



Guide to the  
Ames Research Center  
Exobiology Branch Collection, 1960-1996  
ARC11.17

NASA Ames Research Center Archives

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## **Descriptive Summary**

### **Title:**

Ames Research Center Exobiology Branch Collection, 1960-1996

### **Collection Number:**

ARC11.17

### **Creator:**

Ames Research Center. Exobiology Branch

### **Dates:**

Inclusive: 1960-1996

Bulk: 1961-1993

### **Extent:**

Volume: approximately 20 cubic feet (28 linear feet)

18 record cartons, 2 letter Hollinger boxes, 3 oversized files

244 digital objects (1.96 gigabytes), PDF

### **Repository:**

NASA Ames Research Center Archives

Moffett Field, California 94035

### **Abstract:**

This collection documents the work of the Ames Research Center Exobiology Branch to develop spaceborne instrumentation and methodologies to detect the signatures of extraterrestrial life from the 1960s to the mid 1990s. It focuses on projects initiated in the Life Detection Systems Branch, starting with Vance I. Oyama's first-of-a-kind work as a principal investigator searching for biosignatures in the soil of Mars and in Apollo lunar samples, and the associated construction of a Lunar Biological Laboratory. Additionally, the collection includes Oyama's development of instrumentation for studying the Venusian atmosphere during the Pioneer Venus mission, as well as the efforts of his successor, Glenn Carle, to design instruments aimed at detecting life in comets and asteroids.

### **Administrative Information**

**Access:** Restricted Partly; This collection may contain information that has Controlled Unclassified Information (CUI).

**Distribution Limits:** Partly Public; NASA employees contact archivist regarding restricted materials.

**Publication Rights:** This collection may contain copyrighted material. The researcher assumes full responsibility for conforming with the laws of copyright. Securing permission to publish or use materials is the sole responsibility of the researcher.

### **Languages and Scripts:**

All records are in English.

### **Acquisition Information:**

Transferred by Orlando Santos on September 26-27, 2011, October 3, 2011, December 29, 2011, February 8, 2012, April 18, 2012, June 11, 2012, and the National Archives and Records

Administration on March 4, 2025, and October 20, 2025 (Acc. 2011-016, 2011-018, 2011-024, 2012-001, 2012-008, 2012-012, ARC-TR-2025-006, and ARC-TR-2025-011).

### **Custodial History**

Accession ARC-TR-2025-006 (Pioneer Venus Large Probe Gas Chromatograph project files, 1973-1985) was transferred from Ames Research Center's Space Sciences Division to the San Francisco Federal Records Center in 1987, then transferred to the ARC Archives as a permanent withdrawal in March 2025.

### **Related Material**

*Related collections at the Ames Research Center Archives*  
*AFS8100.15A: Pioneer Project Collection, 1952-1996*  
*AFS1070.8A: Archives Reference Collection, 1939-*  
*ARC25.03: Jeffrey N. Cuzzi Collection, 1975-2025*

### **Administrative History**

Fundamental multidisciplinary research into the origin, evolution, and distribution of life in the universe was launched at Ames in 1961 with the formation of the Exobiology Division, managed by Richard S. Young, under the life sciences research umbrella.(1) This followed the appointment of NASA's Bioscience Advisory Committee (known as the Kety Committee) in 1959 to provide guidance on the agency's role in life sciences. The impetus for establishing an exobiology research capability at Ames is expressed in the following excerpt from the committee's findings:

The basic study of extraterrestrial environments is ultimately likely to be most productive in furthering an understanding of the fundamental laws of nature. Among the most perplexing questions which have challenged men's minds are the nature and origin of life and the possibility of its presence in the Universe other than on the Earth alone. For the first time in history, partial answers to these questions are within reach.... The discovery of extraterrestrial life and a description of its various forms, knowledge of the presence and types of complex molecules based on carbon or other elements, or conversely, the absence of living organisms or of their traces in environments conducive to life will have important implications toward an ultimate understanding of biological phenomena.(2)

By 1964, the young division had appointed chiefs for its three branches. Vance I. Oyama came to Ames from the Jet Propulsion Laboratory to direct the Life Detection Systems Branch, which developed instrumentation and methodologies for detecting the presence of life in extraterrestrial environments. Cyril A. Ponnampertuma led the Chemical Evolution Branch, which was concerned with studying the origin of life in the universe, and attracted a young Carl Sagan to his lab at Ames in the early 1960s. Robert B. Painter headed the Biological Adaptation Branch, which set out study organisms capable of surviving in extreme environments on Earth.

