FINAL REPORT

NASw-3165

APRIL 17, 1978 - JUNE 30, 1988

THE GEORGE WASHINGTON UNIVERSITY
OFFICE OF SPONSORED RESEARCH
2121 EYE STREET, N.W.
WASHINGTON, DC 20052

FINAL REPORT

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From 1978 to 1988, the Science Communication Studies unit of The George Washington University provided data base, bibliographic, literature research, editorial, and related services in the space life sciences to the Life Sciences Division of the National Aeronautics and Space Administration under contract NASw-3165. A total of fifty-seven publications were produced directly as a result of the contractual effort. A list of these publications and a copy of the title page of each publication is attached. Editorial, production or other types of support were supplied as well for numerous other publications not produced directly by GWU; a representative sample list and the title page of these publications is attached also.

The activities performed under this contract can be categorized into two broad areas, data base development and research and editorial support.

Data Base

A significant part of the contractual effort was the creation in 1981 and subsequent expansion of the Life Sciences Bibliographic Data Base. The purpose of this project was to develop a systematic, professional system to collect, organize, and disseminate information about the scientific publications resulting from research supported by NASA Life Sciences. The data base consists of bibliographic information and hard copies of all research papers published by Life Sciences-supported investigators. Bibliographic and Principal Investigator (PI) information is entered and stored in a computer data base; the data can then be manipulated and extracted for assorted scientific and programmatic uses. Approximately 8000 citations were entered during the contract period. The scope of coverage was expanded in 1987 to include Life Sciences Flight Program investigators.

Technical improvements were instituted in the data base. It was initiated in 1981 on a VAX computer at Johnson Space Center and accessed over long distance telephone lines. To minimize costs, take advantage of advances in personal computer technology, and achieve maximum flexibility and control, the data base was transferred from the JSC computer to personal computers at

GWU in 1987. Another development was the institution of automated computer searching for PI citations in 1987. Personal computers were used extensively during the last 2 years of the contract period for GWU's research and editorial activities.

Research and Editorial Support

In conjunction with the data base activities, GWU carried out an extensive range of bibliographic, literature research, and other support activities, whose common theme is possession and utilization of a knowledge of the literature of the space life sciences subject areas. This resulted in the publications enumerated in the attached list. Highlights of these efforts include:

(a) 23 bibliographies, which encompass all Life Sciences-supported research publications published since 1981;
(b) an annual series of bibliographies spanning 10 years on the subject of chemical evolution and the origin of life;
(c) two major review articles of spaceflight plant research;
(d) a compendium volume of all biological and medical experiments conducted on the Space Shuttle;
(e) an in-depth study of closed ecological systems' nutritional and food production requirements, utilizing a mathematical modeling technique;
(f) a series of scientific papers on spaceflight biomedical research;
(g) newsletters that fostered the dissemination of scientific information and information about NASA's activities to the public; and
(h) a number of special bibliographies, conference proceedings, and assorted other publications.

GWU also performed a range of related activities such as conducting in-depth searches on a variety of subjects, retrieving scientific literature, preparing presentations, summarizing investigators' research progress, answering correspondence requiring reference support, and providing writing and editorial support.

A related activity consisted of conference support for the XII US/USSR Joint Working Group on Space Biology and Medicine held in Washington, D.C. from November 8-22, 1981. Soviet and U.S. scientists met and presented their research results at this conference.

LIST OF PUBLICATIONS
GEORGE WASHINGTON UNIVERSITY
SCIENCE COMMUNICATION STUDIES
NASw-3165
1978-1988

SPACE/GRAVITATIONAL BIOLOGY

1) **A Compendium of Hypokinetic and Hypodynamic Animal Studies**. Pleasant, L.G. and Axelrod, P.T. NASA, Washington, D.C., 729 p., 1981. (NASA CR-3485)

2) **ASGSB Bulletin**, Volume 1, 1988.

3) **ASGSB Newsletter**, Newsletter of the American Society for Gravitational and Space Biology (3 issues per year). Halstead, T.W. (Ed.); Dutcher, F.R., Leonard, J.I., Powers, J.V., and Russell, P. (Assoc. Eds.). 1985 - 1988. (Forerunner was **Space Biology Newsletter**, Issue No.1,2, 1984).

4) **Biological and Medical Experiments on the Space Shuttle 1981-1985**. Halstead, T.W. and Dufour, P.A. NASA, Washington, D.C., 184 p., 1986.

5) **Experiments on Plants Grown in Space: Status and Prospects**. Halstead, T.W. and Dutcher, F.R. *Annals of Botany 54(Suppl. 3): 3-18, 1984.*

6) **NASA Space Biology Program: Annual Symposium.** Abstracts of a Program Review held at Harpers Ferry, West Virginia, November 6-9, 1984. NASA, Washington, D.C., 138 p., 1985. (NASA CP-2336)

7) **NASA Space Biology Program: Annual Symposium, Program and Abstracts.** Program and Abstracts of the Annual Symposium held in Arlington, VA, October 12-14, 1983. Halstead, T.W. (Ed.). NASA, Washington, D.C., 121 p., 1984. (NASA CP-2299)

8) **Plants in Space**. Halstead, T.W. and Dutcher, F.R. *Annual Review of Plant Physiology 38: 317-345, 1987.*

9) **Publications of the NASA Space Biology Program for 1980-1984**. Pleasant, L.G. and Solberg, J.L. NASA, Washington, D.C., 103 p., 1984. (NASA TM-86857)

10) **1986-87 NASA Space/Gravitational Biology Accomplishments**. Halstead, T.W. (Ed.). NASA, Washington, D.C., 219 p., 1987. (NASA TM-89951)

11) **1985-86 NASA Space/Gravitational Biology Accomplishments**. National Aeronautics and Space Administration and George Washington University. NASA, Washington, D.C., 184 p., 1987. (NASA TM-89809)

12) **1984-85 NASA Space/Gravitational Biology Accomplishments**. Halstead, T.W., Dutcher, F.R. and Pleasant, L.G. NASA, Washington, D.C., 144 p., 1985. (NASA TM-88379)

13) **1983-84 NASA Space Biology Accomplishments.** Halstead, T.W.; Dutcher, F.R. and Pleasant, L.G. NASA, Washington, D.C., 121 p., 1984. (NASA TM-86654)

14) **1982 NASA Space Biology Accomplishments**. Halstead, T.W. and Pleasant, L.G. NASA, Washington, D.C., 119 p., 1983. (NASA TM-86244)

EXOBIOLOGY

15) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1985**. Wade, R.C. and Ponnamperuma, C. In press

16) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1984**. Wade, R.C., Powers, J.V., and Ponnamperuma, C. *Origins of Life 17: 185-206, 1987.*

17) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1983**. Pleasant, L.G., Wade, R.C., and Ponnamperuma, C. *Origins of Life 17: 171-184, 1987.*

18) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1982**. Pleasant, L.G. and Ponnamperuma, C. *Origins of Life 15: 55-69, 1984.*

19) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1981**. Pleasant, L.G. and Ponnamperuma, C. *Origins of Life 13: 61-80, 1983.*

20) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1980**. Pleasant, L.G. and Ponnamperuma, C. *Origins of Life 12: 93-118, 1982.*

21) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1979**. Pleasant, L.G. and Ponnamperuma, C. *Origins of Life 11: 273-288, 1981.*

22) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1978**. Pleasant, L.G. and Ponnamperuma, C. *Origins of Life: 10: 379-404, 1980.*

23) **Chemical Evolution and the Origin of Life: Bibliography Supplement 1977**. Pleasant, L.G. and Ponnamperuma, C. *Origins of Life 10: 69-87, 1980.*

24) **Comets and the Origin of Life: Bibliography.** Pleasant, L.G. In: *Comets and the Origin of Life* (Ponnamperuma, C., Ed.). D. Reidel, Dordrecht, Holland, p. 255-268, 1981.

25) **First Symposium on Chemical Evolution and the Origin and Evolution of Life, NASA Ames Research Center, August 2-4, 1982**. DeVincenzi, D.L. and Pleasant, L.G. (Eds.). NASA, Washington, D.C., 120 p., 1983. (NASA CP-2276)

26) **ISSOL Newsletter**, Newsletter of the International Society for the Study of the Origin of Life (3 issues per year). DeVincenzi, D.L. (Ed.); Pleasant, L.G.(1981-85) and Dutcher, F.R. (1985-86) (Assoc. Eds.)

27) **Publications of the Exobiology Program for 1986: A Special Bibliography**. George Washington University and National Aeronautics and Space Administration. NASA, Washington, D.C., 68 p., 1988. (NASA TM-4029)

28) **Publications of the Exobiology Program for 1985: A Special Bibliography**. George Washington University and National Aeronautics and Space Administration. NASA, Washington, D.C., 83 p., 1987. (NASA TM-89605)

29) **Publications of the Exobiology Program for 1984: A Special Bibliography**. Wallace, J.S. and DeVincenzi, D.L. NASA, Washington, D.C., 41 p., 1986. (NASA TM-88382)

30) **Publications of the Exobiology Program for 1983: A Special Bibliography**. Pleasant, L.G. and DeVincenzi, D.L. NASA, Washington, D.C., 35 p., 1984. (NASA TM-86653)

31) **Publications of the Exobiology Program for 1982: A Special Bibliography**. Pleasant, L.G. and DeVincenzi, D.L. NASA, Washington, D.C., 35 p., 1983. (NASA TM-85837)

32) **Publications of the Exobiology Program for 1981: A Special Bibliography**. Pleasant, L.G. and DeVincenzi, D.L. NASA, Washington, D.C., 29 p., 1982. (NASA TM-84895)

33) **Publications of the Exobiology Program for 1980: A Special Bibliography**. Pleasant, L.G. and DeVincenzi, D.L. NASA, Washington, D.C., 32 p., 1981. (NASA TM-83308)

34) **Publications of the Exobiology Program for 1979: A Special Bibliography.** Pleasant, L.G. and DeVincenzi, D.L. NASA, Washington, D.C., 30 p., 1980. (NASA TM-82182)

35) **Publications of the Planetary Biology Program for 1978: A Special Bibliography.** Pleasant, L.G. and Young, R.S. NASA, Washington, D.C., 34 p., 1979. (NASA TM-80745)

36) **Publications of the Planetary Biology Program for 1977: A Special Bibliography.** Pleasant, L.G. and Young, R.S. NASA, Washington, D.C., 33 p., 1979. (NASA TM-80338)

37) **Second Symposium on Chemical Evolution and the Origin and Evolution of Life, NASA Ames Research Center, July 23-26, 1985.** DeVincenzi, D.L. and Dufour, P.A. (Eds.). NASA, Washington, D.C., 134 p., 1986. (NASA CP-2425)

38) **The Voyager Mission and the Origin of Life: Selected References.** Pleasant, L.G. *Origins of Life 12: 321-329, 1982.*

CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS

39) **Bibliography of Carbohydrate Synthesis. Selected Works 1861-1981.** Dufour, P.A. NASA, Washington, D.C., 1981. (NASA CR-168553)

40) **Bioregenerative Life Support Systems Publications of the USSR.** Wade, R.C.(Ed.) 1988.

41) **Insects: A Nutritional Alternative.** Dufour, P.A. NASA, Washington, D.C., 64 p., 1981. (NASA CR-169056)

42) **Nutritional Models for a Controlled Ecological Life Support System (CELSS): Linear Mathematical Modeling.** Wade, R.C. In press (NASA publication).

43) **Nutritional Models for Space Travel from Chemically Defined Diets.** Dufour, P.A. NASA, Washington, D.C., 139 p., 1984. (NASA CR-3850)

44) **Publications of the NASA CELSS (Controlled Ecological Life Support Systems) Program.** Dufour, P.A., Solberg, J.L., and Wallace, J.S. NASA, Washington, D.C., 32 p., 1985. (NASA CR-3911)

45) **Publications of the Controlled Ecological Life Support Systems (CELSS) Program 1984-1986.** George Washington University. NASA, Washington, D.C., 26 p., 1987. (NASA CR-4070)

BIOSPHERICS

46) **First Symposium on Biospheric Research, Abstracts of a Program Review held at the NASA Ames Research Center, Moffett Field, CA, March 13-14, 1985.** Pleasant, L.G. (Ed.) George Washington University, Washington, D.C., 1985.

47) **Publications of the NASA Biospheric Research Program 1981-1987.** Bibliography in preparation.

BIOMEDICINE

48) **Biomedical Research Publications: 1980-1982.** Pleasant, L. and Limbach, L. NASA, Washington, D.C., 44 p., 1982. (NASA CR-3587)

49) **Biomedical Research Publications: 1982-1983.** Bolcik, C. and Pleasant, L.G. NASA, Washington, D.C., 52 p., 1983. (NASA CR-3739)

50) **Consideration for Solar System Exploration: A System to Mars.** Nicogossian, A.E. and Garshnek, V. Presented to Nihon University, Japan, November 1987. (Proceedings in press)

51) **Historical Perspectives.** Nicogossian, A.E. and Garshnek, V. In: *Space Physiology and Medicine*, 2nd Edition (ed. by A.E. Nicogossian, C.L. Huntoon, and S.L. Pool). Lea and Febiger, in press.

52) **Human Capabilities in Space Exploration and Utilization.** Garshnek, V. and Brown, J. In: *Space Physiology and Medicine*, 2nd Edition (ed. by A.E. Nicogossian, C.L. Huntoon, and S.L. Pool). Lea and Febiger, in press.

53) **Preparing Cosmonauts for Space Flight: Simulation Facilities of the Soviet Space Program.** Garshnek, V. and Overmeyer, R. Proceedings of the Society of Automotive Engineers, Aerotech Conference, Long Beach, California, October 1987. (Accepted for publication).

54) **Soviet Space Flight: The Human Element.** Garshnek, V. *ASGSB Bulletin* 1: 67-80, 1988.

55) **Space Medicine Research Publications: 1984-1986.** Wallace, J.S. NASA, Washington, D.C. In press (NASA Contractor Report).

56) **Space Medicine Research Publications: 1983-1984.** Solberg, J.L. and Pleasant, L.G. NASA, Washington, D.C., 69 p., 1984. (NASA CR-3860)

57) **Space Vehicles for Manned Programs.** Nicogossian, A.E., Parker, J.F., and Garshnek, V. In: *Space Physiology and Medicine*, 2nd Edition (ed. by A.E. Nicogossian, C.L. Huntoon, and S.L. Pool). Lea and Febiger, in press.

LIFE SCIENCES PUBLICATIONS WITH EDITORIAL/PRODUCTION INPUT OR ASSISTANCE PROVIDED BY GWU

A) **The Global Sulfur Cycle.** Sagan, D. (Ed.). NASA, Washington, D.C., 306 p., 1985. (NASA TM-87570)

B) **The Internship Experience. Planetary Biology Internship Program 1980-1986.** Sagan, D., McKhann, H., Dolan, M., and Margulis, L. NASA, Washington, D.C., 182 p., 1986.

C) **Life Sciences Accomplishments.** NASA, Washington, D.C., 85 p., 1985. (NASA TM-88177)

D) **Life Sciences Accomplishments.** NASA, Washington, D.C., 60 p., 1986.

