A BRIEF HISTORY OF THE SPACE SCIENCES LABORATORY AT THE UNIVERSITY OF CALIFORNIA, BERKELEY

by

Forrest Mozer

My purpose is to explain how it happened that, in its 50 years of existence, the Space Sciences Laboratory at Berkeley has risen to be the premier academic institution in the world for atmospheric, ionospheric, auroral, magnetospheric, planetary, interplanetary, solar, astrophysics and cosmology research.

"The first qualification for a historian is to have no ability to invent" - Stendhal

EARLY HISTORY OF SATELLITE LAUNCHES

1954	U.S. Army/U.S. Navy began Project Orbiter
1955	Project Orbiter cancelled by Eisenhower in favor of U.S. Navy Project Vanguard
Oct. 4, 1957	Russia launches Sputnik I
Nov. 3, 1957	Russia launches Sputnik II
Dec. 6, 1957	Vanguard launch failure. Project Orbiter revived shortly before this failure.
Jan. 31, 1958	Explorer I launched. Payload was a Geiger tube for measuring cosmic rays, temperature sensors, and a micrometeorite detector. Payload built in 84 days
Feb 5, 1958	Vanguard launch failure
March 5, 1958	Explorer 2 launch failure
March 17, 1958	Vanguard 1 launched. Called "Grapefruit satellite" by Kruschev
March 21, 1958	Explorer 3 launched. Discovered the Van Allen radiation belts.
1957-1959	Eleven Vanguard launch attempts. Three reached orbit

"Physics is like sex: sure, it may give some practical results, but that's not why we do it."
Richard Feynman

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February 10, 1959

Chancellor Glenn T. Seaborg
Durnells Hall
Berkeley Campus

Dear Chancellor Seaborg:

The Committee on Space Sciences presents the following proposal for the establishment of a Space Sciences Laboratory on the Berkeley campus. If this proposal is approved, funds should be sought from the National Aeronautics and Space Administration to support the Laboratory.

Proposal

Scientists are no longer limited to experiments that must be performed on the earth. Already significant scientific results have been obtained from satellites placed in orbit by powerful rockets and from instruments shot completely out of the gravitational influence of the earth. A new era in scientific experimentation is upon us, and scientists on the Berkeley campus have actively entered into planning experiments that can only be performed with rockets and satellites.

We have before us almost unlimited possibilities for experiments in astronomy, physics, chemistry, nuclear chemistry, and biology. There is an enormous amount of interest in space sciences on the Berkeley campus, and a strong feeling that the University should enter this field of study. Several of our scientists are already engaged in various types of work in connection with rockets, artificial satellites, and other space vehicles.

A Committee on Space Sciences has been established, with the following membership: Professors Otto Struve (Chairman), Robert B. Brode, Melvin Calvin, Isadore Perlman, Edward Teller, Cornelius A. Tobias, Dr. A. E. Whitford, Dr. Haydon Gordon and Dr. Herbert York. This Committee has considered the report of a previous informal ad hoc group, also under the chairmanship of Professor Struve, in which it was recommended that an interdepartmental space laboratory be established on the Berkeley campus. The Committee endorses this idea and presents the following proposal for a Space Sciences Laboratory.

FUNCTIONS:

1. The proposed Laboratory would provide specialized services and equipment for experimental projects. The fundamental questions to be answered by experiments or observations possible only in a satellite could be proposed by scientists anywhere in the University. One role of the University Laboratory in space science research would be to design a practical method of performing the experiments and to invent and provide the sensing instruments. Other agencies would provide the vehicle, the telemetering system, and the tracking and data-recovering system. Although University scientists can design the experiments, the specialized problems of equipment design and packaging, as well as handling of data after recovery, are such as to demand facilities not now available in the scientific departments of the University. The Laboratory would provide these services and facilities, preventing wasteful duplication of effort and expensive equipment in the various departments and to act as a clearing house for information on space science. Special equipment, such as g-testing tables and vacuum tanks, would be needed, and special talents of electronic and mechanical engineers would also be required.

- Members of The Committee On Space Sciences:
  Otto Struve, Professor of Astronomy, CHAIRMAN
  Robert Brode, Professor of Physics
  Melvin Calvin, Professor of Chemistry
  Haydon Gordon, Chief Engineer, Lawrence Radiation Lab
  William Fretter, Professor of Physics (substitute for Brode)
  Isador Perlman, Professor of Chemistry
  Edward Teller, Professor of Physics, Director of Livermore Radiation Lab
  Cornelius A. Tobias, Professor of Medical Physics
  A. E. Whitford, Professor of Astronomy, Director of Lick Observatory
  Herbert York, Professor of Physics

Excerpt from the proposal to the Regents

"There are few places in the nation where such a remarkable galaxy of scientific stars could be assembled. They are enthusiastic about space. They have concluded that, if the University is to retain its reputation at the forefront of scientific research and teaching, a space sciences program must be established without delay… One needs a new perspective to appreciate these possibilities. If the ideas seem fantastic, please remember that they are from the minds of a group of the nation's most eminent scientists, most of whom are members of the National Academy of Sciences."

"One of my impressions from this proposal is this: it seems to me that the scientists, who only recently have had practical reasons for considering space research, are themselves amazed at what awaits them. A fabulous, adventurous frontier beckons." -- Clark Kerr

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FORMAL PROPOSAL TO THE REGENTS TO ESTABLISH THE SPACE SCIENCES LABORATORY

SPACE SCIENCES LABORATORY

Faculty Investigator: Chairman of the Space Sciences Committee
At present, Professor Otto Struve.

Amount: $500,000.00

Duration: Twelve Months

University of California
Berkeley, California
March 20, 1959

"Research!! A mere excuse for idleness; it has never achieved, and will never achieve any results of the slightest value." - Benjamin Jowett, British theologian (1817-1893)

BUDGET

A.	Personnel		
	Director (two-thirds time)	$ 12,000	
	Research Engineer (Electronics)	12,000	
	Research Engineer (Mechanical)	12,000	
	Associate Research Astrophysicist (1/2 time)	4,578	
	Associate Research Biologist (1/2 time)	4,578	
	Associate Research Physicist (1/2 time)	4,578	
	Associate Research Chemist (1/2 time)	4,578	
	Principal Electronic Technician	6,516	
	Principal Electronic Technician	6,516	
	Senior Electronic Technician	5,364	
	Senior Electronic Technician	5,364	
	Principal Laboratory Mechanician	6,360	
	Principal Laboratory Mechanician	6,360	
	Senior Laboratory Mechanician	5,496	
	Senior Laboratory Mechanician	5,496	
	Assistant Business Manager II	7,356	
	Secretary	4,092	
	Graduate Research Physicist II	4,980	
	Graduate Research Chemist II	4,980	
	Graduate Research Biologist II	4,980	
	Graduate Research Astrophysicist II	4,980	
	Graduate Students:	20,940	
	Research Assistants (10 at 1/2 time - $2,094 each)		$154,092.00
	State Employees Retirement System Charges		12,322.72
	Workmen's Compensation		1,004.23
B.	Overhead on Salaries (32%)		49,309.44
C.	Supplies and Expense		113,271.61
D.	Travel		20,000.00
E.	Equipment:		200,000.00
	1. Electronic Testing Equipment (Oscilloscopes, power supplies, scaling circuits, radio receivers and transmitters, etc.)	$90,000.	
	2. Mechanical Equipment (machine tools)	50,000.	
	3. Special Facilities for environmental and shake- and g-testing of packages of equipment.	60,000.	
	Cost of Space Sciences Laboratory for twelve months		$550,000.00
	Less: University Contribution for purchase of equipment*		50,000.00
	Amount requested from NASA		$500,000.00