Based on the contents of this collection, this administrative history is primarily focused on the work of the Life Detection Systems Branch under Oyama's leadership until approximately 1980 and under Glenn C. Carle until about 1994. During his tenure, Oyama pioneered first-of-a-kind efforts to employ gas chromatography to search for biological signatures in the soil of the Moon and Mars and to analyze the atmosphere of Venus, in the context of nine NASA missions. His initial work focused on analyzing lunar samples for signs of viable life. His bids to be a principal investigator for the Apollo 11-17 missions with "A Proposal for the Isolation, Culture, and Characterization of Viable Organisms from Lunar Samples"(3) were consistently approved. For these analyses, his approach involved incubating moon rocks in a nutrient-rich solution known to elicit "biological activity and growth for every terrestrial soil known to contain microorganisms"(4) and then waiting to see if any organisms

grew. Biological activity of the tests was monitored by gas analysis. Ultimately, no signs of life were detected in the samples.

To facilitate this analysis, the Lunar Biological Laboratory was constructed in Building N239A at Ames. The laboratory occupied the first floor of the structure and included sophisticated systems for maintaining a sterile environment for processing the samples, conducting tests, and analyzing results. The branch also developed comprehensive protocols to prevent cross contamination.

While his teams worked on lunar sample analysis, Oyama was also busy designing experiments to look for life in the Martian soil, with an eye to ensuring that these efforts would not contaminate the Martian environment. His gas exchange (GEX) experiment, for which he served as principal investigator, was one of three exobiology experiments within the Viking Lander Biology Instrument packages, alongside the labeled release (LR) experiment, and the pyrolytic release (PR) experiment. These experiments, carried aboard the twin Viking landers, did not detect signatures of life, though some scientists think the results were inconclusive.

In the 1970s, Oyama participated in the Pioneer Venus mission as a principal investigator for the large probe gas chromatograph (LGC) experiment (also called the sounder probe gas chromatograph experiment). For this mission, his investigations focused on the planet's atmosphere instead of its rocky surface, using a variation of a portion of the gas chromatograph he designed for the Viking lander experiments. This instrument measured and analyzed the chemical composition of the planet's atmosphere during the sounder probe's descent, providing insights into the gases and water vapor present. Data from Oyama's instrument, combined with returns from other Pioneer Venus instruments and in conjunction with data from the Soviet Venera spacecraft, greatly expanded our knowledge of the evolution and structure of the Venusian atmosphere. This, in turn, provided data for comparisons with other planets, which proved especially valuable for advancing our understanding of Earth, its habitability, and the consequences for life associated with dramatic climatic changes, using the runaway greenhouse effect observed on Venus as an informative model.

After Pioneer Venus, Glenn Carle stepped in as branch chief in 1981 following Oyama's retirement from federal service. In that year, the branch was renamed the Solar System Exploration Office. During Carle's tenure as chief through the mid-1990s, the Exobiology Branch researchers applied their expertise in designing gas chromatograph experiments, but none were flown because the missions for which they were designed were either canceled or not chosen during the proposal phase. Development of the Cometary Ice and Dust Experiment (CIDEX), with Glenn Carle as PI, was conducted from the late 1980s to early 1990s for the proposed Comet Rendezvous Asteroid Flyby (CRAF) mission, which was approved as a dual mission with Cassini before being canceled. CIDEX would have orbited the sun in tandem with a comet and also pass by an asteroid to take remote measurements. Carle's group then designed a smaller version of this instrument, called Mini CIDEX, from about 1992 to 1995 for a proposed Discovery class Cometary Coma Chemical Composition (C4) mission. By 2000, his group had developed the Gas Chromatograph - Ion Mobility Spectrometer (GC-IMS) instrument for another proposed Discovery Program mission (Hummingbird) designed to analyze the nucleus of a comet.

