



UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM



SUMMARY REPORT

OF

ALVIN REVIEW COMMITTEE WORKSHOPS AND MEETINGS

December 8, 1985 - San Francisco
January 12, 1986 - New Orleans, Louisiana

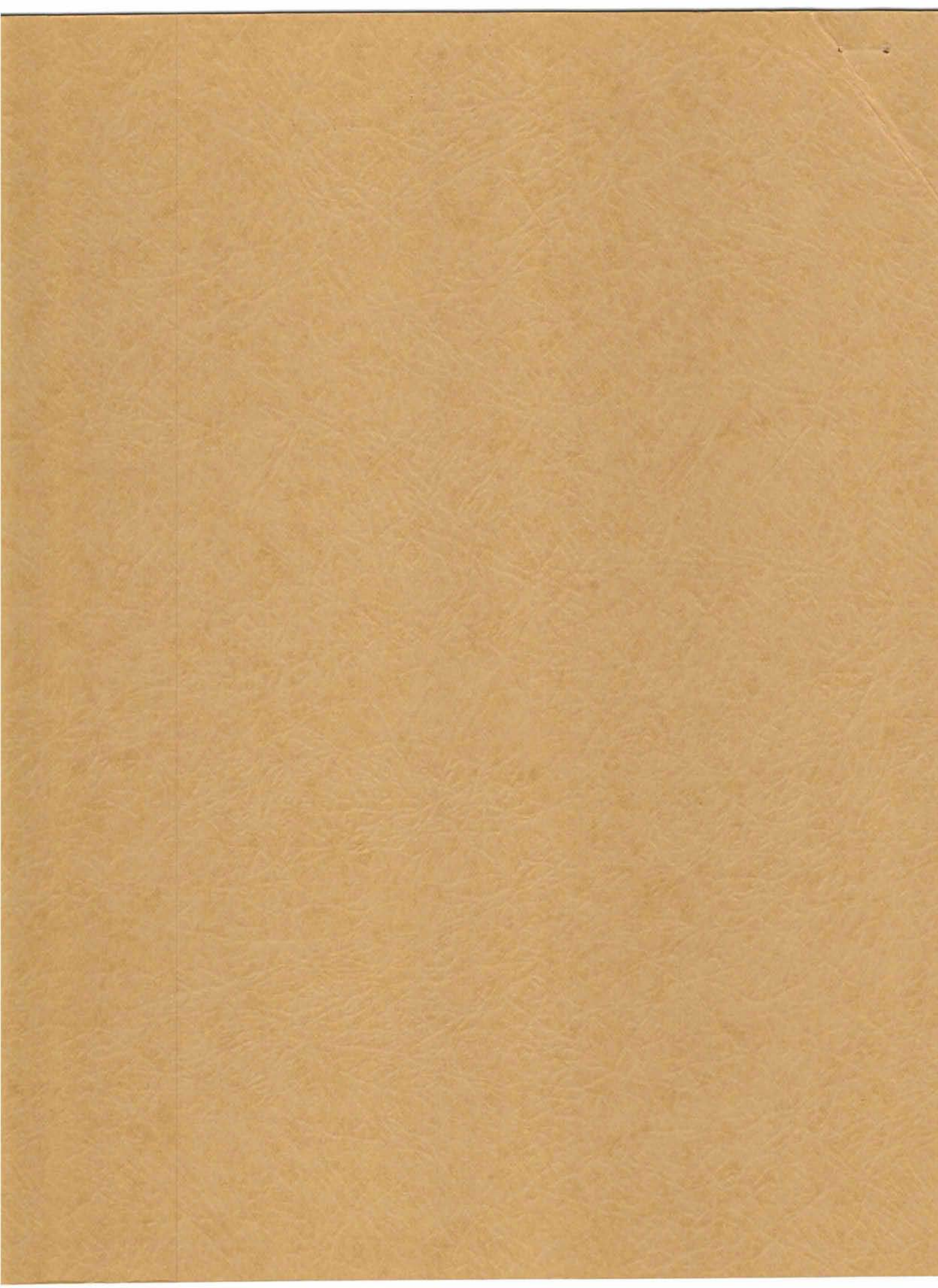
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UNOLS

ALVIN Review Committee

Summary of Workshops

December 8, 1985 - San Francisco, California

January 12, 1986 - New Orleans, Louisiana

Forward: By letter of October 31, 1985 (Appendix I) the Chairman of the ALVIN Review Committee announced to the ALVIN user and oceanographic communities two workshops to generate planning information for ALVIN/ATLANTIS II deep submersible science in 1988 and beyond. The workshops were held in San Francisco on December 8, 1985, just preceding the Fall AGU meeting and on January 12, 1986, before the AGU/ASLO Ocean Sciences meeting in New Orleans.