*In addition to this direct contribution, the University will contribute a very substantial amount indirectly. Approximately ten regular faculty members will participate in research in the Laboratory, and it is expected that this number will increase. Graduate students will also participate in the research program of the Laboratory.

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SPACE SCIENCES LABORATORY

Faculty Investigator: Chairman of the Space Sciences Committee
At present, Professor Otto Struve

Amount: First Year - 1959-1960 $250,000
Second Year - 1960-1961 $350,000
Third Year - 1961-1962 $500,000

Duration: Three Years

University of California
Berkeley, California
May 13, 1959

NASA did not fund this proposal because the NASA Administrator, Dr. Keith Glennan, was opposed to supporting laboratories at universities. His policy was to support only specific projects.

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  (Director's Office)
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Sam Silver was the driving force behind the establishment of the early facilities because he argued that he did not wish to be Director of a Lab whose main function was processing paperwork for grants and contracts.


SPACE SCIENCES LABORATORY

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The INDEPENDENT

Contra Costa County's Complete Home Newspaper

Richmond, Calif., Friday, Jan. 12, 1962 ★ FIFTY-SECOND YEAR

UC to Build Space Age Lab

Millions to Be Involved

The University of California will start immediately on a crash program for the establishment of a space age laboratory at the university's Service Center—the former Ford assembly plant—at the foot of South 10th St. in Richmond.

This information was gained by The Independent today in an exclusive interview with Chancellor Edward W. Strong, who said that an appropriation of $100,000 has been authorized for the remodeling of the plant and the installation of laboratories, offices and a scientific library.

While no appropriation figures beyond that for the remodeling were announced, it is expected the amount will run into the millions of dollars through a continuing program.

So anxious is the university to press the program, Chancellor Strong said, that a staff of 40 persons, mostly scientific researchers, will be installed in the plant immediately. This number will be doubled, at least, within the year. It is hoped to have the program actually under way by March of this year.

The announcement followed the return from Washington, D.C., of the university's president and vice president, Dr. Clark Kerr and Dr. James Corley, who conferred with James Webb, NASA chief, and other high government officials.

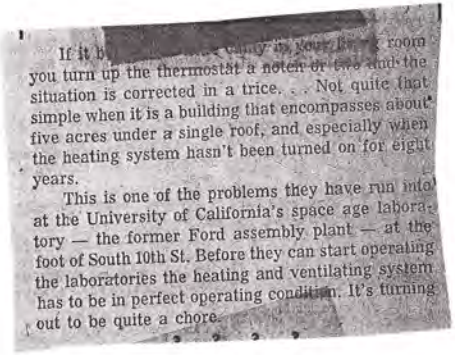
The program here will be divided into three parts:

1. The study of primates when exposed to space environment. Prototype space capsules will be built here and efforts made to simulate space conditions. The reactions of the primates will be carefully recorded.

This program will be under the direction of Dr. Harden Jones, professor of medical psychology and physiology. Dr. L. J. Milch will supervise the research.

2. A space scientific laboratory to deal with genesis and maintenance of life on planets other than earth. It is hoped through micro-organisms to prove that planets other than earth will support life. This portion of the research will be under the direction of Dr. Samuel Silver, assisted by Dr. Carl Sagen and Dr. Stanley Scher.

3. The study of mammals as exposed to the impact of space environment, including the problem of vertigo and space travel. An attempt will be made to seek means for adjusting human beings to the vicissitudes of space life. This program will also be under the direction of Dr. Silver and supervised by Dr. George Rosenfeld.



If it b[illegible] you turn up the thermostat a notch or two and the situation is corrected in a trice. . . Not quite that simple when it is a building that encompasses about five acres under a single roof, and especially when the heating system hasn't been turned on for eight years.

This is one of the problems they have run into at the University of California's space age laboratory — the former Ford assembly plant — at the foot of South 10th St. Before they can start operating the laboratories the heating and ventilating system has to be in perfect operating condition. It's turning out to be quite a chore.

The University of California will start immediately on a crash program for the establishment of a space age laboratory... at the foot of South 10th Street in Richmond.

Chancellor Strong said that a staff of 40 persons, mostly scientific researchers, will be installed in the plant immediately. This number will be doubled at least within a year.

The program will be divided into 3 parts:

1. The study of primates when exposed to the space environment. Professor Hardin Jones.
2. Genesis and maintenance of life. Professor Sam Silver and Dr. Carl Sagan.
3. The study of mammals exposed to the space environment. Professor Sam Silver and Dr. George Rosenfeld.

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keley Daily Gazette

BERKELEY, CALIFORNIA, THURSDAY EVENING, DECEMBER 6, 1962

Publication Office: 2048 Center St., Berkeley, Calif.
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LU

Downtown Site OK'd For New UC Science Lab

Permit Good for 2½ Years

Space science research will be conducted in the middle of downtown Berkeley.

This is the report today of the Board of Adjustments, which has granted the University of California a permit to "temporarily" locate its new space sciences laboratory in a former shoe store and market building at 2119 University Ave. while the permanent quarters are being constructed.

The permanent laboratory will be located in the hills behind the campus and be part of the Lawrence Radiation Laboratory.

The short-term grant of variance is for two and a half years—the time estimated for completion of the permanent laboratory.

"We don't normally approve the location of laboratories in the center of town, but since it's a short term, and due to the nature of the research, we found it acceptable," Robert Humphreys, Board of Adjustment spokesman, reported.

The space sciences laboratory will serve as a research unit for students working on basic elec-

(Continued on Page 3, Column 4)

Downtown Site OK'd for Science Lab

(Continued From Page One)

tronic experimentation. It will also include a small bench assembly shop.

PUBLIC DISPLAYS

Plans call for displays in the front windows of the research center so the public can benefit from the latest experiments in this newest of study fields, Humphreys observed.

Next step in establishment of the research center is approval by the University's Board of Regents, which could not act until the Board of Adjustments gave the go-ahead sign.

Dr. Samuel Silver, director of the University's space science laboratory, said the activities of his department are presently spread all over campus and "bursting at the seams."