Starting in the mid-1980s, the exobiology function began its transition from under the Life Sciences umbrella to Space Science. By 1989, it was incorporated into the Space Science Division of the Space Research Directorate. In 1995, following Glenn Carle's tenure as chief, Donald DeVincenzi briefly took the helm as acting chief until Sherwood Chang stepped in to fill the role. Chang had joined what was originally the Chemical Evolution branch in 1968, attracted by the prospect of working with lunar samples as a principal investigator for Apollo 11. In 1975, he had brief stints (circa 1980 to 1985) as chief of the Chemical Evolution Branch and assistant chief for research for the Exobiology Division, before being promoted to head the Planetary Biology Branch from about 1985

until his retirement in 1998. Among his many achievements, Chang is remembered as a heavyweight across scientific disciplines and credited with being one of the architects of the field of astrobiology.

Currently, the exobiology function is a branch in the Space Science and Astrobiology Division.

#### Selected Exobiology Branch Timeline

- 1959 NASA's Bioscience Advisory Committee emphasizes the significance of studying extraterrestrial environments to search for life
- 1961 Exobiology Division formed within Life Sciences with Richard S. Young as chief
- 1962 Exobiology Division adds a Life Synthesis Branch and Cellular Biology Branch
- 1963 Exobiology Division branches are now Life Detection Systems, Biochemical Evolution, and Cellular Biology
- 1964 Exobiology Division comprises a Life Detection Systems Branch headed Vance I. Oyama, a Chemical Evolution Branch headed by Cyril A. Ponnampuruma, and a Biological Adaptation Branch headed by Robert B. Painter
- 1965 In the lab, Cyril Ponnampuruma and team synthesize some of the individual genetic building blocks necessary for forming life
- 1967 Leonard P. Zill is acting chief of the division and Milton R. Heinrich heads the Biological Adaptation Branch  
Contract awarded for the construction of the ARC Lunar Biological Laboratory
- 1968 Leonard P. Zill is chief of the division
- 1969 Analysis of lunar samples collected during the Apollo 11 and 12 missions begins in the ARC Lunar Biological Laboratory and other labs in the division
- 1971 Analysis of lunar samples collected during the Apollo 14 and 15 missions continues at Ames  
Chief position for the Chemical Evolution Branch is vacant
- 1972 Analysis of lunar samples collected during the Apollo 16 and 17 missions continues at Ames.  
The Exobiology Division becomes the Planetary Biology Division with a Life Detection Systems Branch still headed by Vance Oyama, Biological Adaptation Branch still headed by Milton Heinrich, and Chemical Evolution Branch headed by Keith A. Kvenvolden.
- 1975 Sherwood Chang is chief of the Chemical Evolution Branch
- 1976 Viking 1 and 2 Landers land on Mars and carry the Viking Lander Biology Instrument packages, which include Vance Oyama's gas exchange (GEX) experiments
- 1977 Planetary Biology Division becomes the Extraterrestrial Biology Division with Vance Oyama heading the Planetary Exploration Office (the Chemical Evolution, Biological Adaptation, and Life Detection Systems branches are discontinued).  
A Search for Extraterrestrial Intelligence Office forms with John Billingham as chief.
- 1978 Pioneer Venus multiprobe enters the Venusian atmosphere. Instruments aboard include Vance Oyama's large probe gas chromatograph (LGC) experiment
- 1979 Extraterrestrial Biology Division is renamed the Extraterrestrial Research Division
- 1981 Planetary Exploration Office is renamed the Solar System Exploration Office and is headed by Glenn C. Carle
- 1984 John Billingham heads the Extraterrestrial Research Division and Bernard M. Oliver heads the Search for Extraterrestrial Intelligence Office
- 1985 Life Science Directorate becomes a division headed by John Billingham and is moved under the Space Research Directorate. It has the following Exobiology functions: Solar System Exploration Branch (still headed by Glenn Carle), Planetary Biology Branch headed by Sherwood Chang, and Search for Extraterrestrial Intelligence Office (still headed by Bernard Oliver)
- 1989 Exobiology function is moved from the Life Science Directorate to the Space Science Directorate within the Space Research Division and comprises the Solar Systems Exploration Branch and Planetary Biology Branch. The Search for Extraterrestrial Intelligence Office moves up to the division level and John Billingham steps in again as chief.