E) **Life Sciences Report 1987.** NASA, Washington, D.C, 84 p., 1987.

F) **Plant Gravitational and Space Research. Report of a Workshop held April 30-May 2, 1984 in Rosslyn, Virginia.** Halstead, T.W. and Scott, T.K. (Eds.). Workshop Summary III. American Society of Plant Physiologists, Baltimore, MD, 48 p., 1984.

G) **The Regulatory Functions of Calcium and the Potential Role of Calcium in Mediating Gravitational Responses in Cells and Tissues.** Proceedings of a Workshop held at Federation of American Societies for Experimental Biology, Bethesda, MD, September 16-18, 1982. Roux, S.J. (Ed.). NASA, Washington, D.C., 298 p., 1983. (NASA CP-2286)

H) **Space Life Sciences Symposium: Three Decades of Life Science Research in Space, Abstracts of a Symposium held in Washington, D.C., June 21-26, 1987.** Universities Space Research Association and Lunar and Planetary Institute, Houston, TX, 402 p. 1987.

I) **Space Physiology and Medicine, 2nd Edition.** Nicogossian, A.E., Huntoon, C.L., and Pool, S.L. (Eds.) Lea and Febiger, in press.

J) **USSR Space Life Sciences Digest**. Hooke, L.R., Teeter, R., Garshnek, V., and Rowe, J. (Eds.). Issues 1- . NASA, Washington, D.C. 1985-present. (NASA CR-3922[01-])

NASA Contractor Report 3485

A Compendium of Hypokinetic and Hypodynamic Animal Studies

Linda G. Pleasant and Phyllis T. Axelrod
The George Washington University
Washington, D. C.

Prepared for
National Aeronautics and Space Administration
under Contract NASw-3165

National Aeronautics
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CONTENTS

SPACE BIOLOGY

No. 1

March 1984

Newsletter of the Space Biology Program, NASA Headquarters, Washington, D.C.

THE EDITOR SPEAKS

This is the first issue of the SPACE BIOLOGY NEWSLETTER which we will publish three to four times yearly. The purpose of the Newsletter is to disseminate information relevant to the Space Biology Program. It is hoped this Newsletter will encourage scientific interest and activity in space and gravitational biology research by sharing information among scientists on such matters as: reports on recent and upcoming meetings, reviews of publications, significant research findings, education news, news release articles, etc.

Your help will be essential in making this Newsletter successful as a device for communicating current information about activities relevant to the Space Biology Program. You are invited to submit items at any time. Please send all entries to the Editor.

Thora W. Halstead
Editor

TRAVEL GRANTS

The Sixth Meeting of the Commission on Gravitational Physiology of the International Union of Physiological Sciences (IUPS) will be held in Lausanne, Switzerland in September 1984. The annual Proceedings of these meetings are published as supplements to The Physiologist, The American Physiological Society (APS) membership journal. This year's meeting will emphasize accomplishments in plant gravitational research.

In order to assure representation of U.S. scientists at the 1984 meeting, the APS has arranged to provide travel grants to 20 U.S. participants. All applicants will be required to submit abstracts of the paper they plan to deliver at the meeting. Applications will be reviewed by a selection committee chaired by the Executive Secretary-Treasurer of APS (Dr. Orr E. Reynolds). All those interested are encouraged to contact Dr. Orr E. Reynolds, The American Physiological Society, 9650 Rockville Pike, Bethesda, Maryland 20814.

FLIGHT NEWS

COSMOS 1514

The U.S.S.R. Cosmos 1514 biosatellite flight flown December 14-20, 1983 carried 2 rhesus monkeys, 18 rats, fish and plants. U.S. investigators including Richard Keefe, Jeffrey Alberts, Christopher Cann, and Frank Sulzman were involved in experiments or measurements on the 2 monkeys and the pups born to 10 flight rats impregnated prior to flight. U.S. experiments are expected to provide data on cardiovascular system changes due to weightlessness, synchronization of the circadian timekeeping system in space, bone calcium metabolism alterations during weightlessness, and fetal and post-natal development of rats exposed to spaceflight. A number of other experiments were conducted by the Soviets either independently or in cooperation with scientists from Bulgaria, Hungary, the GDR, Poland, Romania, Czechoslovakia and France. We have received flight data and biological materials from the experiments in which we were involved. Our scientists were able to personally make some postflight measurements on the animals in the Soviet Union. In addition, the Soviets have provided some general medical information about the monkeys.

STS-8 Flight

Six rats were flown on each of two shuttle flights, STS-8 and STS-41B, as a student experiment to assess the effects of weightlessness on arthritis. The experiment demonstrated that the Animal Enclosure Module (AEM) could adequately support rats in flight. Activities are now underway to increase the air flow and flight qualify the water bottle developed for this system. The original AEM used potatoes as a water source, and during STS-8 the rats consumed about 250 g/day of potatoes making an experimental period longer than 8.5 days almost impossible. Additional information about the AEM and the student experiment can be obtained from Dr. Emily Morey-Holton (FTS 448-5471 or 415-965-5471).

SPACE BIOLOGY

No. 2

November 1984

Newsletter of the Space Biology Program, NASA Headquarters, Washington, D.C.

RESEARCH NEWS

Muriel Ross of the University of Michigan presented a paper at the American Medical Association Meeting in San Diego in May 1984 on significant new findings concerning the complexity of innervative patterns in rat gravity receptors. Ultrastructural results indicate that the two kinds of receptor cells in the maculas are integrated functionally through shared afferents and that there exists a system of efferent type nerve fibers and terminals of intramacular (mostly calyces) origin. Additionally, there is a plexus-like arrangement of afferent and efferent-type terminals at many sites in both maculas. On the basis of her finding, Dr. Ross suggested that sensory processing of information concerning linear acceleration begins peripherally. The finding of an intramacularly originating system of efferents may provide anatomical evidence for lateral inhibition in the macula, to improve signal to noise, and for peripheral adaptation to constant acceleration. Because of the complexity of the neural patterns both on the afferent and the efferent neural side, Dr. Ross hypothesized that naturally occurring asymmetry in macular neural organization may be common, and that variability in degree of asymmetry may provide a peripheral contribution to the expression of space adaptation syndrome in the novel environment of microgravity. The results provide an anatomical basis for complex sensory processing in the maculas, and suggest that macular asymmetry may be common.

EDITOR'S NOTE

HELP! WE NEED YOUR NEWS

What can you contribute to the following categories: research notes, meeting announcements, book announcements/reviews, conference summaries, editorials, awards/honors, etc. All submissions should be sent to: F. Ronald Dutcher (the Associate Editor), Science Communication Studies, George Washington University, 2000 L Street, #301, Washington, D.C. 20036.

AWARD

Dr. Emily Morey-Holton of the Ames Research Center and an investigator in the Space Biology Program has been designated a 1984 Ames Associate Fellow. The designation of Ames Associate Fellows and Ames Fellows was instituted last year in recognition of distinguished scientific research or outstanding engineering by exceptionally talented staff. Associate Fellow designation is for a 2-year term and carries a personal honorarium, a research grant, and a travel grant, over and above the funding provided to the researcher from programmatic sources.

Dr. Morey-Holton came to Ames in 1974 to resume research on her major interests--bone and calcium homeostasis. In 1975, 1977, and 1979, she participated in the Cosmos biological satellite missions, studying the influence of gravity on bone formation in growing rats. Data from these missions form the main basis of our current understanding of the effect of spaceflight on bone and calcium homeostasis. Dr. Morey-Holton is the principal investigator of an experiment scheduled to fly on the first dedicated life sciences Shuttle mission; this experiment will investigate the mechanisms of cessation of bone formation and the initial response of bone to spaceflight.

From 1982-84, she was project manager/scientist for a Student Shuttle Involvement Project, which involved development and flight test of a middeck locker module for housing 2-6 rats (see page 3). The successful flight of this hardware on STS-8 and STS 41-B proved that an animal carry-on experiment was possible.

Dr. Morey-Holton intends to use her research funds from the Associate Fellowship to try to establish a unique system of culturing bone cells. The funds will allow her new lab to purchase the necessary equipment to do this project and to determine whether such a technique is feasible.

--from the October 25, 1984 issue of The Astrogram, the official publication of Ames Research Center, Moffett Field, CA.

ASGSB

Vol. 1, No. 1
April 1985

Newsletter of the American Society for Gravitational and Space Biology

LETTER FROM THE PRESIDENT

This is the first newsletter to appear under the egis of the recently established American Society for Gravitational and Space Biology, a not-for-profit, scientific and educational organization with broad aims: to promote research, training, and development of space biology and its applications both on Earth and in space. An important role of the ASGSB should be to provide a forum for communication among scientists and professionals in business and government. It may assist its membership by disseminating information, conducting studies, sponsoring scientific meetings, and serving as an appropriate focus for scientific contributions to considerations of public policy.

The need for a society to unify researchers, students, and practitioners of space biology has been long apparent. A number of older scientific organizations from time to time sought to assist space biologists in areas where national or international coordination of meetings was needed. Those efforts were helpful and were appreciated but it was clear that, in the long run, organizational needs of the US space biology community could not be fully served without the establishment of an independent organization.

The ASGSB is in no sense in competition with any other society; it has the flexibility either to hold its own meetings or to meet with other national or international societies for joint sponsorship of symposia, workshops, and other functions. Thus we begin as an independent society which may expect to cooperate with other scientific organizations to further mutual objectives.

The concept of what has become the ASGSB materialized in October of 1983 at a NASA-sponsored Space Biology Symposium. An Organizing Group was appointed, and at a subsequent Symposium in November of 1984 that Group reported favorably and proposed an organizational format and a Constitution which provides for an elected Board of Directors with representation from academia, business, and government. The Board elects the Society Officers: President, Vice-President, and Secretary-Treasurer, which constitute an Executive Committee to act on behalf of the Board. The Constitution also provides for Sustaining and Affiliate Memberships--business and non-business organizations that foster the purposes of the Society.

The Symposium participants approved the Organizing Group's recommendation without dissent and 89 persons signed up as Charter Members of ASGSB. The Executive Committee members appointed for 1985 are:

President: A.H. Brown
Vice-President and President-Elect: O.E. Reynolds
Secretary-Treasurer: D.R. Beem.

Dr. Thora Halstead has agreed to serve as Editor of the newsletter.

We gratefully acknowledge our debt to several organizations whose contributions of personnel time and of certain facilities have been especially helpful; these are the American Institute of Biological Sciences, the American Physiological Society, and the National Aeronautics and Space Administration.

A mail-in form for applying for membership in ASGSB is located on page 7 of this newsletter. Information on qualification requirements and specific advantages of membership are outlined on page 6.

Allan Brown
President, ASGSB

ASGSB

Vol. 1, No. 2
September 1985

Newsletter of the American Society for Gravitational and Space Biology

SPACEFLIGHT NEWS

The first NASA Life Sciences dedicated mission (SLS-1) has now been manifested to fly in February 1987. NASA hopes to fly at least one Research Animal Holding Facility (RAHF) housing 24 rats and the General Purpose Work Station (GPWS). The engineering costs involved in correcting the problems encountered with the RAHF when it was flown on Spacelab-3 (SL-3) will determine the number of RAHFs that can be flown on SLS-1; this in turn will have an impact on the SLS-1 animal experiments to be flown.

The second dedicated Life Sciences mission is now planned for the summer of 1988.

In the meantime, some experiments have been manifested on other flights. The 7-day Earth Observation Mission (EOM), scheduled to be launched September 3, 1986, will carry three Space Biology and one Medical middeck experiments. The experiments are:

(1) Robert S. Bandurski - Michigan State U.
Effects of microgravity on growth hormone concentration and distribution in plants.

(2) W.C. Hymer - Pennsylvania State U.
(Co-investigators: R. Grendeland - Ames Research Center; P.W. Todd - Pennsylvania State U.; D. Morrison - Johnson Space Center)
Microgravity-induced effects on pituitary growth hormone cell function: a mechanism for muscle atrophy in manned spaceflight?

(3) Frank M. Sulzman - SUNY at Binghamton
Characterization of Neurospora circadian rhythms in space.

(4) Steven R. Bussolari - Massachusetts Institute of Technology
Study of the effects of display orientation and graphic input devices on workload and performance in zero gravity.

On May 5, 1987, the International Microgravity Lab (IML) is scheduled for launch. It will carry the following experiments:

(1) Allan Brown - U. of Pennsylvania
Determine properties of the gravitropic response of plants in the absence of the complicating G force.

(2) David G. Heathcote - University College of South Wales
Post-illumination onset of nutation at zero gravity.

(3) Patricia S. Cowings - Ames Research Center
A preventative method for the zero gravity-sickness syndrome; autogenic feedback training for vestibular symptomatology.

(4) Philip C. Johnson - Baylor Col. of Med.
Countermeasures for reducing postflight orthostatic intolerance.

(5) Millard F. Reschke - Space Biomedical Research Inst., Johnson Space Center
Middeck rotator vestibular function tests.

(6) Carlo V. Bruschi - East Carolina Univ. School of Medicine
Microgravitational effects on chromosome behavior.

Carlo V. Bruschi's experiment is from the Space Biology middeck program, while the other five experiments were submitted in response to the 1978 Life Sciences Announcement of Opportunity.

Spacelab-J is scheduled for launch January 31, 1988. The following experiments, both 1978 AO submissions, are slated for that mission:

(1) Kenneth Souza - Ames Research Center
The effect of weightlessness on the development of amphibious eggs fertilized in space.

(2) Jerrald S. Petrofsky - St. Louis Univ. Medical School
Isometric exercise performance under 0 G conditions.

EDITOR'S NOTE

I strongly urge all ASGSB members attending the Niagara Falls October meeting to come to the ASGSB Business Meeting and Social, scheduled for 5:00-8:00 p.m., Monday, October 14. This is the first official meeting of our new Society and many important decisions will be made that will determine the future course of ASGSB. It is crucial to our success that we begin with an active, well-attended meeting. Enrollment in the Society has been excellent; we now have 150 members. A productive first meeting will help us continue our momentum.

ASGSB

Vol. 2, No. 1
February 1986

Newsletter of the American Society for Gravitational and Space Biology

NEXT ASGSB MEETING

The Second Annual Meeting of ASGSB will be held October 2, 3, and 4 at the University Hilton in Charlottesville, Virginia. Additional information and a call for papers will be given in the next issue of the ASGSB Newsletter in April.

FIRST ANNUAL ASGSB MEETING

MINUTES

The first annual business meeting of the ASGSB was convened by President Brown on October 14th, 1985 in Niagara Falls, New York.

Dr. Brown reported on the deliberations of the ASGSB Board meeting the previous evening. The Board had approved the minutes of the 1984 Board meeting held in Harpers Ferry, West Virginia, and the Secretary-Treasurer's report of the Society's financial position through October 11, 1985: In accordance with the Society By-Laws, Vice-President Orr Reynolds would become President on January 1, 1986 and Thora Halstead, who was newly elected Vice-President, would fill that position on the same day.