"Work in the space sciences is expanding so rapidly that we must have more room near the campus for easy student access," Dr. Silver said.

Main function at the center will be the assembly of payloads for orbiting in geophysical observatories.

SOLAR ACTIVITIES

Units built in the temporary Berkeley research center will measure solar activities and radiation around the earth. Information obtained from the observatories will be processed in the Berkeley laboratory.

One of the payloads for an observatory has already been sent east by the University and is scheduled to go into orbit early next year.

Others assembled in the Berkeley lab will also identify measure pulses of light and s Dr. Silver reported.

Approximately 15 scientists assistants will be stationed i temporary Berkeley labora Kinsey A. Anderson, associat fessor of physics and El C resident, will be director.

Date for opening of the contingent on the regent' proval of the location.

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MEMORANDUM OF UNDERSTANDING
BETWEEN
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AND
THE UNIVERSITY OF CALIFORNIA (BERKELEY)
CONCERNING RESEARCH FACILITIES GRANT NsG(F) 5-62

It is the policy of the National Aeronautics and Space Administration to support research in space related science and technology at non-profit scientific and educational institutions. Where additional research facilities are urgently needed to conduct such research and the institution involved has demonstrated its intent to seek ways in which the benefits of such research can be applied to the social, business, and economic structure of the United States, NASA may supplement research support with funds necessary for the construction of such facilities. The National Aeronautics and Space Administration is particularly desirous that the environment in which space research is conducted will be characterized by a multidisciplinary effort which draws upon creative minds from various branches of the sciences, technology, commerce, and the arts.

The University of California has conceived and implemented a multidisciplinary program of space research and has received strong financial support from NASA during the last several years. It is expected that the space research efforts of California scientists will be significantly extended as a result of the laboratories being made available in these facilities. The University has made a staff of exceptional scientists available to conduct research on space oriented problems while providing a framework within which students can work toward graduate degrees in interdisciplinary fields. The research results and trained scientists emerging from these efforts are expected to make a major contribution to the nation's space efforts. The physical limitations and separation of available laboratory research facilities for experiments in space at California are now blocking the expansion of their research in a manner detrimental to the most rapid advancement of the space effort.

The University of California has requested NASA's support for construction of additional facilities in accordance with its proposal SC 3372-F and supplementary information. It is contemplated that the new facilities will consist of approximately 39,000 gross square feet of space for Space Sciences Laboratory Facilities. These facilities will be in a separate building on the hill site of the Berkeley campus on

land owned by the University. The facilities will be accessible by an extension of the road leading to the Lawrence Radiation Laboratory. The cost of the road extension and subsequent bus service to these facilities will be borne by the University. The location of these facilities in proximity to other contemplated and existing campus facilities will widen areas of cooperation and contribute to increasing cross-fertilization of ideas and research, thereby enhancing the research potential of the new facilities.

*

During 1961, the expansion of the research activities at California was made possible by the increase in the number and size of grants from outside sources. The University expects a continuing expansion of such activities and that the proposed new facilities will accommodate and be increasingly utilized by both governmental and non-governmental sponsored research in space related science and technology in the ten year period following completion of the facilities.

The proposed new facilities are in accordance with the California long range development program which will eventually enable a substantial increase in the number of graduate students and a consequent increase in the research potential of the University. Ownership of the new facilities by California, instead of by the Government, will assure that control is in the organization which is finally responsible for implementing the long range expansion plans and will eliminate an uncertainty which may be detrimental to the University's fund raising program. Additionally, it is expected that the ownership of the facilities will contribute to the execution of the development program and the consequent space related science and technology.

Grant No. NsG(F) 5-62 by the National Aeronautics and Space Administration is made for the construction of new Space Science Laboratory facilities in the University of California. Pursuant to the NASA Appropriation Authorization Act of 1961 (Public Law 87-98) the Administrator has determined that the national program of aeronautical and space activities will best be served by vesting title to such facilities in the grantee. Accordingly, title to the facilities constructed with the funds provided under this Grant is vested in the University of California. The subject Grant is made in contemplation of the potential effect of the new facilities in stimulating the growth of space related research at California in the manner outlined in this memorandum and the University's proposal.

It is expressly understood that no charge will be made by California to any agency of the United States respecting the use of such facilities in connection with any Government sponsored research.

Sam Silver – First director of SSL

George Miller – Congressman

Roger Heyns – Chancellor (This is NOT Stuart Bale)

Clark Kerr – President of UC (Hounded by State Unamerican Activities Committee and fired by Ronald Reagan)

James Webb – NASA Administrator (Responsible for managing Apollo program and involving universities in space program

U.C. May Use Aerial 'Cable Car' System

BERKELEY — The idea of a able railway for the University f California campus is still live, though somewhat up in he air.

Some kind of funicular rail- vay, as they call it, or "upside own" cable car, could connect he main campus and its hillside egions in ski-lift fashion.

"We're checking it out, and lso the possibility of our serv- ce around campus," reports O. V. Campbell, vice chancellor or business and finance.

SWISS IDEA

The idea was given a lift by a Swiss manufacturer's represent- tive, who suggested orally that is firm might be willing to in- tall an aerialway from Gayley oad to the new Space Sciences aboratory, if it could run the ystem for profit on weekends nd U.C. would shoulder operat- ng costs.

A 36-page report by the Traf- ic Research Corp. of San Fran- isco mentions two possibilities: A gondola monocable device nd a jog-back aerial tramway.

The first uses 40 four- assenger gondolas and runs at 590 feet per minute. The second uses two enclosed cabs, each seating from 35 to 40, and runs at 1,380 feet per minute.

Both have a capacity of 600 passengers per hour.

4,110-FOOT RIDE

From Gayley Road near Memorial Stadium there is an 885-foot vertical rise to the Lawrence Hall of Science. The ride would be 4,110 feet.

If the aerialway were anchored near Kleeberger Field, adjacent to the stadium, it could serve the Lawrence Radiation Laboratory, the Hall of Science and — higher yet, near Grizzly Peak Boulevard — the space sciences lab.

Cost factors are vague. The jig-back aerial tramway installation cost would run on the order of $1 million, or about twice that of the gondola monocable.

TRAFFIC STUDIED

Charles D. Tefft, a planner in the campus architects and engineers office, explains that the campus' east-west traffic patterns have been under study for some time.

The three hillside science outposts can be reached by road, and eventually the science hall will have parking for 700 cars and 50 buses. How many people would use an aerialway?

The Rad Lab has about 3,000 employes. The Atomic Energy Commission operates one bus between campus and lab that is free to employes, and estimates are it serves 500 employes and 300 students each day.

4 TIMES CAPACITY

Whatever the system in use by 1975, the consulting firm advises it should have four times the carrying capacity of today's peak-hour loads, and six times that of current full-day loads.