- 1995 Exobiology Branch is formed with Donald L. DeVincenzi as acting chief (the Solar Systems Exploration and Planetary Biology branches are discontinued)
- 1996 Sherwood Chang heads the Exobiology Branch
- 1998 Exobiology Branch chief position is vacant
- 1999 The Space Directorate is renamed the Astrobiology and Space Research Directorate and the Exobiology Branch chief position is filled by Mark H. Kliss.
- 2001 David F. Blake heads the Exobiology Branch
- 2026 The Exobiology Branch is in the Space Science and Astrobiology Division within the Science Directorate

#### Exobiology Research, Selected Managers

##### Vance I. Oyama

- 1962 Hired by Richard S. Young
- c. 1964 - 1981 Chief, Life Detection Systems Branch (and other iterations of this function)

##### Glen C. Carle

- 1963 Hired by Vance Oyama
- 1981 - 1994 Succeeds Oyama as chief, following Oyama's retirement circa 1981

##### Cyril A. Ponnampерuma

- 1962 Comes to work at Ames
- c. 1964 - 1970 Chief, Chemical Evolution Branch

##### Sherwood Chang

- 1968 Hired by Cyril Ponnampерuma to join the Chemical Evolution Branch
- 1975 Chief, Chemical Evolution Branch
- 1981-1984 Assistant Chief (Research), Extraterrestrial Research Division
- 1985-1994 Chief, Planetary Biology Branch
- 1996-1998 Chief, Exobiology Branch (retired September 29, 1998)

#### Endnotes

1. Edwin Hartman. *Adventures in Research: A History of Ames Research Center, 1940-1965*. Washington, D.C.: NASA SP-4302, 1970, 485.
2. Richard S. Young, Robert B. Painter, and Richard D. Johnson. *An Analysis of the Extraterrestrial Life Detection Problem*. NASA SP-75. 1965. Accessed October 27, 2025. <https://ntrs.nasa.gov/api/citations/19650024626/downloads/19650024626.pdf>.
3. *Proposals*. NASA Ames Research Center Archives, ARC11.17, Exobiology Branch Collection, 1960-1996 (ID FRC-000076).
4. *ibid.*

#### Sources Consulted

- Ames Research Center. Telephone Directories. NASA Ames Research Center Archives, AFS1070.8A, Archives Reference Collection, 1939-2025.
- Ames Research Center. *The Appointment of Five Ames Staff Members to New Positions Announced*. October 25, 1962. Ames Astrogram, Volume 5, Number 1. NASA Ames Research Center Archives, AFS1380-69A, Ames Astrogram Collection.
- Billings, Linda. *In Memoriam: Sherwood Chang*. Accessed January 7, 2026. <https://astrobiology.nasa.gov/news/in-memoriam-sherwood-chang/>
- Carle, Glenn interview by Steven J. Dick, May 13, 1997. NASA Ames Research Center Archives, ARC20.06, Oral History Interviews of Ames Personnel.
- Chang, Sherwood interview by Steven J. Dick, November 21, 1997. NASA Ames Research Center Archives, ARC20.06, Oral History Interviews of Ames Personnel.

Lunar Biological Lab Construction. NASA Ames Research Center Archives, ARC11.17, Exobiology Branch Collection, 1960-1996 (ID FRC-000032).

Richard O. Fimmel, Lawrence Colin, and Eric Burgess. *Pioneering Venus: A Planet Unveiled*. Washington, D.C.: NASA SP-518, 1995.

Search For Extraterrestrial Life: Protocol for the Examination of Lunar Samples in the Lunar Biological Laboratory. NASA Ames Research Center Archives, ARC11.17, Exobiology Branch Collection, 1960-1996 (ID FRC-000038).

## **Scope and Content**

This collection encompasses research and development in exobiology conducted between the early 1960s and the mid-1990s, primarily led by biochemist Vance Oyama, the inaugural chief of the Life Detection Systems Branch, along with his successor, Glenn Carle.