A report on the financial position of the Society was presented to the membership by the Secretary-Treasurer. ASGSB funds are deposited in an interest-bearing checking account at the Bank of Virginia, Arlington, Virginia. Funds in the account are:

Balance as of 9-30-85		$2,459.90
Debits		0.00
	Subtotal	$2,459.90
Deposit 10-11-85		78.00
Adjusted balance	10-11-85	$2,537.90

Interest of 5.25% is paid on the average daily balance. Interest to 9-30-85 of $40.27 is included in the above adjusted account balance.

Thora Halstead explained the need for assistance in gathering information for the ASGSB Newsletter and reported that the Board had authorized her to establish a system of associate editor positions. Halstead and the Board favor the concept of regional editors who will organize local and regional members to report newsworthy events. The Board authorized Halstead to establish such a system with associate editors appointed by her with the concurrence of the Board.

The need to appoint several standing committees of the Board was discussed by Brown. These include standing committees for finance, membership, and meetings.

Brown led a discussion on the organization and site of the 1986 ASGSB meeting. Both the Board and membership overwhelmingly concurred that the Society meet alone in 1986. It was suggested that the meeting be held in October for about 3 days. The annual NASA Space Biology Symposium will be integrated into the

--continued on next column

IN MEMORIAM

The ASGSB with the nation and world mourns the loss of Christa McAuliffe, Gregory Jarvis, Ronald McNair, Ellison Onizuka, Judith Resnick, Francis Scobee, and Michael Smith. They were our surrogates in the greatest exploration by mankind, and part of each of us went with them on Shuttle mission 51-L. In this tragic accident, however, they still accomplished a great deal. They unified the country in its dedication to their goal - a strong manned space program.

The NASA news of future events in this newsletter does not reflect the effects the accident will have on mission and activity schedules.

--continued from previous column

meeting and the sessions will be broadened to accommodate all members with papers or posters to present. If the Society should in the future meet in conjunction with another society, the ASGSB meeting will precede or follow the other meeting and will not be integrated into the meeting as occurred this year. (The dates and meeting site have been selected; see above.)

A meeting registration fee will be charged to cover the costs of the meeting program and abstracts and, if financially feasible, a reception and coffee breaks. The amount of the fee will be set by the Executive Committee acting for the Board in advance of the meeting. More information on costs will be developed by Meetings and Finance Committees.

Orr Reynolds reported on his recent visit to the USSR and about discussions held there concerning the formation of an international society on gravitational biology.

The final item of business was the annual election of Board members. Article III (2) of the ASGSB By-Laws states "The terms of the Board members shall be staggered so that approximately one third (1/3) of the positions require re-election each year. A total of twelve (12) positions are involved; therefore four (4) terms will expire each year." Nine candidates were advanced by the Nominating Committee. The following individuals were elected to serve terms of three (3) years: Charles Fuller, Muriel Ross, Stanley Roux and Tom Scott. They will replace outgoing Board members Allan Brown, Richard Keefe, Carl Leopold, and Calvin Ward. Allan Brown will continue to serve on the Board as immediate past President and chairman of the Nominations Committee. The Board and members of the Society offer their congratulations to all new Board members and also their thanks for a job well done to the retiring Board members.

With no further business, President Brown adjourned the meeting.

Donald Beem
Secretary-Treasurer

ASGSB

Vol. 2, No. 2
May 1986

Newsletter of the American Society for Gravitational and Space Biology

LETTER FROM THE PRESIDENT

Dear ASGSB members and potential members:

The 1986 meeting of the American Society for Gravitational and Space Biology will be held in Charlottesville, Virginia on October 1-3, 1986. The site was selected on the basis of excellent facilities, relatively easy accessibility (Charlottesville is located 150 miles southwest of Washington, D.C.), and congenial surroundings.

Charlottesville, the county seat of Albemarle in Central Virginia, is often referred to as "Mr. Jefferson's Country" in recognition of the area's most illustrious citizen. From the earliest days of settlement, Albemarle attracted and nourished men and women who would leave their mark on the pages of history. James Madison, James Monroe and Thomas Jefferson represent a trio of talent and wisdom concentrated in one small geographic area.

This will be the first meeting solely devoted to the Society since its formative meeting and should afford an opportunity for discussion of questions of mutual interest of attendees without distraction. The Society has grown from 89 members in its formative meeting to over 200 members at present. The increased membership gives promise of new perspectives being introduced in discussions as individuals with varying backgrounds look at the same scientific problems. The program is expected to be very full, with inclusion of most topics of current concern in gravitational and space biology.

All pertinent information regarding meeting registration, housing reservations, and submission of abstracts along with a tentative agenda for the meeting are enclosed in this newsletter. I urge you to attend and look forward to seeing you in Charlottesville.

Sincerely,
Orr Reynolds, President
ASGSB

SIGN UP!

There is still time to register for the FASEB Summer Conference, "Responses to Gravity and Space Weightlessness." The conference will be held from July 27 to August 1, 1986 at Copper Mountain Resort in Copper Mountain, Colorado.

Conference information and the agenda were outlined in the previous issue of this newsletter. The conference fee of $300.00 covers registration, room, and meals for the entire conference. It promises to be a stimulating and enjoyable time.

For additional information, a complete program, and an application form, write or call Marilyn Marsh, FASEB Summer Conferences, 9650 Rockville Pike, Bethesda, MD 20814, (301) 530-7093.

ASGSB

Vol. 3, No. 1
March 1987

Newsletter of the American Society for Gravitational and Space Biology

Dear ASGSB Members:

The U.S. Space Program has had a turbulent year, buffeted by the wake of the Challenger accident. Future flight missions and programs and, ultimately, research opportunities are unclear.

I believe this challenging environment is also one of opportunity, for the hiatus in flights has given us time to reexamine what has been found and learned -- and to see more clearly where we are and what needs to be done. New life can be breathed into space biological and medical research if parochial interests are put aside and we work together to achieve a common goal -- recognition of space biological and gravitational research for excellence and achievements. This means not only doing a good job, but also gaining awareness of our accomplishments by the scientific, political and lay communities.

It is obvious that space research requires space flight. It is outrageous that after a quarter century of space flight, we have flown so few experiments and know so little of the effects on living organisms.

The United States can point with pride to its accomplishments in solar and planetary exploration and advancement of knowledge in astrophysics. But these achievements came from missions in programs that have continuous access to space. NASA's Astrophysics Division routinely launches Explorers to collect data while planning to launch the huge Hubble space telescope. In the meantime, Planetary Sciences has a bevy of planetary probes waiting in the wings. There is Galileo to probe Jupiter, Ulysses for solar polar, Venus radar mapping by Magellan, and a Mars observer. Is there any wonder that they excel?

The physical scientists obviously recognize the importance of the use of more than one launch vehicle as well as dedicated spacecraft. Can we afford to do less? Biosatellites, the Shuttle, and a Space Station are all necessary to get the flights we need to be viable, let alone excel. They are not and should not be competitive.

We know what we need, and it is space flight and research support. The real question is how do we get it. The answer is awareness. As Society members you can play a major role in enlightening your scientific colleagues, political representatives, and the public at large. ASGSB has established committees to help coordinate an effort to spread the word. Our work is cut out for us -- we are on the threshold of a new future. Let's take that step together and make it happen.

Sincerely,
Thora Halstead
President

UTAH STATE IS SITE FOR 1987 ASGSB ANNUAL MEETING

The Third Annual Meeting of the ASGSB will be held on October 19-21, 1987 in the Conference Center of Utah State University in Logan, Utah. Local arrangements are being completed by Frank Salisbury, Chairman of the ASGSB Meetings Committee. Highlight the dates on your calendar and plan to attend! Additional information and a call for papers will be provided in the next Newsletter.

ASGSB

Vol. 3, No. 2
June 1987

Newsletter of the American Society for Gravitational and Space Biology

Dear ASGSB members and potential members:

It is my pleasure to serve as your chairman and host of the 1987 Annual Meeting of the American Society for Gravitational and Space Biology to be held at Utah State University (USU) in Logan, Utah on October 19-21, 1987. Logan is located 83 miles north of Salt Lake City near the Utah-Idaho border in the scenic Cache Valley and is surrounded by the majestic Wasatch Range of the Rocky Mountains. The Eccles Conference Center and the University Inn on campus will provide convenient and comfortable facilities to enhance scientific exchange for our members and other meeting participants. The enthusiasm generated by our previous annual meeting in Charlottesville, Virginia will be reflected in our program with your support and involvement.

As Utah State University begins the Centennial celebration of its founding in 1888, it is surely appropriate to look towards the future; our Society represents an important element of that future. We can expand and strengthen our foundation by convening in Logan in October.

Sincerely,
Frank Salisbury
ASGSB Meeting Chairman

Dear Colleagues:

You are cordially invited to participate in the Third Annual Meeting of the ASGSB to be held in Logan, Utah, October 18-21, 1987. The program will cover the topics listed in the "Call For Papers" instructions dealing with the effects of gravity, spaceflight and simulated weightlessness on the physiological systems of plants and animals, including humans. It has been arranged to provide paper and poster sessions, panel discussions, and time to get together with old and new friends to discuss your favorite gravitational and space biology topic. An afternoon has also been set aside to enjoy the country and talk.

This year is filled with increased international interest and activities in life science space research, and the time is right for all of us to get together and bring attention, recognition, and support to space biological research. Therefore, our meeting this year will focus on international communication, coordination, and cooperation. Information about research and flight programs supported by other countries and activities of other societies will be presented in special sessions.

Your participation in the ASGSB meeting is welcomed and encouraged, and I look forward to seeing you in Logan.

Sincerely,
Thora W. Halstead, President
ASGSB

ASGSB

Newsletter of the American Society for Gravitational and Space Biology

Volume 4, Number 1
June 1988

1988 ANNUAL MEETING ISSUE

CALL FOR PAPERS

ABSTRACT FORMS

REGISTRATION

HOTEL RESERVATIONS

OCTOBER 20-23 WASHINGTON, D.C.

DETAILS INSIDE

A WORD FROM THE PRESIDENT: A CALL FOR INPUT

It would border on the platitudinous if I were to state that now more than ever gravitational and space biologists are faced with the need to come up with considered responses to the challenges and opportunities facing us. Those few who have made attempts to put forward a unified front have encountered enormous stumbling blocks. An incredible diversity of interests and perhaps too narrowly focused objectives have prevented amalgamation of basic and applied life scientists into a group with an overall coherent and recognizable "game plan."

(Continued on page 2)

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BIOLOGICAL AND MEDICAL EXPERIMENTS ON THE SPACE SHUTTLE 1981 - 1985

Edited by

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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1986

LIFE SCIENCES DIVISION
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Annals of Botany 54, 1984. *Supplement* 3, 3–18

Status and Prospects

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Accepted: 25 April 1984

ABSTRACT

Space flight provides a unique capability to gravitational research by providing an environment in which gravity can be manipulated below the Earth norm of 1 to a state comparable to weightlessness. Although space experiments with seeds and plants have been conducted for almost 25 years, we are only now entering an era that promises the capability of routinely conducting controlled plant experiments in space. Results from experiments with higher plants and seeds flown thus far in both manned and unmanned spacecraft from both the USA and USSR are briefly summarized. An overview of the current status of space biology experimentation as it relates to plants is presented and present and future opportunities to conduct plant experiments under space flight conditions are discussed.

Key words: Gravity, microgravity, gravitational plant physiology, space biology, space flight, Space Shuttle, biosatellite, Cosmos, Salyut.

INTRODUCTION

Biologists have been interested for many years in the responses of plants and animals to the gravitational component of the Earth's environment. Serious research has been limited, however, by the relatively few means available to manipulate gravity experimentally. The advent of space flight in the late 1950s produced a new research capability to modify the intensity of gravity below the Earth norm of 1 and approach a state comparable to weightlessness. Experiments utilizing seeds and plants have been flown in space for almost 25 years, but investigations have been limited both by infrequency of flights and undesirable experimental conditions in spacecraft. We are now on the threshold of a new era that promises the capability of routinely conducting controlled plant experiments in space. It is especially appropriate, therefore, that the results of current as well as earlier space experiments be readily accessible. This is all the more important as one increasingly prepares for future space experimentation.

Observations on plants and seeds flown thus far in both manned and unmanned spacecraft from both the USA and USSR have been modestly informative, and they provide a frame of reference and can serve as a point of departure for more sophisticated experimentation. A wide range of lower and higher plant species, ranging from algae, fungi, mosses to ferns, gymnosperms, and angiosperms, have been tested from one perspective or another. In this first paper, results from experiments focusing on gravitational problems using higher plants are briefly summarized. The subsequent four papers that are published here in sequence may seem at first glance to have little in common; they are linked, however, by a methodology which has just begun to be exploited for purposes of botanical research — the use of a microgravity environment

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NASA Conference Publication 2336

NASA Space Biology Program

Annual Symposium

Thora W. Halstead, *Chairman*
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Washington, D.C.

Abstracts of a program review held at
Harpers Ferry, West Virginia
November 6–9, 1984

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National Aeronautics
and Space Administration

Scientific and Technical
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NASA Conference Publication 2299

NASA Space Biology Program

Annual Symposium

Program and Abstracts

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October 12-14, 1983

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PLANTS IN SPACE

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NASA Technical Memorandum 89951

1986-87 NASA Space/Gravitational Biology Accomplishments

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NASA Office of Space Science and Applications
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1984-85 NASA Space/Gravitational Biology Accomplishments

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CHEMICAL EVOLUTION AND THE ORIGIN OF LIFE

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INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

President's Address: Third ISSOL Meeting*

Distinguished guests, ladies and gentlemen,

As President of the International Society for the Study of the Origin of Life, it is my great privilege to welcome you to the Sixth International Conference on the Origin of Life and the Third International Meeting of the Society for the Study of the Origin of Life.

Many of you have come from far and wide to gather here today in the city of Jerusalem, which is a hallowed location to peoples of many generations and diverse persuasions. It is perhaps most appropriate that our Society meets in a place that is steeped in tradition. Indeed there is almost an unwritten custom in our society that we meet in places that have long been associated with history, culture, and a tradition. Our previous meeting places have been Moscow, Paris, Barcelona, and Kyoto, and today we are here in a location that is a cradle of Judaic, Christian, and Islamic civilization.

Our Society, from its very simple beginnings, indeed no more than a gleam in the eye of a few of our enthusiastic members, has now grown into an interdisciplinary organization that embraces practically every continent of the world. It was in Cortina d'Ampezzo, during the 1967 meeting of the Radiation Research Society, that an International Symposium on the Origin of Life was held. At that time, in a hotel room overlooking the Dolomites, Alexander Ivanovich Oparin and his wife sat with a few of our members — Sidney Fox, Cyril Ponnamperuma, and others — and discussed the possibility of gathering together those who were scattered around in different disciplines under one banner — the International Society for the Study of the Origin of Life.

*Opening Address of Fujio Egami, President of ISSOL, at the Sixth International Conference on the Origin of Life and Third International Meeting of ISSOL, Jerusalem, Israel, June 23-27, 1980.

At the subsequent international meeting, which was held at Pont-a-Mousson and was organized by Buvet and Ponnamperuma, the idea of inaugurating a society was enthusiastically acclaimed by those present. Thus the Society was born. Today we are at a point in our development where we are able, under this one banner, to bring together astronomers, geologists, chemists, and biologists — a vast interdisciplinary array of investigators — whose sole aim is to understand how life began on this Earth.