Over the last several years it has become apparent that the task of watching time on the seagoing ships and platforms operated by UNOLS institutions with requests by skilled individual investigators for the use of those facilities is becoming critical and requires careful advanced planning. The situation is especially critical with respect to the ALVIN, Deep Submergence Vehicle, operated as a UNOLS National Oceanographic Facility by the Woods Hole Oceanographic Institution. The ALVIN generates many more requests than can be accommodated. With the advent of ATLANTIS II as support ship, operations can be considered throughout the world's oceans. ALVIN is nearly the unique facility for deep, manned undersea research by academic investigators in the United States. Interest and requests for ALVIN dives are for diverse operations in widespread areas. These factors compound the need for capable advanced planning.

The ALVIN Review Committee (ARC), Robert W. Corell, Chairman, is charged with advanced planning, review of dive requests, and making recommendations for ALVIN schedules and operations. Beginning in December, 1982 the ARC has, annually, solicited statements of interest or intent to use ALVIN two and more years into the future, and has organized workshops for the presentation of that interest. Statements by individual investigators of interest and intent to use ALVIN provide a basis for advanced planning.

Status of the ALVIN Program: At the time of the workshops ALVIN/ATLANTIS II had completed 1985 field investigations and returned to Woods Hole for maintenance, overhaul and modification, lasting until early 1986.

A provisional schedule had been developed for 1986 that would have ALVIN/ATLANTIS II take up work in the North Atlantic, support investigations in the Gulf of Mexico along transit to the Panama Canal, and, in the Pacific, work in the Panama Basin and California Basins, ending the year in San Diego.

For 1987, specific schedule recommendations had not yet been made. Based on Dive Requests already recommended together with additional

Dive Requests that might be recommended at the ARC's May, 1986 review, the likely 1987 schedule would support investigations near San Diego, in the vicinity of the Hawaiian Islands and mid-Pacific enroute to the Mariana region. After completing recommended work (late winter/early spring 1987) the ALVIN/ATLANTIS II would return to the eastern Pacific, most likely the Gorda-Juan de Fuca-Oregon margin area. Work there and perhaps in the California basins and farther south would complete operational availability prior to return to Woods Hole.

The Workshops: Workshops were convened by Robert Corell, Chairman, ARC:

December 8, 1985
8:30 a.m.
Cathedral Hill Hotel
San Francisco

January 12, 1986
8:30 a.m.
Fairmont Hotel
New Orleans

Workshops followed agenda, as presented by the Chairman.

1. Introduction to the Workshop - *Robert W. Corell*
 - . Welcome
 - . Introduction of ARC Members present and UNOLS Executive Secretary
 - . Review of Agenda
 - . Expectations of P. I. Presentations
2. Review of ALVIN/ATLANTIS II Operations - *Barrie Walden*
3. New Opportunities and Perspectives for ALVIN/ATLANTIS II - *Dan Fornari, L-DGO (S. F. only)*
4. Presentations of Interest or Intent by P. I.'s
5. Workshop Summaries and Conclusions.

ARC members, UNOLS staff and funding agency officials at one or both workshops:

ARC Members

Robert Corell, Chairman
J. K. Cochran
J. W. Deming
P. A. Jumars
D. E. Karig
W. B. F. Ryan
G. Thompson
G. Weatherly
G. Grice

Agency Personnel

E. Finkle, NOAA
K. Kaulum, ONR
R. Batiza, NSF
D. Heinrichs, NSF
B. Malfait, NSF
J. McMillan, NSF
M. Reeve, NSF
P. Taylor, NSF
H. Schrader, NSF

UNOLS Office

W. Barbee

Some 50 prospective investigators and others attended one or the other workshop.

In addition to reporting on ALVIN program and operational status (as above) Bob Corell described the formation of a special committee to review and provide oversight for the ALVIN program. This committee, chaired by Dirk Frankenberg, will review ALVIN program history and direction, and provide recommendations aimed at maintaining program excellence and high level of accomplishment. They will examine program management, advanced planning and roles of the ALVIN Review Committee. The special committee solicits input from the oceanographic community, especially ALVIN users.

The ARC chairman also described the advanced planning process employed for the ALVIN program. On the basis of notices of intent or interest in using ALVIN (as received in workshops or through other communications) the ARC will make provisional recommendations for ALVIN operations in 1988 and beyond. These recommendations will be publicized in a PROSPECTUS issued in Spring, 1986. The recommendations will also be reflected in the Announcement of Opportunities for Oceanographic Research, DSV ALVIN, for 1988 (The ALVIN Flyer). Dive requests for 1988 will be reviewed and schedules recommended at the ARC meeting in about May, 1987. This planning-schedule recommendation process is cyclic annually.