No one knows precisely, though, what these traffic loads are, or can predict how many auto users will switch to the Bay Area Rapid Transit District for campus commuting. About two-thirds of Berkeley's students walk to campus.

Besides the unresolved practical and legal aspects of aerialways, there is a basic policy question. Tefft hopes a report can be forwarded to Chancellor Roger W. Heyns in time for consideration by the campus planning committee in February.

SLOWER AND CHEAPER

An aerialway would seem to be fast and costly, while shuttle buses, slower and cheaper, pick up BARTD passengers at or near the downtown station. If they delivered to hilltop, the buses would climb a grade of about 25 per cent.

The aerial railway idea popped up about three years ago, but has never really got off the ground.

As one campus wag observed, "Think what business the Hall of Science could do with an aerialway, a big Bay-view dining room and a liquor license."

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- Addition to Lab 1998-

THE ADDITION TO THE SPACE SCIENCES LABORATORY

Garamondi legislation provided bonds to cover building of research buildings on the UC campuses. The only building selected at Berkeley was the Addition to the Space Sciences Laboratory.

The Addition was completed in May 1998 at a cost of $14,500,000.

The cost is repaid at a rate of $1,400,000/year for 25 years that comes from the increased overhead associated with research in the building.

This increased overhead has exceeded $1,400,000 every year and the lab is NOT credited for the excess overhead.

"Astronomers say the universe is finite, which is a comforting thought for those people who can't remember where they leave things." - Woody Allen

EARLY HISTORY OF THE SPACE SCIENCES LABORATORY

	October 1, 1958	NASA formed from the National Advisory Committee for Aeronautics
	Mid 1958	Chancellor Seaborg establishes The Committee on Space Sciences to study the place of space research in the Berkeley academic program.
	Feb. 10, 1959	Committee presents proposal to Chancellor Seaborg. First year budget proposal: $25,000 from University, $250,000 from NASA. Includes money to build one unspecified space instrument.
	March 20, 1959	Formal proposal to Regents for establishing the Space Sciences Laboratory. Otto Struve was the faculty investigator. One year proposed budget $50,000 from Berkeley, $500,000 from NASA.
	April 17, 1959	REGENTS APPROVE FORMATION OF THE SPACE SCIENCES LAB WITH INITIAL BUDGET FROM STATE FUNDS OF $50,000.
	May 13, 1959	Formal proposal to NASA. Otto Struve, the faculty investigator. Three year proposal, 1959-1962, for $1,100,000 with additional University contribution of $160,000. Not funded.
	January, 1960	Professor Samuel Silver appointed Director. Lab operations begin in Leuschner Observatory
	1961	Space physiology research program begun at Richmond Field Station.
*	June 25, 1961	CORE GRANT Proposal to NASA for general lab support in amount of $741,000 for 3 years. This sustaining grant partially supported 50 faculty and 92 graduate students in some 50 projects in its first year.
*		
	August, 1962	Facilities grant from NASA provided for a new building, $1,900,000
	Dec. 6, 1962	2119 University Ave. (the "Shoe Store") leased for "2 ½ years"
	1963-1966	First plasma physics instruments flown on satellites by Anderson group
	October, 1966	New building completed and dedicated
	August, 1969	Mariner VI and VII, Pimentel group infrared spectrometer fly by Mars.
	April 1, 1970	Kinsey Anderson appointed director of the Space Sciences Laboratory
	June 2, 1978	Anderson proposes Senior Fellow Program.
	May, 1998	Addition completed and dedicated

PROPOSAL FOR GRANT-IN-AID FOR GENERAL SUPPORTIVE RESEARCH IN THE SPACE SCIENCES LABORATORY

UCBSSL NO. 131

Amount:	First Year	$247,000.00
	Second Year	$247,000.00
	Third Year	$247,000.00
Duration:	Three Years	