No other problem in the history of human endeavor has attracted such wide attention. No other problem has beckoned to its solution such vast and varied intellectual resources from different individuals, from different countries, from different disciplines, and from different approaches.

This is perhaps, the great strength of our Society. At our meetings we are not constrained by the limitations of a particular subject, but rather we have a problem to be solved, and we try to bring a number of methods to the process of finding a solution.

Our endeavors, using any tool that is available, from the studies in the laboratories to the fieldwork at the poles of the Earth, have moved into deep space where the exploration of the planets and the search for extraterrestrial intelligence are all involved in this grand effort.

I am pleased to say that our Society is progressing. We are still a small group when we compare ourselves with other societies and organizations around the world, but our intensity makes up for what is lacking in our size.

This gathering here today is testament to the development of our Society. However, from this note of joy, satisfaction, hope, and pleasure in being able to convene this meeting, I must now turn to a matter of great sadness. Alexander Ivanovich Oparin, the previous president of this Society, whom I might truly describe as the founder of the study of chemical evolution, passed away on April 21st of this year. It is ironic that his death happened so close to this meeting because we had expected to have him here with us to celebrate the awarding of the first Oparin Medal, which will take place at the banquet on Thursday evening.

It was Alexander Ivanovich Oparin who in 1924, in a preliminary study published in Russian, put forward the whole concept of chemical evolution in scientifically defensible terms. Perhaps the entire modern development of this subject may be traced to that single publication. It was from his writings that the early students of the subject matter gained inspiration and knowledge and the basis for their experiments.

It was Oparin's great genius that in the early stages of his thinking he considered how carbon in the atmosphere had to be reduced to some form in order to be of use in the amino acids and the carbohydrates necessary for living organisms. An idea struck him that organic matter had to be produced under nonoxygenic conditions. By his own admission, a discussion of a Mendelevian idea on the carbides in the crust of the Earth led him to believe that carbon may have been in the reduced form. It is to Oparin's credit that long before astronomers established the reducing nature of the universe, when they discovered that the entire universe was 90% hydrogen, he had already postulated the important role for reduced gases.

He continued in this field of study from 1924 and was Director of the Bakh Institute of Biochemistry until the very day of his death. Many of us were privileged to know him personally as a friend and colleague. Some of us were present in 1974 when we celebrated his 80th birthday and the 50th anniversary of the publication of his book.

Oparin was a warm individual. He appreciated science in all of its forms, and

(continued on pg. 2)

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INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

In Memoriam

HAROLD CLAYTON UREY 1893-1981

On January 5th, 1981, died Harold Urey, a legend in his lifetime. Few men of science have had the impact Urey has had on science, ranging from the study of the origin of life to the exploration of the universe.

Harold Urey was born in Walkerton, Indiana, on April 23rd, 1893. His father, Samuel Clayton, a teacher and minister, died when Harold was only six years old. When his mother, Cora Urey, remarried, Harold took her maiden name and was known as Harold Clayton Urey. In 1926, he married Frieda Dawn; they had four children, Gertrude, Frieda, Mary Alice, and John.

Harold Urey's early education was in the rural schools of Indiana; he became a school teacher, but his restless craving for knowledge propelled him on to a college education at Montana State University where he studied biology. Although later in life his greatest efforts and contributions were in the physical sciences, he recalled with some degree of nostalgia his first independent research project in which he studied the protozoa in the Missoula River. After graduating from Montana State University and a brief stint at a war materials plant in Philadelphia, he returned to Montana, this time as a university teacher.

In 1921, Urey headed for Berkeley where G.N. Lewis was laying the foundations of Berkeley's great preeminence in chemistry. He earned his doctorate from Berkeley in 1923 in physical chemistry. It was here, that in a sense, Urey discovered himself. From Berkeley, his scientific odyssey took him to Copenhagen where he spent a year steeping himself in atomic science under the patronage of the famed Niels Bohr. Denmark was followed by a brief period on the faculty at Johns Hopkins in Baltimore. From Baltimore he moved to Columbia, where in 1931 he did his epochmaking work on the isolation of deuterium. Barely ten years after his Ph.D., he received the Nobel prize in chemistry.

During World War II, he headed the Manhattan Project at Columbia; after Columbia and the war followed the days in Chicago. This was the exciting period when the rudiments of the new discipline of cosmochemistry was being forged by Libby, Harrison Brown, Hans Seuss, and the galaxy of chemists bold enough to venture from their Earth-bound laboratories to nature's own in the very heart of the stars. The years in Chicago swiftly gave place to those in La Jolla, where in 1958, Harold Urey was named Professor-at-large. To his last day, Urey lived in La Jolla, making it the Mecca and Medina of all cosmochemists.

Urey's influence extended to every branch of science. One of the first significant experiments on the origin of life was performed by his graduate student, Stanley Miller; other associates, like Harmon Craig, have blazed the isotope trail, and a whole generation of researchers have emulated his studies of the Moon.

His love affair with the Moon began over thirty years ago. In his own oft-quoted words, "Joyously! One day... on a train I read a book, *The Face of the Moon* by Ralph Baldwin. I was fascinated." He went back to his office at the University of Chicago and pasted together a map of the Moon from photographs and hung it on his office wall. "And I just went on from there." He went on to participate in every aspect of lunar exploration. At the height of the Apollo program he once exclaimed, "I'd love to go to the Moon. I think I'd go even if I knew I could never get back."

Perhaps the greatest legacy that Harold Urey has left us was his dedication to basic science. He represented in the scientific world, long before its time, the phenomenon of the native American scientist inspired by the problems of pure science; working not towards practical applications but attempting to formulate the natural laws of the universe. Urey hunted for deuterium not because of the potential value of heavy water, but because he had a chart of nuclear species on the wall with a blank space where he was convinced that deuterium had to be.

Harold Urey thrived in the intellectual climate of academe. To him, "the main business of a university is to examine the discrepancies between actual phenomena and the currently accepted explanations of them." Throughout his scintillating career, to a degree seldom equalled, he personified excitement in science.

Of him, more than of anyone else, one could say with Ogden Nash:

> There wasn't a problem he feared to face
> From smashing atoms to conquering space
> And, should one of his theories expire
> He had other ions in the fire.

Harold Urey was a warm and affectionate human being. Those of us who had the privilege of knowing him have lost a friend and a teacher. A generation of American scientists accustomed to him will miss the special Urey brand of inspiration and leadership.

C. Ponnamperuma

Origins of Life Official Publication of ISSOL

We are pleased to announce that ISSOL has signed a two-year agreement with D. Reidel Publishing Company for the publication of *Origins of Life*. This agreement makes the journal *Origins of Life* the official publication of the society.

ISSOL will assume editorial responsibility for the journal commencing with Volume 12, 1982. Current editorial staff has agreed to a request by the society to continue until the next meeting of ISSOL in July 1983 at which time the society will appoint a new Editor, Associate Editors, and Editorial Board. At least five Associate Editors and fifteen Editorial Board members will be appointed by ISSOL for a period of three years.

Origins of Life will continue to contain only original, previously unpublished, refereed articles within the subject domain of the field of origins of life, book reviews, ISSOL announcements, and Reidel publication notices. One volume per year will be published consisting of four issues of approximately one hundred pages each.

Beginning with the first issue of Volume 12, 1982, there will be a special subscription price for ISSOL members (for personal use only) of US $20; this is a savings of $15 to ISSOL members. The society will receive a 2% royalty on institutional subscription sales above the 800 subscription level.

ISSOL

Fall/Winter 1981
Vol. 9, No. 3

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

Guest Editorial

SETI—THE SEARCH FOR EXTRATERRESTRIAL INTELLIGENCE

In the past twenty years, much of the attention given to the search for extraterrestrial life has focused on the possibility of discovering evidence for such life in our solar system, particularly on Mars. During the same time, some investigators have been pursuing a very different approach, namely the search for life outside the solar system. Studies throughout this period have indicated clearly that attempts to send spacecraft to nearby stars would require prodigious expenditures of energy and other resources, and the results would not be forthcoming for hundreds or thousands of years. But there is another approach, first enunciated by Cocconi and Morrison in their classic paper in *Nature* in 1959. The idea is to search for extraterrestrial intelligence (SETI). One must ask what manifestations of the existence of other civilizations may be most easily detected. After many years of discussion there does now appear to be a consensus that the initial search should concentrate in the microwave region of the electromagnetic spectrum. The goal is simply to detect signals that are unequivocally of intelligent origin. The task is difficult since one is confronted with a multidimensional search space consisting of direction, signal strength and pattern, polarization, repetition rate, and frequency. Many reasonable inferences can be made to reduce the odds against detection. For example, it may not be profitable to examine O stars, since their lifetime is too short to allow the evolution of intelligence on any of their planets.

The SETI concept then is to use existing large radiotelescopes to search specific targets, and to sweep the sky to ensure that we are not missing any strong signals. But the heart of the SETI system is a sophisticated multichannel spectrum analyzer and signal processor, which splits up the incoming data stream into millions of separate channels, and which automatically identifies patterns which are significantly different from the noise background.

Some two dozen searches have been carried out by American, Canadian and Soviet investigators since 1960. No signals of intelligent origin have yet been found, but this is not surprising in view of the comparatively primitive data processing systems which have been available to date. SETI is appearing more frequently on the programs of the meetings of various national and international bodies, such as ICSU (the International Council of Scientific Unions), COSPAR (the ICSU Committee on Space Research), IAU (the International Astronomical Union), URSI (the International Radio Union), AAAS (the American Association for the Advancement of Science), and AIAA (the American Institute for Aeronautics and Astronautics). There are regular technical sessions on SETI at the annual Congress of the International Astronautical Federation. SETI is also appearing in more and more college courses dealing with exobiology and life in the universe.

The worst problem faced by SETI investigators is radio frequency interference. The microwave window is rapidly becoming filled with terrestrial transmissions of all types, and of strengths which will drown out faint signals of intelligent extraterrestrial origin. In spite of representations made by twenty nations to reserve a part of the spectrum for SETI, the World Administrative Radio Conference in 1979 did not take such action, though they did note that SETI searches would be taking place in the microwave region of the spectrum. The only escape may be to go into space with large antennas (which will probably happen anyway in the near future) and shield the listening system from terrestrial interference. But we must first find out the extent of the problem with terrestrial telescopes.

For ISSOL colleagues who may be interested, the best general description of the philosophy, science and technology of SETI is the report of the SETI Science Workshops, chaired by Philip Morrison, and published in 1977 as NASA Special Publication 419, entitled *SETI*. In the summer of 1979, a scientific meeting on "Life in the Universe" was held at the Ames Research Center. The proceedings will be published late in 1981 by MIT Press. The papers presented at the meeting trace the story of life in the context of cosmic evolution, including chemical evolution, the origin of life, complex life and intelligence. Again, for those interested, the last paper in the volume, by J.H. Wolfe, et al., describes the essence of the SETI microwave observing program.

There are many interesting parallels between Viking and SETI. It is most important, of course, that we continue the exploration of Mars in the future, and that we eventually carry out a Mars Sample Return Mission. In the meantime, we can continue the search for extraterrestrial life by conducting a modest SETI program. It is highly probable that valuable radioastronomical data will be collected as the SETI activities proceed, so that there will be a scientific return whether or not a signal of intelligent origin is detected. And a positive result, namely the detection of another civilization, would be of considerable scientific interest.

I would appreciate hearing from ISSOL members who have comments or questions about SETI, or who would like to be kept apprised of developments as they occur.

John Billingham
Chief, Extraterrestrial
Research Division
NASA Ames Research Center
Moffett Field, CA 94035

Editor's Note

HELP EXPAND MEMBERSHIP NEWS. All ISSOL members are encouraged to submit material, at any time, for inclusion in future newsletter issues. Entries in all categories are welcome: articles, editorials, research notes, education notes, conference summaries, meeting announcements, membership news, book announcements or brief reviews, etc. All submissions should follow the format already established for the newsletter and be sent directly to the Editor.

ISSOL

Spring 1982
Vol. 10, No. 1

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

Research News

A Non-Enzymatic RNA Polymerase Model

Leslie E. Orgel
The Salk Institute for Biological Studies
San Diego, California

There is a great deal of argument about the nature of the first information-transferring process that occurred on the primitive Earth and formed the starting point for the evolution of life. One attractive possibility is that a process related to nucleic-acid replication was responsible for the conservation of genetic information from the very beginning. It is important, therefore, to explore systematically the nature of replication processes that could have occurred in the absence of anything as complicated as an enzyme. We have been doing this for a number of years.

We have concentrated on reactions in which a preformed polynucleotide chain facilitates the synthesis of complementary oligomers—such reactions are similar to those carried out by RNA-dependent RNA polymerases. The principle is illustrated in Fig. 1.

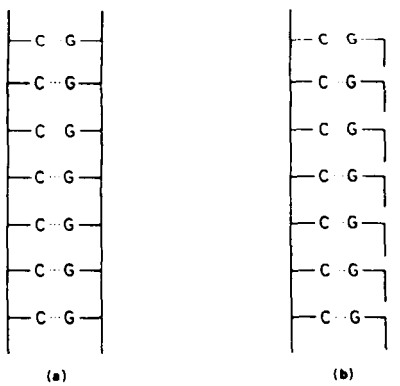
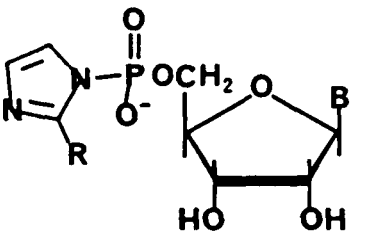


Fig. 1 (a) A poly (C)-poly (G) double helix. (b) The corresponding double helix formed by poly(c) with pG. The pG molecules are oriented in such a way as to facilitate oligomerization.

When poly(C), a homopolymer related to RNA, is mixed with a derivative of guanine (G) in aqueous solution at pH 8 and cooled to 0°C an organized double-helical structure is formed which is completely analogous to a Watson-Crick double helix, except that the G residues are lined up head-to-tail without being joined together. Poly(U) and A also form an organized structure under these conditions, but it is more complicated. Clearly if the G derivative in the poly(C):G helix were GTP or some other activated derivative of guanylic acid (pG) the template poly(C) might induce the G derivative to polymerize.

Our early work established that the template principle does indeed work. Poly(U) facilitates the formation of oligo(A)'s from adenylic acid(pA) in the presence of a condensing agent, but has no effect on the polymerization of U, C, or G derivatives. Similarly, poly(C) is a template for the formation of oligo(G)'s, but has no influence on U, C or A derivatives. Furthermore, we found that derivatives of other sugars than D-ribose do not undergo template-directed reactions—poly(U) has little effect on the polymerization of derivatives of 2'-deoxy A, 3'-deoxy A, ara A or L-adenosine, for example. However, these reactions were somewhat disappointing in other ways. First they were not very efficient and yielded only short oligomers, and second they tended to produce the wrong isomers, the products were 2'-5'-linked while nucleic acids are always 3'-5'-linked.

