board - L. V. Berkner, Chairman;
Hugh Odishaw, Executive Director.

Liaison Representatives:

National Science Foundation - J. T. Wilson
National Aeronautics and Space Administration - Richard Young.

1. Consideration of Minutes

There being no objection, the minutes of the February 29, 1960 meeting were approved as circulated.

2. Organization of The National Academy of Science Space Biology Committees -- Roles and Responsibilities

2.1 Space Science Board

Discussions of the organization and responsibilities of the biological committees of the Space Science Board constituted the principal topics for discussion at sessions on June 24, morning, afternoon and evening, and were concluded at the June 25 morning session. The following summary was presented to the Board as a result of these discussions:

Dr. Berkner advised the Committee of the recent discussions with Dr. Bronk and Dr. Cannan which had established the necessity for consolidation of the activities of the NRC Committee on Bio-Astronautics and the Biology Committee of the Space Science Board. These discussions, implemented by activities of the Academy's staff had resulted in his memorandum to Dr. Bronk dated June 3 (Attachment A). The expanded biological activities of the Space Science Board are now being established generally in accordance with the plan outlined in this memorandum. Three new biology committees are to be activated as follows:

Committee 14 - Exobiology

(Extraterrestrial life, contamination and related topics)

Chairman - Dr. Joshua Lederberg

Membership - Messrs. Hartline, Pittendrigh, and the current membership of Committee 11 a.

Committee 15 - Environmental Biology

(Biological effects of earth dependent rhythms, the gravity free state, high vacuum, radiations and other features of satellite, planetary and interplanetary environments.)

Chairman designate - Dr. Colin S. Pittendrigh

Membership - Messrs. Hartline, Lederberg and Curtis (Additional members to be appointed by the Chairman, Space Science Board, on recommendations of Dr. Pittendrigh.)

Committee 16 - Man-in-Space

(To develop for the Board a clear philosophy with regard to man-in-space programs. To establish as required ad hoc sub-committees to provide assistance to the civilian space agency and to the Department of Defense and the individual services.)

Chairman - Dr. Christian J. Lambertsen

Membership - To be appointed by the Chairman Space Science Board on recommendations of Dr. Lambertsen.)

Both the newly organized Office of Life Sciences at NASA and the Department of Defense, specifically the Air Force Directorate of Bio-Astronautics, expect to look to the Board for policy and program guidance. Each intend to establish in-house advisory committees for project level advice of a detailed nature. General Flickinger, representing the Air Force, stated that he would not support the continued operation of the NRC- Bio-Astronautics Committee. However, he expressed the hope that its forum type activity would be continued within the Space Science Board and that the biology committees of the Board would be responsive to Armed Forces requests for advice. Chairman Berkner and Dr. Odishaw assured him that the Board would be responsible for these activities.

2.2 Bio-Astronautics Committee

The Bio-Astronautics Committee panels will continue in being until tasks now being completed can be phased out in an orderly fashion. The Secretariat of the Committee will be consolidated with that of the Space Science Board thus an orderly integration of the two organizations can be accomplished. It is hoped that final reports of each panel's activities can be prepared at an early date so that the Board, and particularly its man-in-space committee chairman, can take full advantage of the significant contributions of the Bio-Astronautics Committee.

3. Government Plans and Interests

3.1 NASA Office of Life Sciences - Dr. Richard Young

Objectives for space flight experiments in the Life Sciences are contained in attachment B.

The Office of Life Sciences is organized currently in four sections:

1. Grants and Contracts - responsible for spending a major portion of the life sciences budget in support of the long term program and the development of in-flight experimentation.
2. Bio-Engineering - responsible for the development of life support systems, and eventually will absorb Project Mercury.
3. Bio-Sciences - the area now being emphasized as the major effort of the Office; responsible for general biology, in-flight experiments, contamination, extraterrestrial life, radiation studies and so forth. The program in this area has been developed in some detail.

4. The Life Sciences Center - responsible for developing plans and justification for a central laboratory at a location not yet decided and programmed as "at least several years away".

The Office of Life Sciences does not at this time have any connection with Project Mercury although liaison is maintained at the management level. Two in-house review committees have been established, one under Dr. W. R. Lovelace and the second under Dr. Melvin Calvin. More are contemplated. These committees will form in-house advisory bodies to which staff committees of the division can turn for advice on proposal evaluation and related topics.

The advice and support of the Space Science Board is needed for three reasons:

1. To establish an independent scientific point of view.
2. To enlist the support of competent scientists.
3. To influence the biology program along the most valuable lines of investigation and to help sell to and enlist the support of engineers.

Dr. Odishaw commented that the scientific community has the responsibility to prevent foolish experiments, that the Board, as the voice of space science within the Academy, accepts this responsibility. However, the scientific community must respond to its needs and participate actively in its behalf.

3.2 National Science Foundation - Dr. John T. Wilson

The liaison provided by the Foundation in the biological sciences has not been comparable so far to that which they have provided in the physical sciences.

there is no special division for "space biology". Proposals in this field are handled through the regular organization although they have been so few in number that it has been possible to provide special consideration. Since the organization of the NASA life sciences program, close informal liaison is maintained. The Foundation stands ready to assist NASA through facility grants, coherent area science grants and support of specific research projects. Generally, the NSF/NASA relationship regarding funding of research is as follows:

NSF - ground-based research for general understanding.