Samuel Silver

Prof. Samuel Silver, Director
Space Sciences Laboratory

Space Sciences Laboratory
University of California
Berkeley 4, California

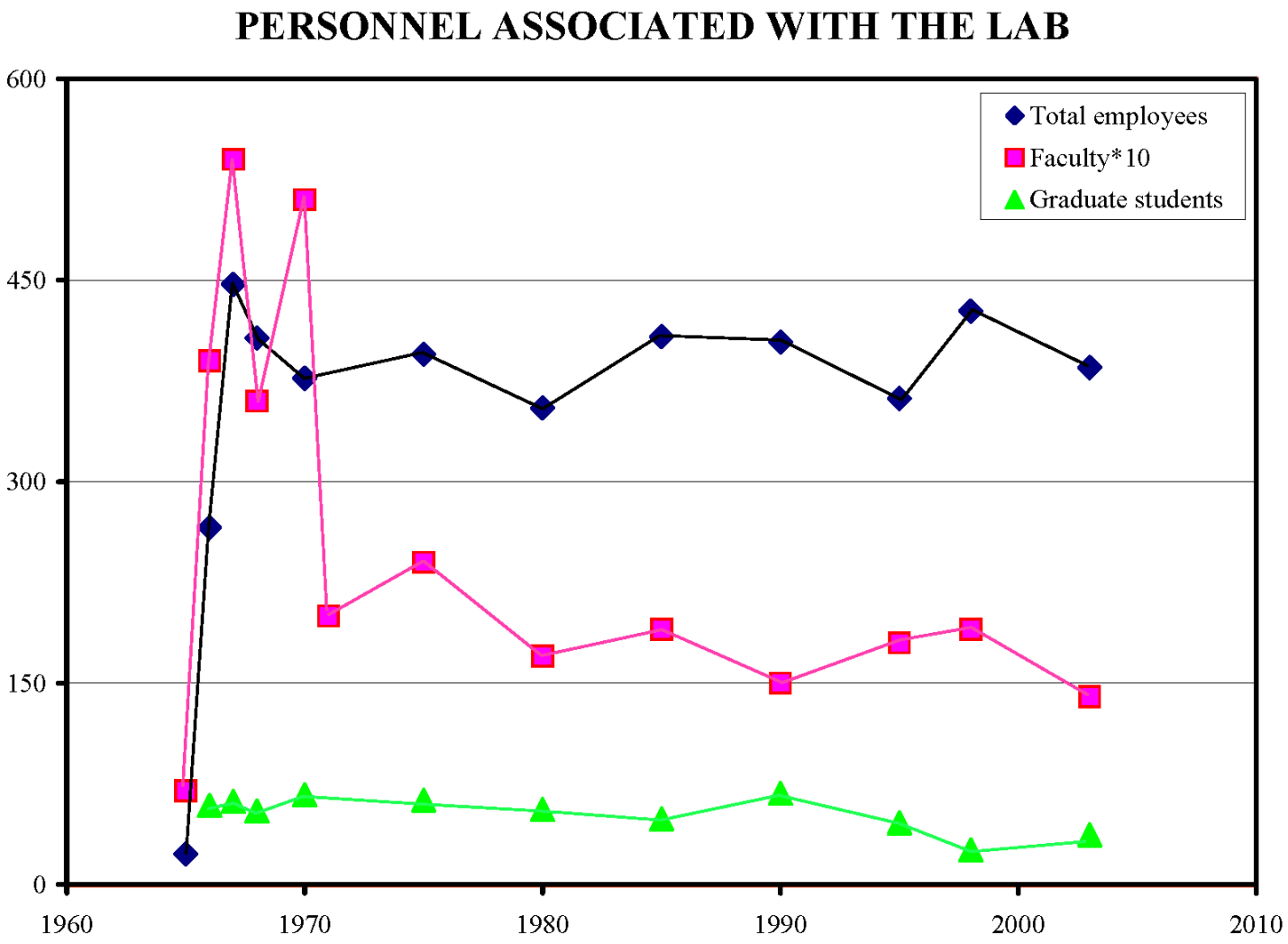
June 25, 1961

THE CORE GRANT

- 1961-1971
- Mainly supported life sciences, physiology, and sociology.
- James Webb wanted the lab to be interdisciplinary with sociologists studying how scientists and science works and transferring such knowledge to the general public.

University of California, Berkeley

April 7 and 10, 1967



"The reason that every major university maintains a department of physics is that it's cheaper than institutionalizing all those people."

EARLY HISTORY OF THE SPACE SCIENCES LABORATORY

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PROPOSED PRINCIPAL INVESTIGATOR POLICY

FOR THE

SPACE SCIENCES LABORATORY

Dr. Kinsey A. Anderson
Director
August 1978

THE SENIOR FELLOW PROGRAM

In place of requesting P.I. exceptions for professional researchers, it was proposed to have Senior Fellows appointed for limited terms, during which they would have P.I. status. Because of the nature of the work and the breadth of the field, it is essential that the faculty be supported by such people who would manage and extend research into space.

"I see the main role of the Space Sciences Laboratory today and in the future as lying in the area of Space Astrophysics. This broad subject includes space plasma physics, magnetospheric physics, interplanetary, solar and cosmic ray physics, gamma-ray, X-ray, EUV, IR, and millimeter wave astronomy." Kinsey Anderson

SSL SENIOR FELLOWS

	1	Name	Initial Start Date
?	2	R. Holmquist	1/1/1980
*	3	Mary Hudson	1/1/1980
	4	Michael Lampton	1/1/1980
*	5	Robert Lin	1/1/1980
*	6	Jerry Nelson	1/1/1980
*	7	George Smoot	1/1/1980
*	8	S. White	1/1/1980
*	9	Al Betz	3/1/1981
	10	Garrett Jernigan	8/1/1981
	11	J. Eric Arens	4/1/1982
*	12	P. Lubin	4/1/1982
?	13	J. Lacy	7/1/1982
	14	Charles Carlson	7/1/1984
*	15	Su Chakrabarti	7/1/1984
?	16	R. Thomas	7/1/1985
?	17	E. Sutton	6/1/1986
	18	Kevin Hurley	7/1/1987
*	19	Cynthia Cattell	1/1/1988
	20	Oswald Siegmund	7/1/1989
	21	William Danchi	7/1/1992
	22	George Fisher	7/1/1992
	23	Kunihiko Nishiizumi	7/1/1992
?	24	Roger Malina	1/1/1994
*	25	Robert Ergun	7/1/1994
	26	Janet Luhmann	7/1/1994
	27	Mark Hurwitz	7/1/1995
	28	Stephen Mende	1/1/1996
	29	Jerry Edelstein	7/1/1997
	30	Isabel Hawkins	7/1/1997
	31	Andrew Westphal	7/1/1997
	32	James McFadden	1/1/2000
?	33	Alfred Krabbe	9/15/2000
*	34	Saul Perlmutter	5/1/2002
	35	Joanne Cohn	7/1/2002
	36	Michael Levi	7/1/2002
	37	Greg Delory	1/1/2003
	38	Randolf Klein	1/1/2005
	39	Huan Tran	1/1/2005
	40	Tai Phan	7/1/2006
	41	Cornelia Wunderer	9/1/2006
	42	Dietmar Krauss-Varban	12/1/2006
?	43	Samuel Krucker	7/1/2007