Two or three years ago we made the surprising observation that metal ions profoundly influence the poly(C)-directed oligomerization of one particularly activated G derivative, the phosphorimidazolide, ImpG (I). The Pb^{2+} and



I: B=G, R=H

II: B=G, R=CH_3

Zn^{2+} ions were the most effective catalysts, but they lead to fundamentally different products. The Pb^{2+} ion yields the "wrong" 2'-5'-linked oligomers, while the Zn^{2+} ion gives the natural 3'-5'-linked product. In both cases oligomers up to 30-50 units long are obtained in excellent yield.

The Zn^{2+}-catalyzed reaction proved to have high fidelity. In the presence of poly(C), only G was incorporated into long oligomers from an equimolar mixture of G and U, A or C. The discrimination factor was about 200 for each "wrong" base. This compares reasonably well with the fidelity of RNA polymerases which discriminate by a factor of about 3000. We found this reaction particularly exciting, because all RNA and DNA polymerases are Zn^{2+}-containing enzymes, so we thought there might be an evolutionary relationship between Zn^{2+}-ion catalysis and Zn^{2+}-enzyme catalysis.

Unfortunately, it has not proved possible to generalize the Zn^{2+} catalyzed reaction. In fact, Zn^{2+} inhibits the oligomerization of ImpA on

(Continued on p. 2)

James P. Ferris Proposed as Journal Editor

A resolution adopted at the 1980 ISSOL meeting in Jerusalem accepted the journal *Origins of Life* as the official publication of the Society. Cyril Ponnamperuma (USA) agreed to continue to serve as editor until a new editor is named by the Society.

A committee composed of C. Ponnamperuma, R.S. Young, J.W. Schopf, and D. DeVincenzi nominated James P. Ferris, Renssalaer Polytechnic Institute, Troy, New York (USA) to become the new editor of the Society's journal. The Executive Council accepted the committee's recommendation. Dr. Ferris' appointment will be submitted for ratification by the Society membership.

ISSOL

Summer 1982
Vol. 10, No. 2

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

In Memoriam

FUJIO EGAMI
1910—1982

On July 17th, 1982, died Fujio Egami, a legend in his lifetime. He made a strong impact on science ranging from biochemistry to the study of the origin of life.

Fujio Egami was born in Tokyo, Japan, on November 21st, 1910. In 1939, he married Yuki Yoneta; they had two daughters, Fuyuko and Shinko.

Fujio Egami graduated from the University of Tokyo in 1933 and then started his research work on sulfate esters and sulfatase under Prof. T. Soda (1932-1942). During this period, he went to France to study the methanol oxidation in mice at the Institut de Chimie Biologique de la Faculté de Médicine de l'Université de Strasbourg under Prof. M. Nicloux (1934-1935), followed by research on the microbial deamination of alanine at the Institut de Biologie Physico-chemique under Prof. E. Aubel (1935-1936).

In 1942, Egami moved to Nagoya University and began his research and lecturing in biochemistry. He earned his doctorate from the University of Tokyo in 1942 in chemistry. He became a Professor of Organic Chemistry in the Department of Chemistry in 1943. At Nagoya, Egami studied inorganic nitrogen metabolism centering upon nitrate reductase and he discovered that nitrate is utilized in organisms instead of oxygen; at the same time, he proceeded with the biochemical study of a series of toxins such as *Shigella* exotoxin, streptolysin S and endotoxins of Gram-negative bacteria. Egami did his epoch-making work on the isolation of RNase T_1 in 1957, his last year at Nagoya.

In 1958, from Nagoya University he moved to the University of Tokyo, where in 1960 he published in *Nature* his prediction that the sequencing of RNA would be possible by the use of several species of ribonuclease with different specificities. He further

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INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

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Vol.11, No.1

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7th International Conference on the Origins of Life and 4th International Meeting of the Society for the Study of the Origin of Life

The "7th International Conference on the Origins of Life (ICOL) and the 4th Meeting of the International Society for the Study of the Origins of Life" is to be held at the Kurfürstliche Schloß (Electors' Palace) in Mainz, Federal Republic of Germany, from Sunday, July 10 to Friday, July 15, 1983 at the invitation of the International Society for the Study of the Origin of Life (ISSOL).

The 7th Conference on the Origins of Life will mark a twenty-five-year period which started with the "Symposium on the Origin of Life on the Earth" in August 1957 in Moscow and included those in Wakulla Springs (1963), Pont-à-Mousson (1970), Barcelona (1973), Kyoto (1977) and Jerusalem (1980). Each of them has been very successful in stimulating scientific co-operation and communication in the field of the origins of life.

The schedule aims at interdisciplinary information exchange among participants. To achieve this, each topic is made up of specific elements, namely

PROGRAM OUTLINE

Date	Morning	Afternoon	Evening	Other Events
Sunday 10 July		Registration (14-21)	Welcoming Recept., at Landesmuseum - (20-22)	
Monday 11 July	Registration (8-9.30) Opening Ceremony (10-12)	Lectures A1-A3 (14-16.30) Poster Presentat. Commercial Exhib. (16.30-18)	Lectures A4+A5 (19.30-20.50) Reception by the City of Mainz (21-22)	Guided Walking Tour at Mainz (afternoon)
Tuesday 12 July	Lectures B1-B3, Poster Presentat., Commercial Exhib. (8.15-12)	Lectures C1+C2, Poster Presentat., Commercial Exhib. (14-17.25)	Concert (20-22)	Guided Walking Tour at Mainz (cont.) (morning)
Wednesday 13 July	Lectures C3+C4, Poster Presentat., Commercial Exhib. (8.15-11.40)	Rhine River Tour (13.15-21.00)		
Thursday 14 July	Symposium SA, Poster Presentat., Commercial Exhib. (8.15-12.30)	Symposium SB, Poster Presentat., Commercial Exhib. (14-18.15)	Wine Tasting/Sparkling Wine Cellar + Tasting/"Germany on Slides" (18.45-21.30)	Visit to ZDF (Second German Television) (morning)
Friday 15 July	Lecture D (8.15-8.55) Symposium SC, Poster Presentat., Commercial Exhib. (9-12)	ISSOL Business Meeting (14-)	Closing Dinner with Dinner Lecture and Presentation of Oparin Medal (19.30-23)	Guided Bus Tour to the Rheingau, including a Visit to Procellan Manufacture Hoechst (all day)
Saturday 16 July				Post Congress Tours Begin + Guided Bus Tour to Roman Churches, Worms, Speyer, Heidelberg Castle (3/4 day)

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INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

A FEW WORDS FROM THE EDITOR

With the upcoming Society meeting and election of new ISSOL officers and executive councilors, it is appropriate to evaluate the goals for the Society's newsletter and our plans to achieve them.

The purpose of the newsletter is to disseminate information about the Society and the research field to the ISSOL membership in a timely fashion. A newsletter such as this cannot, of course, directly promote research or report original scientific data on a regular basis. Those are the roles for scientific journals and professional meetings. But a newsletter can encourage scientific activity indirectly by sharing information among members on matters such as: reports on recent and upcoming meetings; field trips; summer schools; reviews of current publications (including books, articles, films etc.); new appointments; scientific honors and awards (yourself and your colleagues); new research discoveries (e.g., news release type articles); teaching materials/educational notes; editorials; and letters-to-the-editor. We can only reach this goal with your help. With members scattered over a dozen disciplines and countries, the ISSOL Newsletter needs reporters and correspondents. If you are a member of ISSOL, then consider yourself a staff writer for this Newsletter.

Your help is essential in order to make the newsletter successful as a device for disseminating current information about the Society, its members, and its research. You are invited to submit items for the newsletter at any time. Please do your share to make the newsletter truly reflective of our Society's activities and interests. Articles may be brief and on any of the above subjects (or others you may think are appropriate). The format should follow previous issues. Please send all entries directly to the Editor.

D.L. DeVincenzi
Editor

4TH ISSOL MEETING

The "7th International Conference on the Origins of Life (ICOL) and the 4th Meeting of the International Society for the Study of the Origin of Life" is to be held at the Kurfuerstliche Schloss (Electors Palace) in Mainz, Federal Republic of Germany, from Sunday July 10 to Friday, July 15, 1983 at the invitation of the International Society for the Study of the Origin of Life (ISSOL).

The 7th Conference on the Origins of Life will mark a twenty-five year period, which started with the symposium on the Origin of Life on the Earth in August 1957 in Moscow and included those in Wakulla Springs (1963), Pont-A-Mousson (1970), Barcelona (1973), Kyoto (1977) and Jerusalem (1980). Each of them has been very successful in stimulating scientific cooperation and communication in the field of origins of life.

In the meantime, the society membership roles indicate over 285 members. We hope that most of them and many other interested scientists will attend the conference and join us in Mainz.

To date, 225 scientists from 26 countries have announced their participation. Included in the program are 55 oral contributions (plenary and short lectures) and 130 poster presentations. During the opening ceremony on July 11, Professor Schuster (University Wien) will present the intro- ductory lecture on the evolution between chemistry and biology.

TRAVEL GRANTS

Competition for travel grants to the 4th ISSOL Meeting was substantial. The Committee received travel grant applications from more that 40 ISSOL members from 16 countries, with total requests for funds (for travel only) amounting to some $33,000 (US). A total of 16 students and 2 professionals received travel funds. Because of limited monies, ISSOL was only able to provide 12 individuals with travel grants. Six individuals were recipients of a Dr. Herbert M. Phillips-ISSOL Travel Award. This award was made possible through the generosity of Dr. Herbert M. Phillips of La Jolla, California. The Herbert M. Phillips-ISSOL Travel Award was established to encourage participation of younger scientists, especially graduate students, at the 4th Meeting of ISSOL.

DONATION/OPARIN MEDAL

D. Reidel has donated funds to cover the cost of the production of the A.I. Oparin Medal. This medal is awarded at ISSOL's tri-annual meetings to the scientist who has had the best sustained scientific research program in the origin of life field for the three years since the last meeting. D. Reidel's generosity is appreciated by ISSOL. Professor Cyril Ponnamperuma, the recipient of last years A.I. Oparin Medal, will present this year's award at the Closing Dinner of the "7th ICOL and 4th ISSOL Meeting" on July 15, 1983.

ISSOL is the newsletter of the International Society for the Study of the Origin of Life.

Dr. Donald DeVincenzi, *Editor*
Linda G. Pleasant, *Associate Editor*

ISSOL

Fall 1983
Vol. 11, No. 3

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

A FEW WORDS FROM THE ISSOL PRESIDENT

In a celebrated essay on the physical basis of life, J.D. Bernal, the British physicist, wrote in 1949 about the problem of the origin of life,

> Even the formulation of this problem is perhaps beyond the reach of any one scientist, for such a scientist would have to be at the same time a competent mathematician, a physicist, and an experienced organic chemist. He should have a very extensive knowledge of geology, geophysics, and geochemistry, and, besides all this, be absolutely at home in all biological disciplines. Sooner or later, this task would have to be given to groups representing all these faculties and working closely together theoretically as well as experimentally.

What Bernal foresaw in 1949 has become a reality with the inauguration of the International Society for the Study of the Origin of Life. ISSOL is unique in its composition. We are an interdisciplinary society of astronomers, geologists, chemists, biologists and philosophers who are interested in one objective: trying to answer the question, "How did life begin?"

Our fledgling society, since its inauguration at the meeting in Pont-a-Mousson in the spring of 1970, has grown to maturity, and provides an unusual platform to bring together the disciplines that can answer a question which is fundamental to all science.

As the new president of your society, it is a privilege to be able to write these few words for the ISSOL Newsletter. Let me first thank you for the confidence that you have placed in me by electing me to this high office. It is with a feeling of trepidation that I assume this position when I consider that those who went before me were Academician Alexander Ivanovich Oparin and Professor Fujio Egami. It is a responsibility which I will try to shoulder to the best of my ability and serve the members of the society and the cause for which we are gathered together under this umbrella.

It is customary for a candidate for a presidency to outline his program before an election. However, since you have already given me your vote of confidence, I do not need to campaign by placing before you the agenda or the blueprint for action. However, I shall nevertheless try to share with you some of my thoughts regarding the organization and functioning of our society.

Our society is a very young society. It has scanty resources. But it has great strength because of the individuals who make up the society. My first objective as president of the society will be, with the help of the members of the executive council, to try to bring into the society all those who are interested in the subject of the origin of life and are contributing to it in their own disciplines, whether it be in interstellar chemistry, or in molecular biology, so that they could share with us their knowledge and experience and thus contribute to the furtherance of this subject.

In trying to bring other members into our society, we shall still maintain our high standards of discrimination. We have a set of guidelines, which, according to our by-laws, require a careful scrutiny of those who apply. We shall keep these rules. However, we shall try to be active in attracting members to our society. We would also

(continued on p. 7)

ELECTION RESULTS

Officers (1983-1986)

President
C. Ponnamperuma (USA)

1st Vice-President
A. Krasnovsky (USSR)

2nd Vice-President
A.G. Cairns-Smith (UK)

Secretary
D.L. DeVincenzi (USA)

Treasurer
J.P. Ferris (USA)

Councillors (1983-1986)

H. Baltscheffsky (Sweden); S. Chang (USA); G. Eglinton (UK); S. Miller (USA); J. Oro (USA); T. Oshima (Japan); M. Paecht-Horowitz (Israel); F. Raulin (France); C. Sagan (USA); M. Schidlowski (W. Germany); J.W. Schopf (USA); A.W. Schwartz (Netherlands); R.S. Young (USA)

ISSOL

Winter, 1984
Vol. 12, No. 1

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

NEXT ISSOL MEETING

Plans are progressing for the "8th International Conference on the Origins of Life and the 5th Meeting of the International Society for the Study of the Origin of Life." The meeting will be held in the San Francisco Bay Area at Berkeley, California, during the period June 22-27, 1986. These choices were made at a meeting convened on November 5, 1983, by ISSOL President, Cyril Ponnamperuma (USA), and attended by Herrick Baltscheffsky (Sweden), Sherwood Chang (USA), Donald L. DeVincenzi (USA), James Ferris (USA), J. William Schopf (USA) and Richard S. Young (USA). The Program for ISSOL-86 will be developed by a local organizing committee composed of ISSOL members and co-chaired by Sherwood Chang and Donald L. DeVincenzi. General guidelines and oversight for the program will be provided by a national steering group, chaired by Donald L. DeVincenzi, whose membership includes Sherwood Chang, James Ferris, Lynn Margulis, Stanley Miller, Tobias Owen and J. William Schopf. A proposal outlining the program plan for the meeting will be submitted to the Executive Council of ISSOL for review in May, 1984, after which the first circular will be issued. Finally, the resources of the Extraterrestrial Research Division of NASA-Ames Research Center will be available to assist the ISSOL and the local organizing committee in bringing the program plans to fruition.

NASA has been unique in the United States in its stewardship of a basic research program dedicated to the study of the origin of life. The arrival of 1986 will mark a 25-year milestone in the space agency's support. While nurturing the program in earth-bound laboratories during this period, NASA also carried the search for understanding of life's origin to the Moon, Mars and the Giant Planets. In light of the historical role played by NASA, it is both timely and appropriate that scientists participating in the Agency's programs be involved in planning and conducting ISSOL-86 and that the meeting be held in the vicinity of NASA-Ames Research Center, where studies on the origin of life have been on-going since 1961.