NASA - those studies important to flight missions.

The NSF staff, working with the NASA staff will see that projects get funded if they are worthwhile.

3.3 Air Force /DOD - General Don Flickinger

The total Air Force Bio-Astronautics program is contained in a "For Official Use Only" document dated June 15, 1960 (available on loan from the Secretariat). The program is divided into 8 major technical areas: radiation, stress tolerance, capsule habitability, true performance, bio-electronics, animals in space environment and field operation testing. The Air Force intends to rely on the Space Science Board for broad program policy guidance and support. This will provide a single point of contact within the Academy for both the civilian and military space biology programs.

4. Radioactive Power Sources for Lunar Probes, ref SSB Memorandum, June 2, 1960 (Attachment C)

The Committee indicated that its chief concern was not the presently contemplated use of this battery, but the establishing of a precedent for future larger power sources of the same type. It suggested

that while it was in general in agreement with the comments of Professor Hurley, it lacked the information necessary to establish a formal position. It further felt that this was a topic which should be discussed within the COSPAR framework to secure international approval and possibly to establish some measure of international agreement concerning the use of radioactive power sources in lunar or planetary probes.

5. Sterilization Activities at Ft. Detrick - Dr. Charles R. Phillips

As a result of Committee and Board action regarding sterilization of space probes, Ft. Detrick is operating under a NASA contract aimed at the development of techniques and procedures to achieve this end. The basic problem in this regard appears to be that of education of the engineering personnel rather than the development of methods and procedures. A second major problem appears to be establishing lines of communication to the appropriate and responsible individuals. Some research is going forward on biological analysis of payload components with some interesting preliminary results. The Jet Propulsion Laboratory is now specifying their electronic components to withstand 125° for 8 hours. One simple way of accomplishing sterilization of miscellaneous debris is to paint it black. This will produce a sufficiently elevated temperature on burned out rocket parts (nuts, bolts, etc.) to accomplish this end. NASA still has no single focal point for implementation of the sterilization procedure. The Committee agreed with Dr. Phillips that it was most important to establish contact with the appropriate people in time for the sterilization to be built in as a part of the whole payload construction process. However, it was felt there was no sure way to achieve this end other than education.

Dr. Phillips also reported that the Army has established a contract with Douglas Air Craft Company for the development of remote biological sampling and detection devices. Their first step in accomplishing this task will be the assembly of all appropriate information. In this regard, the report of an NRC Chemical Corps Advisory Committee (1958) was noted as being of possible interest.

The background of familiarity and experience of the Ft. Detrick engineers in dealing with the bacterial-tight barriers was also noted and their possible application to the quarantine of sample return from other planets.

5. Consideration of Board Report

It was the sense of the Committee that no new information was at hand to modify its report developed at its meeting on February 29, 1960. (Some minor additions are being developed and will be circulating to Committee members shortly.)

NASA OBJECTIVES FOR SPACE FLIGHT EXPERIMENTS IN THE LIFE SCIENCES

I OBJECTIVES FOR THE STUDY OF THE EFFECTS OF SPACE ON BIOLOGICAL PHENOMENA

To determine effects of extraterrestrial environments on biologic matter, systems, and processes:

- a. Growth
- b. Reproduction
- c. Nutrition
- d. Embryogenesis
- e. Morphogenesis
- f. Mitosis
- g. Heredity
- h. Geotropism
- i. Biological clocks and rhythms
- j. Etc.

1. To select and design experiments required to evaluate effects of space environments on biologic matter, systems, and processes

2. To evaluate the significance of these effects to the fundamental nature of biologic matter, systems, and processes.

3. To conduct above experiments in extraterrestrial environments.

- a. Simulated environments (earth bound)
- b. Extra-atmospheric balloon systems
- c. Satellite systems
- d. Space probe systems
- e. Space laboratories
- f. Lunar and planetary environments

II OBJECTIVES FOR THE STUDY OF THE EFFECTS OF SPACE ON LIVING ANIMALS

To determine the capability of animals to exist in extraterrestrial environments and the means of providing such capabilities.

1. To evaluate the effects of extraterrestrial environments.
2. To determine biologic requirements for animals to exist in such environments.
 - a. Physiologic requirements
 - b. Psychologic requirements
3. To select and design required experiments
 - a. Physiological
 - b. Psychological
4. To conduct above experiments in extraterrestrial environments.
 - a. Simulated environments (earth bound)
 - b. Extra-atmospheric balloon systems
 - c. Satellite systems
 - d. Space probe systems
 - e. Space laboratories
 - f. Lunar and planetary environments

III OBJECTIVES FOR THE STUDY OF EXTRATERRESTRIAL LIFE

1. To conduct experiments with biological material under simulated extraterrestrial conditions.
2. Determination of observations and measurements to be made on extraterrestrial samples.
3. To develop instruments for the remote analysis and identification of organic compounds and life forms with methods for relay of information.
4. To develop techniques for obtaining and recovering sample and returning it in a "natural" and viable state.
5. To design and fabricate instruments and agents for laboratory study of samples.
6. To train laboratory crews for study of returned extraterrestrial samples.
7. To conduct laboratory investigations of origins of life -- primordial molecules.