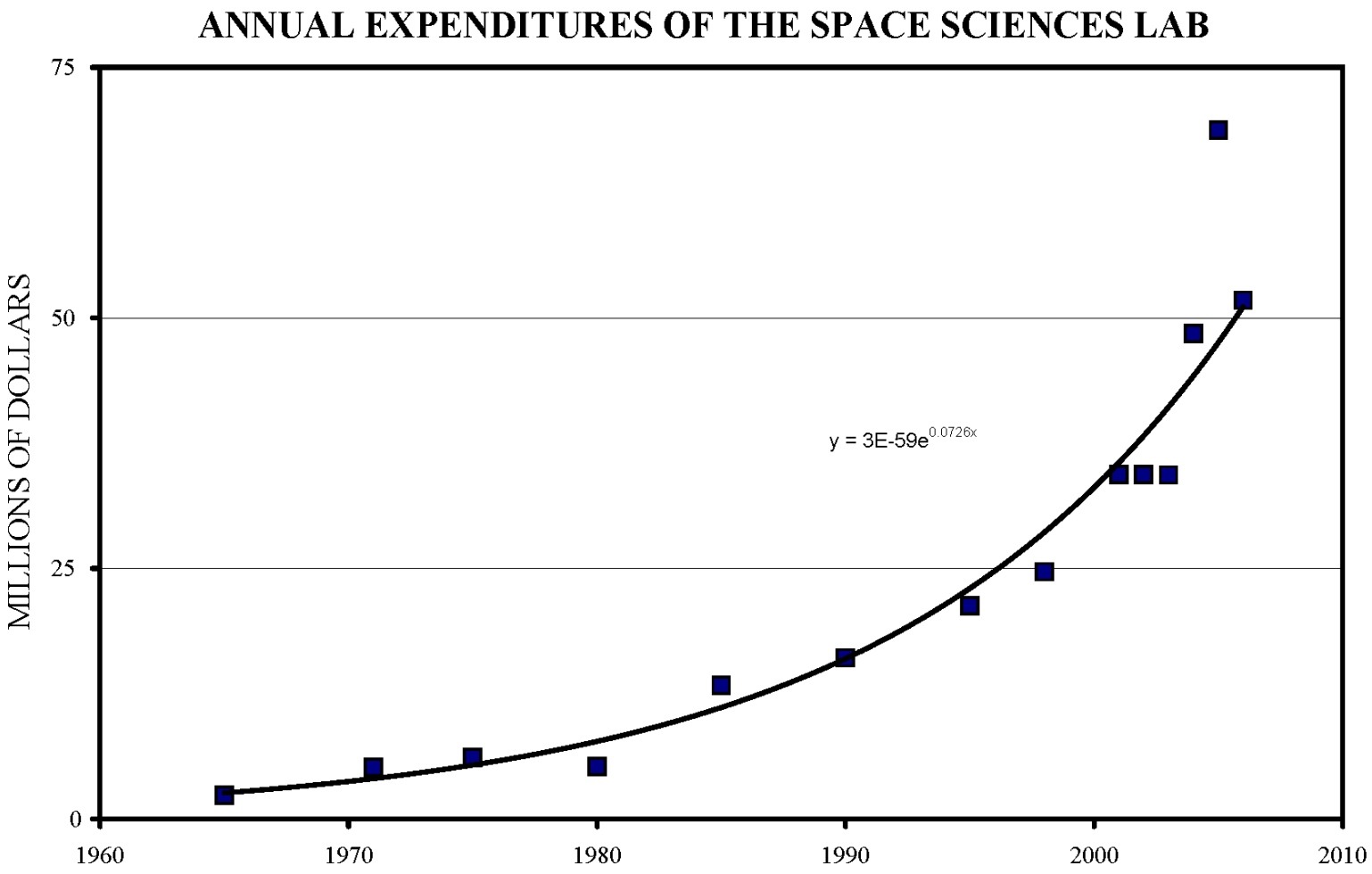
* CURRENTLY FACULTY

? STATUS UNKNOWN (BY ME)

43 SENIOR FELLOWS

(11 + ?) CURRENT FACULTY

19 CURRENTLY AT SSL



"Math illiteracy strikes 8 out of every 5 people."

Comparison of SSL vs UCB Overhead

FY	UCB Overhead	SSL Overhead	SSL Percentage
2001-02	$51,845,449.15	$3,855,563.63	7.44%
2002-03	$54,317,974.36	$4,852,649.38	8.93%
2003-04	$61,607,954.54	$7,042,419.48	11.43%
2004-05	$62,635,616.26	$8,277,546.36	13.22%
2005-06	$59,793,835.72	$6,174,377.79	10.33%
2006-07	$59,153,663.77	$6,845,185.53	11.57%
2007-08	$62,293,714.51	$5,924,037.17	9.51%
2008-09	$64,200,251.23	$6,815,950.78	10.62%
Total	$475,848,459.54	$49,787,730.12	10.46%