The San Francisco Bay Area is widely recognized as an attractive location for conferences and meetings. Its climate provides cool nights and warm, sunny days. Its history and culture reflect a singular blend of Old World influences with Native American, Pacific-Asian and Western American frontier heritages, interfused with the material and intellectual embellish- ments of high technology. And it is richly endowed with colleges and universities, centers of research and technology, natural scenic beauty, and social and cultural amenities, all of which provide an attractive and stimulating setting in which to hold our meeting.

The Society's Journal

J.P. Ferris, Editor

Since Origins of Life was not the Journal of ISSOL when the Society was founded, it was necessary to approve several additions to the by-laws at the Mainz Meeting in order to delineate the relationship between the Society and the Journal. Of particular importance to the Society membership was the reorganization of the Editorial Board. The Board now comprises twenty-five members, each with a term of five years. Five new members of the Board will be added each year as five retire. This change will make it possible for a wider spectrum of the Society's membership to be involved in its Journal. In addition, a five-year term will provide sufficient time for each Board member to become acquainted with the operation of the Journal so that he or she will be better able to provide me with advice and direction.

Recent Developments

Manuscripts are being published as soon as the review process is completed. Most of the articles of the first issue of Volume 13 were received in final form in March 1983 and were in print in July 1983. I was pleased to hear that over 200 reprint requests have already been received for one of the articles published in this issue. The second issue of Origins is in press and should be in your hands by the time you receive this Newsletter. I will be able to guarantee timely publication if I have a continuous flux of good manuscripts and prompt review by referees. The continued support of the ISSOL membership is needed in both these areas if we are to continue to build the quality and reputation of our Journal.

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Spring 1984
Vol. 12, No. 2

ISSOL

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

ELSO STERRENBERG BARGHOORN, JR. 1915–1984

ISSOL lost an illustrious member with the death of Elso S. Barghoorn who died peacefully in his sleep on Friday, January 27, at the age of 68.

Elso Barghoorn was born in New York City in 1915. After a youth that involved a growing enthusiasm for natural history, a stint as a deckhand on a Great Lakes freighter, and an undergraduate education at Miami University of Ohio (AB 1937), he entered Harvard University for graduate study under the tutelage of I.W. Bailey and W.H. "Cap" Weston. Even as a graduate student, Elso's research interests were wide, ranging from studies of marine fungi to the evolution and development of ray cells. The latter proved to be his thesis topic (1941), but it was his mycological training that led to his being sent to Panama during World War II to study fungal destruction of military equipment. This first visit to the rain forest whetted his appetite for travel, and began a lifelong love affair with the tropics.

From 1941 to 1946, Elso was first an instructor and then an Assistant Professor at Amherst College (Massachusetts). Here his background in plant anatomy (the classical entry to paleobotanical studies) led him to investigate the College's "Natural History Cabinet," which contained the collections of the preeminent 19th-century geologist, Edward Hitchcock. The Amherst collections included specimens from the Brandon Lignite, a small brown coal in northern New England. Elso recognized that this flora contained one of the few North American assemblages similar to the diverse and important Tertiary fruit and seed floras of Europe. This discovery was well-timed, for in 1946, Elso returned to Harvard to fill a recently vacated position in paleobotany. The switch permitted him to resume a vigorous research program, and he quickly moved to relocate the Brandon Lignite and investigate its contents in conjunction with the first two of his many graduate students: William Spackman, who investigated the woods, and Alfred Traverse, who studied the pollen. The latter thesis in particular reflected Elso's biological perspective on extinct plants; Al's work was a unique and seminal contribution to palynology in that pollen grains were assigned to living genera and families (where possible), rather than to form taxa.

However, Elso was never content to limit his interest to one corner of the stratigraphic record. In the early 1950s he became increasingly interested in the opposite end of the geologic column--the vast and virtually unknown world of the Precambrian. In 1954 he was simultaneously involved in the discovery of the world's oldest known coal, the 2 billion year old Michigamme coal of Michigan, and the description, with Stanley A. Tyler (University of Wisconsin), of fossilized microorganisms from the equally ancient Gunflint Iron Formation of Michigan. These experiences pointed the way to the future, and Elso will undoubtedly be most clearly remembered as the man who pushed the history of life back sixfold, founding the new discipline of Precambrian paleontology.

The lure of exploring the earliest stages of the earth's history drew Elso to all corners of the earth, from Australia to South Africa and Brazil; true to his inquisitive nature, Elso made a point of stopping everywhere in between! His approach to problems in paleobotany, and particularly those of the Precambrian, broadened in concert with his investigations and travels. He became increasingly interested and informed in the fields of microbiology and biogeochemistry, and applied these to his research. The lure of this intellectual adventure also drew students to him to join in the fun. First J. William Schopf, and then Stanley Awramik, Andrew Knoll, and most recently Paul Strother. The record of the Precambrian was stretched by this group, both in time, to 3.5 billion years before present, and in diversity, as explorations revealed increasing morphological and ecological complexity. Even while this extensive program was under way, Elso's mind roamed to other problems. As an advisor to the National Aeronautics and Space Administration, Elso helped develop a strategy for the biological exploration of the solar system. He examined moon rocks and meteorites and dreamed of the

(continued on p. 2)

ISSOL

Fall 1984
Vol. 12, No. 3

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

Anniversary of A.I. Oparin's Birthday

A meeting commemorating the 90th anniversary of A.I. Oparin's birthday was held at the Bach Institute of Biochemistry, on March 27, 1984. It was arranged by the Department of Biochemistry, Biophysics and Chemistry of Physiologically Active Compounds of the USSR Academy of Sciences, the Bach Institute of Biochemistry, the Scientific Council for Evolutionary Biochemistry and the Problem of the Origin of Life and the Biochemical Society of the USSR.

The Head of the Department of Biochemistry, Biophysics and Chemistry of Physiologically Active Compounds of the USSR Academy of Sciences, Academician A.A. Bayev in his opening words emphasized, that any present and future progress in the studies of the origin of life is and will be connected with the name of A.I. Oparin.

Academician A.L. Kursanov, who was familiar with A.I. Oparin from his student years reminisced about the bright and versatile personality of A.I. Oparin.

The Vice-President of ISSOL, Academician A.A. Krasnovsky pointed out that the theory of the origin of life formulated by A.I. Oparin about sixty years ago has now acquired world-wide recognition. A.A. Krasnovsky discussed the importance of international and interdisciplinary contacts for progress in the studies of the origin of life.

The Director of the Bach Institute of Biochemistry, a Corresponding Member of the USSR Academy of Sciences, Professor I.V. Berezin, pointed out that the studies of the origin of life were only one of the broad scientific interests of A.I. Oparin. His name is also related with the development in the USSR of various aspects of biochemistry, including applied and industrial biochemistry.

M.S. Kritsky
A.N. Bach Inst.

IAU SYMPOSIUM

The Search for Extraterrestrial Life: Recent Developments

It was an important recognition for this new field when in 1982 the International Astronomical Union established a new commission (section) under the title: "IAU Commission 51 - Search for Extraterrestrial Life," which rapidly grew to a membership of about 250 (210 astronomers and 40 distinguished scientists from related fields).

The first "IAU Symposium of Commission 51" was held in Boston, U.S., June 18-21, 1984 and was co-sponsored by four other major international organizations: IAF/IAA (International Astronautical Federation/International Academy of Astronautics), COSPAR (Committee on Space Research), ISSOL (International Society for the Study of the Origin of Life), and IUBS (International Union of Biological Sciences). The meetings were held in the new Science Center of Boston U., the home institution of the President of Commission 51, Michael D. Papagiannis. It was attended by 135 people from 16 different countries spanning five continents, and was financially supported by the IAU, NASA, and Boston U. The Science Organizing Committee was headed by M.D. Papagiannis and included representatives of NASA (J. Billingham), COSPAR (D. DeVincenzi), IAF/IAA (R. Pesek), ISSOL (C. Ponnamperuma), and IUBS (O. Solbrig). The Local Organizing Committee was headed by Philip Morrison of MIT and Edward Purcell of Harvard.

The Symposium opened with a welcoming reception in the elegant "Castle" of Boston U. and closed with a visit to the Harvard-Smithsonian Oak Ridge radio observatory which has now become a SETI dedicated facility. There was also a banquet in the Hall of Flags of Boston U., with Carl Sagan as the speaker, and a special event at Boston's Museum of Science with a reception and a talk by Philip Morrison. During the event, "IAU Commission 51" honored Morrison with a plaque commemorating the 25 year anniversary of the publication of the historic paper "Searching for Interstellar Communications" by G. Cocconi and P. Morrison (Nature, 1959) which ushered in the experimental era in the search for other stellar civilizations. "The initial opposition to our papers", Cocconi wrote at the time to Morrison from Geneva, "was similar to that met by the pioneers of

(cont. on p. 4)

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ISSOL

Winter 1985
Vol. 13, No. 1

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

SOCIETY ANNOUNCES FIFTH ISSOL MEETING

The "Fifth ISSOL Meeting and the Eighth International Conference on the Origin of Life" will be held July 21-25, 1986, at the U. California, Berkeley. The National Aeronautics and Space Administration will host this meeting in honor of the 25th Anniversary of NASA's Exobiology Program and the 10th Anniversary of the Viking-Mars Missions.

The primary objective of the meeting is to provide a multifaceted forum that will foster communication of recent results, discussion of new directions across discipline boundaries, and focus attention on several key issues in the fields of origin of life research.

Several types of activities are proposed for the scientific sessions. The principal emphasis of the meeting will be placed on four symposia, each of which will deal with a broadly based fundamental question through invited and contributed papers. Related to questions covered in the symposia are two additional topics that will be addressed in the format of scientific debates. Completing the program will be topical general sessions with contributed papers and poster sessions that address the topics of the symposia, general sessions, and debates. The diverse styles of communication and interaction available in these forums are designed to provide conferees with ample opportunity for active participation.

The first circular for the "Fifth ISSOL Meeting and the Eighth International Conference on the Origin of Life" will be released during the spring of 1985 and mailed to all ISSOL members (full and associate) and other interested persons. The first circular contains details of the tentative scientific program, participation requirements, lodging and accommodation information, and options for special events. In subsequent issues of this Newsletter, more details about each facet of the meeting will be provided. All correspondence concerning the meeting should be sent to Dr. Sherwood Chang, Co-chairman ISSOL 86 Local Organizing Committee, P.O. Box 152, Moffett Field, CA 94035, USA.

SPECIAL REPORT:

COSPAR Meeting

Over 1300 scientists from 36 countries met at the "25th Plenary Meeting of COSPAR" (Committee on Space Research), in Graz, June 25 to July 7, 1984. This conference, which had the largest participation in COSPAR's history, was subdivided into a large number of symposia, workshops, topical meetings, and special sessions. Three topical meetings and a special session were concerned with different aspects of cosmic chemistry, chemical evolution, and the origin and early evolution of life on Earth. More than 30 invited and contributed papers on these subjects were presented and discussed by a largely interdisciplinary audience.

1. Cosmic Chemistry, Chemical and Biochemical Evolution (COSPAR F.3)

Topical meeting organized by J. Oro and A. Schwartz. First session chaired by J. Oro and refereed by K. Dose (July 3, a.m.).

The meeting began with a presentation by J.M. Greenberg (Huygens Laboratory, Leiden) on cosmic chemistry with emphasis on models for interstellar grains and on the laboratory simulation of chemical processes which are believed to occur in the interstellar medium. It was shown that the action of ultraviolet light on cold ices (H_2O, NH_3, CH_4) produces radicals which upon recombination lead to the formation of complex organic compounds. The general spectral features of these laboratory irradiated ices match the spectral features of interstellar grains fairly well so that one does not have to invoke the hypothesis of the presence of bacteria in the interstellar medium, as has been done by other authors. It is calculated that the total bulk of interstellar grains is such that about 25% of all the organics are bound up in the grains as complex molecules. This amount is several orders of magnitude higher than that present in all probable planets of the Milky Way.

This talk was followed by J. Oro, who in a paper with B. Basile (U. Houston), reviewed and presented new evidence on the formation and chemical evolution of organic molecules in space. Four major chemical evolutionary phases were distinguished: (1) formation of biogenic elements in stars and supernova explosions, (2) mass transfer of simple organic

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ISSOL

SUMMER 1985
Vol. 13, No. 2

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

LATEST PLANS FOR 1986 ISSOL MEETING

At its July 23, 1985 meeting, the ISSOL Local Organizing Committee (LOC) reviewed responses received thus far to the First Circular. Numerous papers have been proposed for each scientific session, so the technical program will remain as originally established.

Several LOC members are currently recruiting speakers for the four symposia and session chairs for the symposia and six general sessions. Individuals from the international ISSOL membership will be invited to fill these positions.

Proposed guidelines have been developed for the two debates, and recruitment of participants is also underway.

A solicitation for contributions to the ISSOL travel fund will be included with the annual dues statement to members. Donations of $50 or more per person are urgently needed in both 1985 and 1986 to meet the goal of assisting with the travel expenses of 25 young scientists attending the Berkeley meeting.

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ISSOL TREASURER'S REPORT 1983-84

Balance Transferred from W. Schopf 10/27/83		$2,636.17
Income		
Dues	$3,750.00	
Travel Fund Donations	1,285.00	
Interest	305.87	
	$5,340.87	5,340.87
Expenses		
Newsletter (printing, mailing)	1,202.58	
Stationery, dues envelope	351.10	
Incorporation Fees	126.00	
Oparin Medal	500.00	
Planning Meeting 1986 ISSOL meeting	683.00	
Bank Charges	10.16	
Uncollected Checks	33.60	
	$2,906.44	-2,906.44
Balance 1/1/85		$5,070.60

James P. Ferris
Treasurer
6/28/85

NEWS OF ORIGINS OF LIFE AND EVOLUTION OF THE BIOSPHERE

An Expanded Title

The expanded title for Origins of Life reflects a concern of mine that many scientists do not submit papers to the journal because they view it as being limited to the research of those scientists simulating chemical events on the early Earth. Few, if any, papers have been received from those working on origins of life from the perspective of geology, atmospheric chemistry, planetology, or biology (the one exception to the latter was the special issue devoted to the Proceedings of the Protistology Meeting). I felt that by expanding the title of the journal I could emphasize the interdisciplinary nature of the field and the journal. Several subtitles were considered and, in the course of discussing these with the members of the Editorial Board, Dick Holland recommended the use of Evolution of the Biosphere. I and other members of the Board felt that it represented the interdisciplinary nature of the field and it was enthusiastically adopted.

Manuscripts

The absence of a good supply of quality manuscripts is still the primary problem facing the journal. There was a 50% acceptance rate of regular journal articles for volume 13, a figure which does not include the Protistology Meeting issue, book reviews, commentary, etc. Your assistance in sending manuscripts to Origins will be greatly appreciated as will your prompt review of articles that I send you to review. Your suggestion of timely review articles will be given careful consideration. An outline of the material to be covered and a brief explanation as to why the review should be published should be sent to me before preparing the full article.