The majority of the files focus on the design of gas chromatography instruments intended for deployment on spacecraft. Most of these were designed to detect signs of life within the solar system, including the Moon, Mars, a main belt asteroid, and the ice and dust in the comae and nuclei of comets, while another would study the atmosphere of Venus. The files also cover methodologies for analyzing data returned from missions that flew. Among these instruments, those that were ultimately flown were carried by the twin Viking Landers sent to Mars in 1975 and by the Pioneer Venus large probe in 1978.

Series I contains records created by both Oyama and his branch. Subseries 1 includes Oyama's records related to his analysis of lunar regolith returned from the Apollo missions 11, 12, 14, 15, 16, and 17. It provides insight into the design of a Lunar Biological Laboratory at Ames in the late 1960s for this work, and development of associated protocols for handling the material without contaminating the samples or potentially harming life on earth. Also included are files pertaining to agency-level work on lunar sample return. Subseries 2 contains records relating to the the Viking lander mission science and engineering efforts in general and lander biology instruments specifically. Subseries 3 documents the development of the Pioneer Venus large probe gas chromatograph.

Series II comprises files maintained by Daniel R. "Dan" Kojiro, incorporating selected files inherited from Oyama. These include technical and project management documentation and photographic materials relating to the Pioneer Venus Lunar Gas Chromatograph (LGC) and Viking Gas Exchange (GEX) instruments, and the Lunar Biological Laboratory.

Series III encompasses branch files mainly generated during Glenn Carle's leadership. Most files are dedicated to the development and testing of gas chromatograph instrumentation designed for proposed missions targeting comets and an asteroid.

Series IV contains technical artifacts related to Oyama's Viking Lander and Pioneer Venus gas exchange experiments.

## **System of Arrangement**

The majority of this collection was kept in the creator's original order, which was disturbed. Files in Subseries 1 and 2 of Series I were arranged by Federal Record Center transfer number, then chronologically by mission.

## **Existence and Location of Originals**

Original and additional paper files for Series I.1 and I.2 are held at the National Archives and Records Administration at San Francisco, California.

## **Separated Material**

General and technical administrative files and a selection of chromatogram data files were separated from the collection. A sampling of these files was retained as exemplary of an older methodology and to retain other information in the files.

## **Series Descriptions**

### **Series I: Records Sent to the National Archives, 1960-1981, 244 digital files, 57 folders**

This series contains file sets that the Exobiology Branch selected and transferred to the National Archives and Records Administration (NARA). Subseries 1 and 2 document efforts led by Vance Oyama, including the search for life in returned lunar samples from Apollo missions and the development of the Lunar Biological Laboratory at Ames. It also documents Oyama's development of instrumentation for the Viking Landers to search for viable life as well as broader science and engineering efforts for the Viking Mission. (Files in these subseries are a digitized subset of the records transferred to NARA.) Subseries 3 documents the development of instrumentation for the Pioneer Venus mission's large probe that measured the atmospheric composition of that planet. These files were not retained by NARA so were transferred back to Ames.

#### **1. Apollo Lunar Sample Analysis and Lunar Biological Laboratory, 1965-1979, 55 digital files**

The files in this subseries belonged to Branch Chief Vance Oyama, who was a Principal Investigator for Apollo lunar sample analysis. The subseries comprises files related to the first-of-a-kind search for viable life in returned Apollo lunar samples and the development of the Lunar Biological Laboratory. The documentation, which pertains to the Apollo 11-17 missions, includes correspondence and memoranda from circa 1965 to 1973, sample inventories and analyses, proposals, plans, notes, reports, and contracts. There are also files related to laboratory construction and the development of associated protocols. Other items of interest include files related to the 1967 Santa Cruz summer study on lunar exploration and science, as well as a Lunar Mission Planning Data Book from the same year.

#### **2. Viking Lander Mission and Biology Instrument Gas Exchange Experiment, 1960-1977, 189 digital files**

This series contains a diverse range of documentation for the Viking Mission and the Viking Biology Instrument (VLBI) and Gas Exchange (GEX) Experiment projects, focusing on the development of first-of-a-kind experiments to detect life on Mars. Key materials include science proposals, planning, strategy, testing, and review files. Several years of progress reports, meeting minutes, correspondence, and memoranda further contextualize the mission's science efforts. Additional documentation in this series covers a range of mission management, planning, design, review, and operational activities. There are two sets of newsletters: the Viking Newsletter spanning from 1973 to 1974, and a run of Viking Science Activities newsletters from 1970 to 1975. Also noteworthy is a NASA technical note describing the First Planning Conference on Biomedical Experiments in Extraterrestrial Environments that was held in June 1960 (NASA TN D-781). The contents of this series appear to be a mix of files maintained by both the branch and Vance Oyama, who was the GEX Principal Investigator.