SSL GRANTS AND CONTRACTS

SOURCE	NUMBER	% OF TOTAL $
NASA	170	80%
NSF	20	15%
LBNL	6	
PRIVATE	2	
GIFT	2	

SSL PH.D.s

242 KNOWN

RECORDS POOR <1968 AND >1998

Year	SSL Ph. D.s Name	Advisor
1968-1969	Ken Schatten	Kinsey Anderson
	Lionel Chan	Diliberto
	Lee M. Chase	Kinsey Anderson
	Ferdinand Coroniti	Sam Silver
	Myra Karstadt	Tom Jukes
	William Knight	Diliberto
	Arnold Meltsner	Wildavsky
	Richard Muller	Luis Alvarez
	John Parry	Ward
	Wigbert Siekhaus	Pigford
	Joan Tesarek	Al Burlingame
	Guilio Varsi	Smith
	Salah Bedair	Smith
1969-70	Michael Kelley	Forrest Mozer
	Jerry Han	Calvin
	Soren Holm	Churchman
	Heikki Hovland	Mitchell
	Kevin Hurley	Kinsey Anderson
	Carlos Krytbosch	Churchman
	Erik Metz	Churchman
	Laith Namiq	Mitchell
	Tran Van	Mitchell
1970-71	Frederick Bogott	Forrest Mozer
	J. Mack	Stuart Bowyer
	Mohamed El-Raey	Sam Silver
	David Lin	Borsook
	Rubin Zelwar	Mitchell
	Ted Vinson	Ward
	Hasan Sharif	Mark
1973-74	Edgar Bering	Forrest Mozer
	Charles Carlson	Kinsey Anderson
	Neal Evans	Charles Townes
	Shailendra Kumar	Stuart Bowyer
	Walter Gonzales-Alarcon	Forrest Mozer
	Arshud Mahmood	Mitchell
	William Mahoney	Kinsey Anderson
	John Mather	Paul Richards
	Bruce Margon	Stuart Bowyer
	Sundar Rahan	Buford Price
	Edward Shirk	Buford Price
	Philip Scherer	Forrest Mozer
	Stephen schutz	Forrest Mozer
1974-75	Arthur Davidsen	Stuart Bowyer
	J. Henry	Stuart Bowyer
	Thomas Hildenbrand	Bhattacharyya
	Jay Holberg	Stuart Bowyer
	Ian Hutcheon	Buford Price
	Susan Lee	Joseph Silk
	L-K Leu	Bhattacharyya
1975-76	Angus Cannon	Samuel Silver
	Thomas Gaballe	Charles Townes
	Richard Godron	Buford Price
	Paul Goldsmith	Charles Townes
	Michael Johnson	Charles Townes
	Siamak Khorram	Knight
	Robert McGuire	Kinsey Anderson
	Donald Olson	Sachs
	Robert Stern	Stuart Bowyer
	Anthony Toste	Calvin
	Stephen Weinberg	Joseph Silk
1976-77	Steven Ahlen	Buford Price
	Albert Betz	Charles Townes
	Howard Smith	Charles Townes
	Eric Wollman	Charles Townes
	Ron Serlin	Forrest Mozer
	John Chan	Buford Price
	Albert Cheung	Charles Townes
	Michael Chui	Charles Townes
	Stephen Lubow	Shu
1977-78	Albert Boyd	Charles Townes
	Webster Cash	Stuart Bowyer
	Kwok-Chun Chan	Morrison
	Lawrence Greenberg	Charles Townes
	William Fawley	Christopher McKee
	Robert Holzworth	Forrest Mozer
	Julian Krolik	Christopher McKee
	John McClelland	Christopher McKee
	John Stevenson	Buford Price
1978-79	J. Freeman	Stuart Bowyer
	R. Kron	King
	Marc Gorenstein	Richard Muller
	D. Matsakis	Charles Townes
	Edmund Sutton	Charles Townes
	G. Tarle	Buford Price
	Michael Temerin	Forrest Mozer
1979-80	Cynthia Cattell	Forrest Mozer
	Henry Crawford	Buford Price
	D. Cullers	Forrest Mozer
	Philip Lubin	George Smoot
	John Lacy	Charles Townes
	R. Lysak	Forrest Mozer
	Roger malina	Stuart Bowyer
	S. Pollaine	George Smoot
	R. Torbert	Forrest Mozer
1980-81	G. Bruzual-Alfonzo	King
	S. Kahn	Stuart Bowyer
	A. Mallinkrodt	Kinsey Anderson
	M. Salamon	Buford Price
	J. Thorstensen	Stuart Bowyer
1981-82	Sara Beck	Charles Townes
1982-83	J. Bonomo	Paul Richards
	R. Bush	Kinsey Anderson/Forrest Mozer
	S. Chakrabarti	Stuart Bowyer
	Dan Watson	Charles Townes
	P. Jakobsen	Stuart Bowyer
	J. Lissauer	Shu
	G. Reichert	Stuart Bowyer
	T. Takahashi	Joseph Silk
	R. Thomas	Colwell
	John Wygant	Forrest Mozer
1983-84	G. Epstein	Buford Price/George Smoot
	S. Friedman	Buford Price/George Smoot
	S. Gasster	Charles Townes
	R. Kimble	Christopher McKee/Stuart Bowyer
	T. Liss	Buford Price
	J. Musser	Buford Price
	R. Schwartz	Kinsey Anderson
	D. Van Buren	Christopher McKee
1984-85	J. Barnard	Arons
	J. Barnes	Davis
	E. Bloemhof	Charles Townes
	A. Das	Charles Townes
	J. Kare	Alvarez
	James McFadden	Kinsey Anderson
	Eugene Serabyn	Charles Townes
	J. Ottusch	Charles Townes
	J. Peterson	Paul Richards
	J. Swift	Knobloch
	M. Tincknell	Buford Price
	C. Witebsky	George Smoot/Welch
	E. Witt	Forrest Mozer/Mary Hudson
1985-86	S. Barwick	Buford Price
	R. Bergmann	Forrest Mozer/Mary Hudson
	A. Harris	Reinhard Genzel
	D. Martin	Stuart Bowyer/Buford Price
	R. Mayle	Christopher McKee
	Michael Burns	Richard Muller
	D. Porter	Garrett Jernigan
1986-87	S. Barwick	Buford Price
	M. Boehm	Forrest Mozer
	J. Drach	Buford Price
	Andrew Lange	Paul Richards
	J. Lerner	Knobloch
	Peter Friedman	Richard Muller
	S. Levin	George Smoot
	Saul Perlmutter	Richard Muller
1987-88	D. Finley	Stuart Bowyer
	Patrick Jelinsky	Christopher McKee/Stuart Bowyer
	S. Labov	Stuart Bowyer
	W. Levedahl	Kinsey Anderson
	J. Zmuidzinas III	Christopher McKee/Albert Betz
1988-89	T. Edberg	Stevenson
	D. Goldhaber	Raymond Chiao/Albert Betz
	D. Lowder	Buford Price
	J. Weiss	Knobloch
	Jay Bixler	Price
	John Carlstrom	Steve Kahn
	Robert Ergun	Forrest Mozer
	A. Kogut	Henry Crawford/George Smoot
1989-90	Mark Hurwitz	Stuart Bowyer
	K. Bertsche	Richard Muller
	James Green	Christopher McKee
	Gary Bernstein	Paul Richards
	A. Mannucci	Charles Townes/Albert Betz
	M. Silber	Knobloch
1990-91	D. Cotton	Chakrabarti
	P. Meinhold	Richard Muller
	Timothy Sasseen	Richard Muller
	J. Schachter	Steve Kahn
	D. Snowden-Ifft	Buford Price
1991-92	David Charles Alsop	Andrew Lange
	Marc John Bensadoun	George Smoot/Henry Crawford
	Marc Fischer	Paul Richards
	Jeffrey Alan Willick	Stuart Bowyer/Christopher McKee
	James Hart Clemmons	Kinsey Anderson
	Paul Aloysius Jaminet	Charles Townes
1992-93	William Craig	Steve Kahn
	Jerry Edelstein	Stuart Bowyer
	Fiona Harrison	Steve Kahn
	Yong He	Buford Price
	Davin Larson	Kinsey Anderson
	Diane Liedahl	Steve Kahn
	Margaret Meixner	Welch
	David Mitchell	Inke de Pater
	Michael Nahum	Paul Richards
	Heidi Newberg	Richard Muller
	Ann Parsons	Bernard Sadoulet
	Andrew Westphal	Buford Price
1993-94	James Bock	Andrew Lange
	Brett Bush	Buford Price/Chakrabarti
	Andre Clapp	Paul Richards
	Thomas Clune	Knobloch
	William Kilgore	Chanowitz/Jackson
	Charles Lineweaver	George Smoot/Davis
	Jeff Schuster	Richard Muller
	Timothy Pfafman	Steve Kahn
	Andrija Rasin	Hall
	David Smith	Robert Lin/Kinsey Anderson
	Bradford Wargelin	Steve Kahn
	Steven Weiss	Bernard Sadoulet
	Mark Devlin	Andrew Lange
	Thor Wilbanks	Andrew Lange
1994-95	Michael Brown	Inke de Pater
	Cynthia Hess	Steve Kahn
	Craig Smith	Richard Muller
	Christopher Johns	Basri
	Austin Richards	Buford Price
	Eric Klementis	Forrest Mozer
1995-96	Gregory Delory	Forrest Mozer
	Matthew Richter	James Graham
	Jeffrey Wilkerson	Bernard Sadoulet
1996-97	Paul Feler	Robert Lin
	Eric Korpela	Stuart Bowyer
	Philip Mauskopf	Andrew Lange
	Alex Kim	Richard Muller
	William Holzapfel	Andrew Lange
	James Vickers	Forrest Mozer/Chakrabarti
1997-98	Steve Boggs	Robert Lin
	Scott Cully	Steve Kahn/Oswald Siegmund
	Everett Lipman	Charles Townes/William Danchi
	John Warren	Steve Kahn/Oswald Siegmund
	Stephen Ashford	Robert Lin
1998-99	Mark Linton	Robert Lin
1999-2000	Matthew Kim	Richard Muller
	John Monnier	Charles Townes
2000-01	Yeh-Kai Tung	Robert Lin
2001-02	Robyn Millan	Robert Lin
2002-03	Jasper Halekas	Robert Lin
	Bahman Rabii	George Smoot
	Jonathon Weiner	Charles Townes
	Celeste Winant	Paul Richards
	Benjamin Lintner	Richard Muller
2003-04		
2004-05	Jonathan Levine	Richard Muller
	Gerardo Dominguez	Buford Price
NO DATES		
	Joan Vorpahl	
	Robert McPherron	
	Stephen Kahler	
	Francesco Paresce	
	George Parks	
	Andrew Tanenbaum	

SATELLITE INSTRUMENTS AND ENTIRE SATELLITES ** (75)