Rotating Membership on the Editorial Board

One of the proposals passed at the 1983 ISSOL Meeting was the appointment of members to the Editorial Board for 5-year terms. I recommended the adoption of this proposal to foster greater input of the membership of ISSOL in the policy decisions of their journal. In this way Board members will have 5 years to advise me as well as work for the objectives they feel are appropriate for the journal. This will be

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ISSOL

Fall 1985
Vol. 13, No. 3

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

LATEST INFORMATION FOR ISSOL '86 MEETING

The ISSOL Local Organizing Committee (LOC) reports that plans are progressing well for the ISSOL Conference to be held at UC-Berkeley, July 21-25, 1986. Affirmative responses have been received from several individuals who have agreed to serve as chairmen of the symposia and general sessions, and from a number of speakers who will present papers, posters, or both.

The LOC was especially pleased that Stephen Jay Gould has accepted the invitation (schedule permitting) to be the keynote speaker at the Formal Opening Reception Monday evening at the Lawrence Hall of Science.

Final editing is underway for the Second Circular which will be mailed before the end of the year. In addition to the official Conference Registration Form, the Second Circular will contain specific instructions on abstracts, posters, graphic material, etc. The due date for abstracts is March 1, 1986. The Second Circular will also contain revised fees for the Conference. Substantial reductions in fees for ISSOL members were made as a result of careful reanalysis of Conference expenses.

Ads describing ISSOL-86 were placed in Nature and Science. Both First and Second Circulars will be sent in response to the many inquiries we are receiving from those ads.

Contributions from ISSOL members to the travel fund were solicited with the annual dues statement. A procedure for applying for ISSOL Travel Grants was mailed to all ISSOL members in November, requesting a response to Dr. Jim Ferris by December 31, 1985. That is an important deadline. Applications need to be reviewed and selections made in time to meet the Conference Registration deadline of March 1, 1986.

The final Meeting Program will be published as a special issue of the ISSOL Newsletter and will be mailed to all ISSOL members and conference registrants by May 1986. The abstract booklet, including the final program, will be distributed at the meeting in July 1986.

Vera Buescher
ISSOL '86 LOC

LINDA PLEASANT LEAVES POST OF ASSOCIATE EDITOR

The Editor would like to express his appreciation on behalf of the Society to Linda Pleasant, Associate Editor of the Newsletter from the Spring of 1981 to the Spring of 1985. Linda has resigned from George Washington University and her ISSOL activities due to illness. She has put in countless hours working on the Newsletter and on other ISSOL functions. Linda was responsible for the change from commercial to internal publication of the Newsletter in the winter of 1982-83, a change that has saved the Society several thousand dollars and that will allow many more young scientists to attend ISSOL meetings. We would like to express our sincere thanks to Linda and we wish her the best of luck.

SOCIETY ELECTIONS

It is once again time for the Society to elect its officers and councillors. The By-laws of ISSOL call for elections of officers and councillors every three years. The Society, therefore, will elect a president, first and second vice presidents, secretary, treasurer, and twelve councillors before the Berkeley meeting next summer. A Nominating Committee is in the process of being formed for approval by the Executive Council. The Nominating Committee will be chaired by the Secretary of ISSOL, Donald L. DeVincenzi, in accordance with the By-laws. Nominations will be made by the Nominating Committee in early 1986 and ballots for the election will be mailed to all voting members of the Society and then counted in March and April of 1986. Results will be announced at the Berkeley meeting.

ISSOL '86 TRAVEL GRANT PROGRAM

Funds, in limited amounts, are available from the ISSOL treasury to offset travel costs required for attendance of selected scientists participating in the 5th ISSOL and 8th ICOL Meeting to be held in Berkeley, CA, USA, July 21-25, 1986.

Following previously established ISSOL practice--and in an effort to spread limited funds as widely and effectively as possible--travel grants will be used especially to encourage participation of younger scientists, including graduate students; funds granted are intended to be used to offset travel costs (e.g., bus, train, and/or air fare), rather than for subsistence; and funding will be restricted to those dues-paying members of ISSOL who are authors or co-authors of abstracts of scientific papers submitted for presentation at the meeting.

To apply for these funds, each applicant must submit the following items to the ISSOL Travel Grants Committee (address given below):

1) One copy of the abstract of a paper submitted for presentation at Berkeley that is authored or co-authored by the applicant.

2) An itemized budget specifying funds required for travel, e.g., bus, train, and/or air fare. Funding will not be provided for food, lodging, etc.

3) A brief written statement (max. length 1 page) by the applicant justifying the itemized budget and indicating why his or her attendance at the Berkeley meeting should be particularly appropriate, useful, etc.

4) For student applicants, a brief written statement (max. length 1 page) from the student's faculty advisor supporting the student's application for a travel grant.

To be considered for funding, applications must be received no later than December 30, 1985. Applicants will be informed in mid-April of action taken by the Travel Grants Committee. Early application will be a factor considered

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ISSOL

Spring 1986
Vol. 14, No. 1

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

ISSOL-86 MEETING UPDATE

The ISSOL-86 Local Organizing Committee (LOC) met in mid-March to review abstracts and select those to be presented at the ISSOL Conference July 21-25, 1986. Over 200 abstracts were selected for either poster or oral presentation in the various symposia or general sessions. The preliminary program is printed in this issue of the ISSOL Newsletter. The final program and abstract booklet will be distributed at the conference in July.

A new conference site on the UC-Berkeley campus recently became available for our consideration. This site has all the facilities required for the conference, including meeting rooms, lodging, dining areas, recreational facilities, etc. The LOC held its planning meeting at the new location and enthusiastically adopted a proposal to relocate the conference to this site, which is the UC-Berkeley Clark Kerr Conference Center at 2601 Warring Street, Berkeley, California, U.S.A. The new site is located a few blocks from the previously planned site and is described fully in a recent mailing sent to all participants.

The following mailings have been distributed recently by the LOC: (1) A notice of the change in meeting location; (2) A confirming letter to participants acknowledging inclusion of their abstracts in the program and their registration for the conference, food, lodging, etc.; and (3) Special letters of encouragement to attendees at the Mainz meeting who have not yet registered for ISSOL-86 and to colleagues who had submitted preliminary forms but have not yet registered formally.

Vera Buescher
ISSOL '86 LOC

ISSOL-86 PRELIMINARY PROGRAM

Program Co-Chairs: S. Chang, D. DeVincenzi

Sunday, July 20

6:30 p.m. — Introductory Lecture

COSMOLOGY OF LIFE AND MIND
George Wald

7:30 - 10:00 p.m. — Welcome Mixer

Monday, July 21

8:00 a.m. — Opening Remarks and Announcements

8:30 a.m. — ISSOL Presidential Address
Cyril Ponnamperuma

9:15 a.m. (001) — HISTORICAL PERSPECTIVE: THE PROBLEM OF THE ORIGIN OF LIFE IN THE CONTEXT OF DEVELOPMENTS IN BIOLOGY
Harmke Kamminga

Symposium 1 — WHAT WERE CONDITIONS LIKE ON THE PRIMITIVE EARTH?

Invited Papers — Session Chairman: S. Chang

10:00 a.m. (002) — PHYSICAL CONDITIONS ON EARLY EARTH: IMPLICATIONS FOR THE ORIGIN OF LIFE
N. Sleep

10:45 a.m. (003) — SURFICIAL CONDITIONS ON THE EARLY EARTH: IMPLICATIONS FOR LIFE
J. Veizer

11:15 a.m. (004) — EARLY ARCHEAN ORGANISMS AND PALEOENVIRONMENTS
D. Lowe

12:00 noon - 2:00 p.m. — Lunch and Poster Session

Symposium 1 (continued)

Contributed Papers — Session Co-Chairs: P. Brimblecombe, J. Levine

2:00 p.m. (005) — DID EXTRATERRESTRIAL IMPACTORS SUPPLY THE ORGANICS NECESSARY FOR THE ORIGIN OF TERRESTRIAL LIFE?: AMINO ACID EVIDENCE IN CRETACEOUS-TERTIARY BOUNDARY SEDIMENTS
J. Bada, M.-X. Zhao and N. Lee

2:20 p.m. (006) — CLIMATIC CONSEQUENCES OF VERY HIGH CO_2 LEVELS IN EARTH'S EARLY ATMOSPHERE
J. Kasting

2:40 p.m. (007) — PHOTOCHEMISTRY OF CH_4 AND HCN IN THE PRIMITIVE ATMOSPHERE
K. Zahnle

3:00 p.m. (008) — PHOTOPRECIPITATION AND THE BIFS: SOME QUANTITATIVE ASPECTS
P. Braterman and A.G. Cairns-Smith

3:20 p.m. (009) — ON THE ROLE OF SUBMARINE HOT SPRINGS ON THE ARCHEAN EARTH: THE CHEMISTRY OF SEA WATER, DEGASSING, AND THE OXIDATION/REDUCTION BALANCE
J. Corliss

Contributed Posters (Displayed July 21-23)

(010) — FORMATION OF HYDROGEN ON IRRADIATION OF AQUEOUS FERROUS ION WITH UV LIGHT AT NEUTRAL pH
Z. Borowska and D. Mauzerall

(011) — THE PHOTOCHEMISTRY OF OXIDATION AND REDUCTION OF TRACE METALS IN THE ARCHEAN OCEANS
P. Brimblecombe

(continued on next page)

ISSOL

Fall/Winter 1986
Vol. 14, No. 2,3

INTERNATIONAL SOCIETY FOR THE STUDY OF THE ORIGIN OF LIFE

FINAL REPORT - ISSOL-86 MEETING

NOTE FROM THE EDITOR

This issue of the newsletter is the official final report of the Fifth ISSOL meeting, held in Berkeley, California July 21-25, 1986. It contains two summaries of the meeting, one based on comments solicited from participants (page 3) and one a personal viewpoint by the principal meeting coordinator (page 1). Also included are the text of the outgoing President's address (page 2), summary reports of the Executive Council and Open Business Meetings (page 8), a report on meeting expenses (page 12), and results of the election and Oparin medal selection (pages 1, 3). It was the intent of the Editor to combine all of these reports into a single issue; hence they are published here as issues #2 and #3 of volume 14. This issue, besides serving as the official report of the meeting, hopefully will give those members who were not able to attend an idea of what occurred; it also is intended to provide whatever assistance it can to the organizers of the next meeting, the 1989 meeting in Prague (see page 3).

ISSOL - 86 A SUCCESSFUL EVENT !

As I looked into the ISSOL Assembly hall for a few moments during the opening session Monday morning, July 21st, I suddenly was overcome by a strange, exciting, overwhelming numbness. It had all come together! What a break that ISSOL-86 was able to congregate at the Clark Kerr Conference Center at the Berkeley campus of the University of California.

Dr. Cyril Ponnamperuma, in his Presidential address, was talking about our discussions of chemical evolution leading us to the limits of the universe and bringing us back to the vents of the ocean bottom. As I looked about the beautiful redwood-paneled meeting room, I couldn't help thinking about all the crossroads that had led to the gathering of over 250 people in that room to take part in those discussions for a full week - scientists from over 20 countries, Nobel laureates, students just beginning their scientific courses, many highly acclaimed scientists in their field, representing the backbone of the world's research in the multifaceted quest for knowledge about the origin of life.

"An outstanding program!" "The best collection of papers and posters at any meeting I've ever attended." "The kind of environment that makes one take notice of what others are doing, and lets you sit out here on a bench and talk with them about it." ...those are the kinds of comments I heard as I walked around the beautiful grounds, chatting with people at coffee

--continued on page 4

ELECTION RESULTS

Officers (1986-1989)

President S. Miller (USA)	1st Vice-President S. Chang (USA)
2nd Vice-President A.G. Cairns-Smith (UK)	Secretary D.L. DeVincenzi (USA)
Treasurer J.P. Ferris (USA)	

Councillors (1986-1989)

H. Baltcheffsky (Sweden)	J. Oró (USA)
A. Banin (Israel)	J.W. Schopf (USA)
A. Brack (France)	P. Schuster (Austria)
G. Eglinton (UK)	W. Thiemann (FRG)
H. Noda (Japan)	D. Usher (USA)
L. Orgel (USA)	R. Young (USA)

D. REIDEL CONTRIBUTION FOR OPARIN MEDAL

ISSOL would like to extend its sincere appreciation once again to the D. Reidel Publishing Company for their generous donation of funds to cover the cost of the 1986 A.I. Oparin Medal. D. Reidel also contributed funds for the 1983 medal. This medal has been awarded at the last three meetings of ISSOL to the scientist deemed to have maintained the most outstanding research program in the origin of life field. Stanley Miller, recipient of the 1983 medal, presented this year's award to John Oró at the ISSOL banquet and closing ceremony on July 25, 1986 (see page 3).

(27)

NASA Technical Memorandum 4029

Publications of the Exobiology Program for 1986

A Special Bibliography

The George Washington University
Washington, D.C.
and
NASA Office of Space Science and Applications
Washington, D.C.

National Aeronautics
and Space Administration

Scientific and Technical
Information Division

1988

(28)

NASA Technical Memorandum 89605

Publications of the Exobiology Program for 1985

A Special Bibliography

The George Washington University
Washington, D.C.
and
NASA Office of Space Science and Applications
Washington, D.C.

NASA
National Aeronautics
and Space Administration

Scientific and Technical
Information Branch

1987

(29)

NASA Technical Memorandum 88382

Publications of the Exobiology Program for 1984

A Special Bibliography

Compiled by
Janice S. Wallace
The George Washington University
Washington, D.C.

Donald L. DeVincenzi
NASA Office of Space Science and Applications
Washington, D.C.

NASA
National Aeronautics
and Space Administration

Scientific and Technical
Information Branch

1986

(30)

NASA Technical Memorandum 86653

Publications of the Exobiology Program for 1983

A Special Bibliography

Compiled by
Linda G. Pleasant
The George Washington University
Washington, D.C.

Donald L. DeVincenzi
NASA Office of Space Science and Applications
Washington, D.C.

NASA
National Aeronautics
and Space Administration

Scientific and Technical
Information Branch

1984

(32)

NASA Technical Memorandum 84895

Publications of the Exobiology Program for 1981

A Special Bibliography

Compiled by

Linda G. Pleasant
The George Washington University
Washington, D.C.

Donald L. DeVincenzi
NASA Office of Space Science and Applications
Washington, D.C.

National Aeronautics
and Space Administration

Scientific and Technical
Information Office

1982

(33)

NASA Technical Memorandum 83808

Publications of the Exobiology Program for 1980

A Special Bibliography

Compiled by
Linda G. Pleasant and Donald L. DeVincenzi
NASA Office of Space Science
Washington, D.C.

National Aeronautics
and Space Administration

**Scientific and Technical
Information Branch**

1981

(34)

NASA Technical Memorandum 82182

Publications of the Exobiology Program for 1979: A Special Bibliography

Compiled by
Linda G. Pleasant and Donald L. DeVincenzi
NASA Office of Space Science
Washington, D.C.