#### **3. Pioneer Venus Sounder Probe Gas Chromatograph Project, 1973-1981, 57 folders**

This series contains project files for the design of the Pioneer Venus large probe (also called the sounder probe) gas chromatograph (LGC) instrument, for which Oyama was principal investigator. The LGC measured the atmospheric composition of Venus in December 1978. Included are project technical documents, reviews, proposals, progress reports, and memoranda.

## **Series II: Branch Files, 1960s-1970s**

Files in this series, which were mostly created by both Vance Oyama and Daniel R. "Dan" Kojiro, contain documentation related to the development of the Pioneer Venus LGC and Viking GEX

instruments. Included are project proposals, progress reports, memoranda, design reviews, technical presentations and reports, schematics, drawings, data, test documentation, experiment results, some GEX flight data, and photographs of instrumentation and personnel. Also included is a binder of photographs of personnel in the Lunar Biological Laboratory performing lab preparations and lunar sample experiments. A clippings file contains a copy of "The Case for Mars: Concept Development for a Mars Research Station."

### **Series III: Branch Files, 1980s-1990s**

Materials in this series were created by various members of the branch, such as Glenn Carle, Bonnie J. Ohara, and Dan Kojiro. A large portion of the files pertain to the development of instrumentation for potential CRAF, CIDEX, C4, and Hummingbird missions, which were mainly focused on studying comets. These documents include proposals, plans, correspondence, meeting files, data and test files, laboratory notes, and reports. Another portion of the files comprises reference documentation across a range of subjects including gas chromatographic analysis, methodologies, and data capture, as well as some administrative files and staff photographs.

### **Series IV: Instruments, 9 objects**

This series contains instrument components related to Exobiology Branch gas exchange and chromatograph experiments and a gas analysis instrument. According to Dan Kojiro, a subject matter expert from the branch, some instrument components appear to be ground unit test simulation models for the Viking Lander or Pioneer Venus gas exchange experiments.

### **Indexing Terms**

The following terms may be used to index this collection.

#### Corporate Name

Ames Research Center. Exobiology Branch  
Ames Research Center. Lunar Biological Laboratory  
Lunar Receiving Laboratory (Manned Spacecraft Center)

#### Personal Name

Carle, Glenn C., 1936-  
Oyama, Vance I.

#### Subjects

Apollo Gas Exchange Experiment  
Biomarkers  
Cometary Atmospheres  
Cometary Coma Chemical Composition  
Cometary Ice and Dust Experiment  
Comet Rendezvous Asteroid Flyby Mission  
Gas Chromatography  
Gas Spectroscopy  
Exobiology  
Lunar Receiving Laboratory  
Lunar Rocks  
Mars Exploration  
Mars (Planet)  
Moon  
Pioneer Venus 2 Sounder Probe

Pioneer Venus Large Probe Gas Chromatograph  
Solenoids  
Spacecraft Instruments  
Venus Atmosphere  
Venus (Planet)  
Viking 1 Lander  
Viking 2 Lander  
Viking Lander Biology Instrument  
Viking Lander Gas Exchange Experiment

### **Selected Acronyms**

C4	Cometary Coma Chemical Composition
CIDEX	Cometary Ice and Dust Experiment
CRAF	Comet Rendezvous Asteroid Flyby
GEX	Gas Exchange Experiment
ISSOL	International Society for the Study of the Origin of Life
LCG	(Pioneer Venus) Large Probe Gas Chromatograph
SPGC	(Pioneer Venus) Sounder Probe Gas Chromatograph
Mini CIDEX	Mini-Cometary Ice and Dust Experiment
PVGC	Pioneer Venus Large Probe Gas Chromatograph
PVGCAA	Pioneer Venus Gas Chromatograph Atmospheric Analyzer
RTOP	Research and Technology Objectives and Plans
VLBI	Viking Lander Biology Instrument