*IMP 1, 2, 3, 4, 5, 6 (Space plasmas)	1963-1972
*AIMP 1, 2 (Space plasmas)	1966-1968
*OGO 1, 3, 5 (Space plasmas)	1966
*Mariner Mars 6, 7 (Infrared)	1969
Apollo 15 and 16 sub-satellites (Space plasmas)	1969-1972
ATS-5 (Space plasmas)	1969
*Surveyor-3 (plastic tracks in camera glass on moon)	1969
Apollo 16 (solar flare tracks in window glass)	1972
RADSAT-2 (P-72) (EUV)	1972
Skylab (plastic tracks from ultra-heavy cosmic rays)	1973-1974
Apollo-Soyuz (EUV astronomy and EUV geocorona)	1975
*S3-3 (Auroral physics)	1976
ISEE 1, 2, 3 (NASA/ESA, Space plasmas)	1977
HEAO 1 (Soft X-rays)	1977
STP Satellite (UV)	1979
FAUST on Spacelab 1 (UV astronomy)	1983
AMPTE-IRM (Space plasmas)	1984
*Giotto (ESA, Halley's comet flyby)	1986
UVX (Shuttle, Diffuse EUV)	1986
Infrared Spatial Interferometer (Infrared)	1988
*COBE (three degree black body)	1989
CRRES (Space plasmas)	1990
Ulysses (ESA, Solar polar orbit)	1990
TREK (Mir, Particle tracks in glass)	1991-1995
*EUVE (mapped EUV point sources in space)	1992
Geotail (Japanese, Space plasmas)	1992
DUVE (diffuse UV from interstellar medium)	1992
Mars Observer (Interplanetary electrons)	1992
FAUST (Space Shuttle, EUV of stellar objects)	1992
ORFEUS (Space Shuttle, EUV)	1993, 1996
ALEXIS (low energy X-ray imaging)	1993
SAREX-2 (Shuttle, amateur radio)	1993
Wind (Space plasmas)	1994
SOHO (ESA, Solar detectors)	1995
Polar (Space plasmas)	1996
ORFEUS-SPAS2 (EUV and FUV specra of stars)	1996
FAST (Space plasmas)	1996
Mars Global Surveyor (Electrons and crustal B field)	1996
EURD (Spanish, EUV of interstellar medium)	1997
Lunar Prospector (Crustal magnetic field)	1998
FUSE (FUV)	1999
EUVIP (EUV of ionosphere, plasmasphere)	1999
Cluster II (ESA, space plasmas)	2000
IMAGE (Remote sensing of auroras)	2000
**RHESSI (Imaging solar X- and Gamma-rays)	2002
INTEGRAL(ESA, Gamma ray bursts)	2002
**CHIPS (EUV of interstellar medium)	2003
GALEX (FUV of nearby galaxies)	2003
SPEAR (Korean, FUV interstellar)	2003
ISUAL (Taiwanese FORMOSAT-2, Sprite imager)	2004
Mercury MESSENGER (Gamma ray instrument)	2004
STEREO (NASA, two-satellite stereo view of sun)	2006
**THEMIS (5 satellites built at SSL, Space plasmas)	2007
Planck (ESA, 3 degree Black body)	2009
Hubble COS (Instrument replacement)	2009


SWALES
AEROSPACE
FRAGILE
PROBE 4
PROBE 3

GROUND BASED

Lunar sample returns	1969-
Kuiper Airborne Observatory	1974-1995
Search For Extra-terrestrial Intelligence	
SERENDIP I, II, III, IV, V	1977-
SEVENDIP	1997-
SETI@Home	1999-
SETHI	2002-2006
SPOCK	2003-
GALFA HI	2003-
DYSON	2003
ASTROPULSE	2005-
FLY's EYE	2007-
Infrared Spatial Interferometer	1984-
5-10 micron camera	1986-
Keck Telescope	1989-
PENGUIN (Antarctic)	1996-
Auroral Imaging from South Pole	1996-
Stardust Cometary Dust Sample Return	1999-
Stardust Interstellar Dust Sample Return	1999-
Genesis Solar Wind Sample Return	2001-
Center For Integrated Space Weather Monitoring	2002-
Solar MURI (Solar theory)	2002-
CASPER	2005-
TEDI Palomar (Near IR)	2006-
THEMIS ground observatories	2006-
Stardust@home	2006-
Automated Geophysical Observatories, (Antarctic)	2007-
BOINC (computational facility)	2008
SALT-BVIT (Microchannel plate detectors)	2009
BigBOSS (BAO with LBNL)	2009

BALLOONS

X-ray	1967-1974
Electric Field (~100)	1967-1974
Measurements of the Cosmic Background Radiation	1974
DMR (IR spectrometer in airplane)	1976
HIREX (Hard X-rays)	1978-1982
HEXAGONE (Gamma rays)	1989-1992
PBAR (Magnetic spectrometer)	1989
HIREGS, (Solar gamma-rays)	1978-1990
ANTIPODE (Iron isotopes in galactic cosmic rays)	1990
HEAT (High-energy antimatter telescope)	1990-1993
EXAM (Extragalactic antimatter detector)	1990-1994
IRIS	1993-1995
Kiruna (X-rays)	1996
MAX, MAXIMA, MAXIPOL (CMB)	1997-
Circum-Polar Alaska Campaign (Auroral physics)	1998
MAXIS (Antarctic electron precipitation)	2000
MINIS (Antarctic and Alaska electron precipitation)	2002, 2005, 2006
Nuclear Compton Telescope	2004, 2009
EBEX	2007-

ROCKETS (~24)

~15 plasma physics	
(Canada, Alaska, Norway, Sweden, Brazil, India, Greenland)	1966-1999
Soft X-rays	1969
5 Ultraviolet	1970-1990
Plastic track detectors of solar flare nuclei	1971-1972

MISSIONS CURRENTLY BEING BUILT

BARREL (electron precipitation, balloons)
MAVEN (Mars atmosphere and volatile evolution, satellite)
NuSTAR (Nuclear spectroscopic telescope array, satellite)
RBSP (Radiation belt storm probes, satellites)
FOXSI (Focusing optics X-ray imager of sun, rocket)
GRIPS (Gamma ray imager for solar flares, balloon)
CINEMA (microsatellite, energetic neutrals) **

PROPOSED SATELLITE MISSIONS

JDEM (Dark energy)
Solar Probe + (10 solar radii from sun)
GOLD (SMEX launch to study limb and disk of sun) **
Solar Orbiter
ARTEMIS

FAILURES

Firewheel (Ariane I failure)	1980
Cluster I (Ariane failure)	1996
Mars Polar Lander (microphone, landing failure)	1998
UCB (EUV and FUV, Spacecraft failure)	1998

There have been no failures of any Berkeley instruments on launch. All instruments have been delivered within the (expanded) schedules and within the (expanded) costs.

"Crash programs fail because they are based on the theory that, with nine women pregnant, you can get a baby in a month." - Wernher von Braun

CONCLUSION

In terms of the breadth and depth of its research in atmospheric physics/space physics/astrophysics/cosmology, the number of missions, the number and quality of its graduates, and its role in the education of scientists and engineers, the Space Sciences Laboratory at Berkeley is the premier institution of its kind in the world.

"Sometimes I think we're alone in the universe, and sometimes I think we're not. In either case, the idea is quite staggering." - Arthur C. Clarke