National Aeronautics
and Space Administration

**Scientific and Technical
Information Branch**

1980

(35)

NASA Technical Memorandum 80745

Publications of the Planetary Biology Program for 1978

A Special Bibliography

Compiled by Linda G. Pleasant and Richard S. Young
NASA Office of Space Science
Washington, D.C.

NASA
National Aeronautics
and Space Administration

**Scientific and Technical
Information Branch**

1979

(36)

NASA Technical Memorandum 80338

Publications of the Planetary Biology Program for 1977

A Special Bibliography

Compiled by Linda G. Pleasant and Richard S. Young
Office of Space Science
Washington, D.C.

National Aeronautics
and Space Administration

**Scientific and Technical
Information Office**

1979

(37)

NASA Conference Publication 2425

Second Symposium on Chemical Evolution and the Origin and Evolution of Life

Edited by
Donald L. DeVincenzi
NASA Headquarters
Washington, D.C.

Patricia A. Dufour
The George Washington University
Washington, D.C.

Proceedings of a symposium sponsored by the National Aeronautics and Space Administration and held at NASA Ames Research Center
Moffett Field, California
July 23–26, 1985

NASA
National Aeronautics and Space Administration

Scientific and Technical Information Branch

1986

(38)

THE VOYAGER MISSION AND THE ORIGIN OF LIFE: SELECTED REFERENCES

Compiled by

LINDA G. PLEASANT

Department of Medical and Public Affairs, The George Washington University Medical Center, Washington, D.C., U.S.A.

(Received 29 March, 1982)

This bibliography contains references arranged in alphabetical order by author under the relevant Voyager scientific investigation. The last section includes laboratory simulation/modelling studies of the Jovian atmospheres.

General

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ABSTRACTS

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CONSIDERATION FOR SOLAR SYSTEM EXPLORATION: A SYSTEM TO MARS

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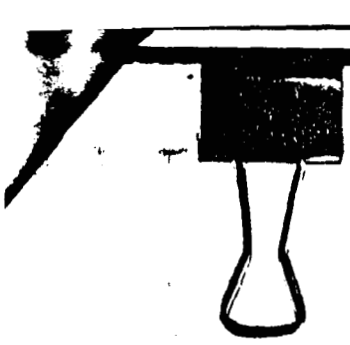
ABSTRACT: A piloted mission to Mars will challenge the human capacity to live and work in extreme environments for an extended period of time. Medical specialists will be called upon to certify that individuals selected for such a voyage are healthy enough to undergo 2 to 3 years of space flight. Spacecraft life support systems must prevent accumulation of toxic chemicals; psychological issues (isolation, confinement) will acquire greater importance; and radiation exposures could exceed Apollo mission doses by orders of magnitude. Other critical issues that must be addressed include cardiovascular and musculoskeletal deconditioning, immunological and hematological changes, and nutritional considerations. Partial prevention of physiological adaptation to weightlessness through various countermeasures geared to the musculoskeletal and cardiovascular systems seems a natural approach to successful readaptation to Earth's gravity. However, doubts arise as to the efficacy of these countermeasures given the extended time required for a round trip to Mars. Readjustment to Earth's gravity may be quite difficult after such a voyage. Should physiological countermeasures prove insufficient, some level of artificial gravity may need to be provided. All of these issues must be better understood and resolved to guarantee productive human exploration of the Martian surface, and safe readaptation upon return to Earth.

INTRODUCTION

Experience has shown that humans can live and work in space for periods approaching one year. However, even short excursions into near-Earth orbit or to the moon have indicated that there is a penalty to be paid upon return to Earth's gravity field once adaptation to weightlessness has taken place. Even though a reduced gravity field exists on Mars, long-duration space travel in excess of one year to this less hospitable planet will challenge the resources of the medical knowledge base.

Before humans can safely undertake a flight to Mars--and safely return--certain stressors inherent to space flight and their physiological and psychological consequences must be considered. These stressors include altered gravitational loads (launch, weightlessness, reentry), sustained workloads, cabin environment (possible toxicological events, confinement), and radiation.

The biomedical issues which need to be adequately understood are changes which occur in different body systems such as cardiovascular, immunological, hematological, and musculoskeletal systems. Other important issues include nutritional considerations and countermeasure development. In addition, appropriate medical selection, screening, and certification of crews must be done for the long mission. A facility for medical care and health maintenance, equipped with the necessary instrumentatation and medications, should be provided on board the Mars transit and landing vehicles.



(51)

Chapter 1
Historical Perspectives

Arnauld E. Nicogossian and Victoria Garshnek

The late nineteenth century marked the invention of the first relatively crude vehicle for powered flight; in 1989, the unmanned Voyager spacecraft will rendezvous with the planet Neptune, to eventually leave the solar system. Clearly, the evolution of space flight has been rapid and progressive: six planets -- and a number of their satellites -- have been remotely studied, Apollo astronauts have worked on the lunar surface, and the scientific community and lay public have expressed enthusiasm for the prospects of a lunar base and a manned mission to Mars.

The need to sustain life and productive human function in space flight has presented an array of unique challenges in the fields of medicine and physiology. Concurrent advances in space flight capabilities and mission sophistication have spurred numerous technological breakthroughs in the biomedical sciences. The symbiotic relationship between the space sciences and medical sciences will continue to further space exploration and benefit terrestrial medicine.

The Support of Man in Space

The foundations for space medicine can be traced back many years to early programs in the fields of occupational and aviation medicine. However, it was not until World War II, and the development of the V-2 rocket, that serious consideration was given to the possibility of manned space flight and, in turn, the need for specialized space medicine. Major General H.G. Armstrong foresaw this need and, in 1948, at the USAF School of Aviation Medicine, organized a panel meeting on the topic of "Aeromedical Problems of Space Travel" (von Beckh, 1979). Presentations were made by (then Colonel) Armstrong, Professor Hubertus Strughold (later to be regarded the "father of space medicine"), and the astrophysicist, Dr. Heinz Haber. From an historical

Chapter 22
Human Capabilities in Space Exploration and Utilization

Victoria Garshnek and Jeri Brown

Manned space flight can be viewed as an interaction of three general elements: the human crewmember (selection, protection, training); spacecraft systems (function, design, performance); and the environment (external, internal, and combined) (Figure 22-1). To ensure the greatest possible mission productivity and success, these elements must be properly integrated, compatible, and mutually supportive. Within such a systems perspective, the three elements become highly interdependent: typically, variations in one component have repercussions in one or more of the others (Nicogossian et al., 1984).

Figure 22-1. Elements of Mission Design (Nicogossian, 1984)

The human operator is a crucial element in this system. His capacity for fine sensory and perceptual discriminations of the environment both inside and outside the vehicle, and the swiftness and accuracy of his responses to specific stimuli, have often proved critical to mission success. These abilities, however, may be compromised by certain physiological, psychological, environmental, and spacecraft systems factors which can negatively influence behavior and performance (Christensen and Talbot, 1985). Table 22-1 lists some of these space flight factors, along with certain appropriate measures that can be implemented to achieve maximum mission productivity.

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PREPARING COSMONAUTS FOR SPACE FLIGHT: SIMULATION FACILITIES OF THE SOVIET SPACE PROGRAM

Victoria Garshnek, Ph.D.[1] and Robert Overmeyer, M.S.[2]

ABSTRACT

Training on specialized simulators is one of the most important methods of preparing cosmonauts to operate space craft systems and perform various mission activities. The Yuri Gagarin Cosmonaut Training Center, located within Star City, northeast of Moscow, is the primary site for cosmonaut training. Trainers that simulate the space environment, develop professional skills, and combine physical sensations of space with rehearsal of operational skills are utilized. Through a comprehensive and thorough approach, the Soviets prepare their crews for future extended flights, while refining their simulation and training programs as the complexities of work in space become more clearly understood.

INTRODUCTION

Simulation facilities have played an integral role in the manned space flight effort of the Soviet Union. From the beginning, simulators provided much of the information for man-machine design factors and training requirements. They continue to be particulary important in space mission design, since there is essentially no opportunity for a graduated series of practice efforts under true operational conditions prior to mission launch.

Simulators have been employed primarily for training purposes. Since space mission crews must be trained to be highly proficient in their tasks before flight, high fidelity simulator systems are imperative for training crewmembers for specific, individual aspects of the mission (partial simulation) and for the completely integrated "dress rehearsal" (full-scale simulation) (Connors et al., 1985). Integrated and specialized simulators are important tools for preparing cosmonauts to operate station and spacecraft systems and for practicing the entire scope of activities planned for a particular mission.

Through such training the crew learns to:

- Control spacecraft systems and equipment
- Orient the spacecraft by the Earth and Sun
- Carry out various spacecraft maneuvers
- Assemble and dismantle replaceable equipment
- Detect and eliminate malfunctioning systems
- Work as a crew during emergency situations
- Practice interaction with each other and with ground control
- Use flight gear
- Practice extravehicular activity (EVA)
- Work with onboard documentation
- Perform activities under conditions of time deficit, insufficient information, isolation, and sensory deprivation (Bluth and Helppie, 1986).

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(54)

Soviet Space Flight: The Human Element

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ABSTRACT

Building on past experience and knowledge, the Soviet manned space flight effort has become broad, comprehensive, and forward-looking. Their long-running space station program has provided the capabilities to investigate long-term effects of microgravity on human physiology and behavior and test various countermeasures against microgravity-induced physiological deconditioning. Since the beginning of Soviet manned space flight, the biomedical training and preparation of cosmonauts has evolved from a process that increased human tolerance to space flight factors, to a system of interrelated measures to prepare cosmonauts physically and psychologically to live and work in space. Currently, the Soviet Union is constructing a multimodular space station, the Mir. With the emergence of dedicated laboratory modules, the Soviets have begun the transition from small-scale experimental research to large-scale production activities and specialized scientific work in space. In the future, additional laboratory modules will be added, including one dedicated to biomedical research, called the "Medilab." The longest manned space flight to date (326 days) has been completed by the Soviets. The biomedical effects of previous long-duration flights, and perhaps those of still greater length, may contribute important insight into the possibility of extended missions beyond Earth, such as a voyage to Mars.

INTO EARTH ORBIT: INITIAL STEPS

"The Earth is the cradle of the mind, but one cannot live in the cradle forever."
Tsiolkovsky, 1857-1935

These words were written long ago by Konstantin Tsiolkovsky, a small-town Russian school teacher who, at the turn of the century, formulated the theoretical foundations for what has now become the Soviet Space Program. Tsiolkovsky foresaw space exploration as part of a continuing social process which would eventually transform human life and spread human civilization throughout the solar system (Riabchikov, 1971). His visionary writings of orbiting manned space stations, interplanetary greenhouses and solar system colonization still inspire Soviet manned space efforts--exemplifying the concept that dreams nurtured are dreams fulfilled.

Twenty-two years after Tsiolkovsky's death, on October 4, 1957, Sputnik 1 was launched, opening the path toward the realization of Tsiolkovsky's dreams. One month later, the Soviets launched Sputnik 2, a significant event since the spacecraft contained a passenger--a dog named Laika. Throughout the one-week flight, Laika's environmental and physiological parameters were telemetered back to Earth offering the first evidence that a higher vertebrate, physiologically similar to man, could not only withstand rocket launch, but also tolerate (for at least one week) a variety of space flight factors (Nicogossian and Parker, 1982).

Similar but expanded studies followed in a series of five "Korabl Sputnik" flights. These flights prepared the way for the world's first manned space flight. Table I displays a timeline of all Soviet manned missions to date.

On April 12, 1961, Yuri Gagarin became the first man to orbit the Earth in his Vostok 1 spacecraft (the Soviets also flew the first woman, Valentina Tereshkova, in the final flight of the Vostok series).

The six Vostok flights were similar in purpose to the six U.S. Mercury flights, sharing several basic objectives, which included: protecting the crewmember against the space environment, ensuring reliable operation of spacecraft systems, assuring safe and accurate reentry and landing, and establishing the basic parameters of human response to space flight (Nicogossian and Parker, 1982).

After the Vostok flights, the Soviets initiated the Voskhod series (essentially the same type of spacecraft). The internal configuration was changed by removing the ejection seat to accommodate up to three cosmonauts. In October, 1964, Voskhod 1 flew the first crew of three, including the first physician in space (Yegorov). His presence enabled the Soviets to obtain more comprehensive medical data in flight, concentrating on various problem areas such as space motion sickness, which was first exhibited by Gherman Titov during the Vostok 2 flight.

In March, 1965, Voskhod 2 was launched with two cosmonauts on board. The first extravehicular activity (EVA) was performed by Alexsey Leonov with the aid of an innovative inflatable airlock and self-contained life support system. This "space walk" consisted of 12 minutes outside the spacecraft and 10 minutes in the depressurized airlock. The Soviets did not attempt another EVA until four years later.

A two-year pause in flight activity followed the Voskhod flights, while a new ferry spacecraft, the Soyuz, was being developed. During this time, the Gemini Program provided the U.S. with experience in rendezvous, docking, and EVA in preparation for the Apollo Program. The Soviets would later develop these skills with their new spacecraft.

In 1967, the Soviets embarked on the long-running

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Space Medicine Research Publications: 1984-1986

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(56)

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Chapter 4
Space Vehicles for Manned Programs

Arnauld E. Nicogossian, James F. Parker, Jr., and Victoria Garshnek

The United States

During the first two decades of manned space flight, the vehicles designed to house and protect astronauts during their ventures into space basically followed a linear course of development. From the conical "tin can" of Project Mercury, through the Gemini program, and over the course of the Apollo and Skylab missions, the external configuration of the manned vehicle changed little. However, internal configuration and systems design were altered, often considerably, to accommodate increasing mission complexity, duration, crew size, and changing objectives. These changes were essentially elaborations upon the basic requirements for life support and instrumentation necessary for spacecraft control and task performance. Apart from the Skylab Orbital Workshop, which was designed for habitation rather than transportation, it was not until the advent of the Space Shuttle that American space vehicles underwent a fundamental change in design and appearance. The following discussion reviews the design of these spacecraft and the philosophy underlying their development.

Project Mercury

In the late 1950's, U.S. leaders attached great importance to the inception of a manned space flight program. Accordingly, the approach taken in Mercury was to use existing technology and off-the-shelf equipment in conjunction with the simplest design that would be reliable. All systems would be automated, with the astronaut functioning primarily as an observer and backup operator should manual control become necessary. The design requirements for the Mercury craft (Smith, 1981) were:

- An escape system which would separate the spacecraft from the launch vehicle in the event of a prelaunch emergency

(A)

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THE INTERNSHIP EXPERIENCE

NASA

planetary biology internship program
1980-1986

by

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The Regulatory Functions of Calcium and the Potential Role of Calcium in Mediating Gravitational Responses in Cells and Tissues

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(H)

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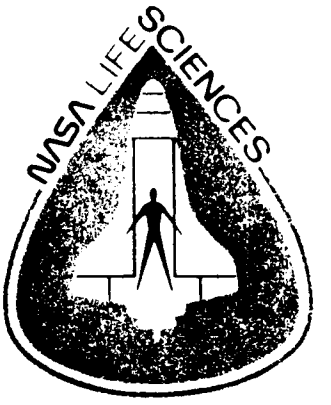
Abstracts



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