Barrie Walden, Submersible Program Manager, W.H.O.I., briefly described ALVIN history, 1985 operations and 1985/1986 modifications and overhaul. ALVIN has made 1,663 dives in its 20-year history. During 1985 161, or 10% of the total dives were completed. Dives were to an average depth of over 2,400 meters, averaged 7.4 hours duration, and accommodated an average of two passengers (or scientist/observers) per dive. By discipline, the dives were 88 in geology, 59 biology, 7 chemistry, 5 engineering tests and 2 other. Only 3 1/2 dives were lost during the year, either to weather or mechanical problems. 1985 has been the most impressive year ever for ALVIN operations. A history of ALVIN is in Appendix II.

The overhaul and modification of ALVIN is expected to provide improvements in:

- . battery power system and power available,
- . improved safety and reliability,
- . improved reliability, efficiency and performance of propulsion system
- . improved efficiency and capability of hydraulic system,
- . replacement of prototype data logger with finalized version, and,
- . increased payload.

Details of the overhaul/modification are in Appendix III.

Don Fornari, Lamont-Doherty Geological Observatory, discussed ALVIN/ATLANTIS II, emphasizing their broad capabilities to support oceanographic research. New capabilities realized at ALVIN's last overhaul and modification together with the considerable capabilities of ATLANTIS II for research investigations makes for an impressive research facility. Staffing for both ALVIN and ATLANTIS II are highly competent, and work well together to support scientific investigations.

SEA BEAM on ATLANTIS II allows both detailed morphological examination and description of areas and navigation based on morphology. (There are still instances, however, when the best available short-and-long-baseline navigation systems are required.) Continued improvements are needed (and are being developed) for data acquisition systems, TV and cameras.

In discussion among recent ALVIN/ATLANTIS II users, the need for more scientific berths was emphasized. (Woods Hole representative described steps then underway to provide additional berths.)

In summary, the ALVIN ATLANTIS II constitutes a nearly unique and highly capable expertly staffed facility for deep submersible and other oceanographic research. The facility is much in demand. Prospective investigators should assure that adequate pre-investigation information is gathered and advance planning is completed so that ALVIN/ATLANTIS II investigations can be conducted effectively and capabilities will be exercised.

Presentations by Prospective Investigators. Chairman Corell outlined the ALVIN Review Committee's expectations for presentations on Notices of Intent:

- . an outline of central science issue(s),
- . a description of pre-dive investigations and information,
- . the area and location of dives,
- . dates proposed,
- . plans for funding, and
- . questions from ARC members.

Twenty-three Notices of Intent to use ALVIN were received (18 were presented). A list of Notices is Appendix IV. The notices, along with two from 1983, 84, are summarized by general area:

Summary Number	Investigator	Number of Dives	Discipline

<i>North Atlantic (Rockall, Trough, Mid Atlantic Ridge, Blake Outer Ridge, W. Florida Escarpment, Hudson Channel)</i>			
6 (1983).	Hollister, C.	20	Geology/geophysics
10.	Rona, P.	?	Geology, geophysics, geochemistry
12.	Hecker, B.	18	Biology
13.	Levin, L.	18	Biology
14.	Lutz, R.	2	Biology
21.	Flood, R.	12	Geology/geophysics
23.	Flood, R.	10/yr, 3 yrs	Geology/geophysics
<i>North Atlantic subtotal</i>		<i>100+</i>	

(continuation)

South Atlantic

22	Flood, R.	15	Geology/geophysics,
	South Atlantic subtotal	15	biology

Northeast Pacific (Gorda-Juan de Fuca, Cal. borderlands, EEZ)

3a.	Hammond, S.	20/yr	Geology/geophysics, geochemistry
3b.	Normark, W.	16/yr	Geology/geophysics
7.	Abbott, D.	21	Geology/geophysics
17.	Koppel, E.	15	Geology/geophysics
18a,b,c.	Cacchione, D.	33	Geology/geophysics
20.	Smith, C.	18	Biology
	Northeast Pacific subtotal	123	

East Equatorial Pacific (EPR, E. Pac. Seamounts, S. American Cont. Shelf, Galapagos, Guaymas)

1.	Batiza, R.	6	Geology/geophysics
5.	Craig, H.	60	Geochemistry/geology/ geophysics
6.	Hessler, R.	35 (2 yrs)	Biology
8.	Kulm, L.	20	Geology/geophysics
9.	Batiza, R.	20	Geochemistry, geology /geophysics
11.	Hey, R.	20	Geology/geophysics
16.	Grassle, J. F.	19	Biology, geochemistry
19.	Childress, J.	30	Biology
	Western Pacific subtotal	89	
	Total Notices Received	522+	

By discipline, with multi-disciplinary investigations counted multiple times

Geology/geophysics	397+
Geochemistry	163+
Biology	179

Although there were fewer presentations than in previous years' workshops, most notices of intent represented a corporate structure, either of a coordinated group of investigators or of a major agency program. The total number of dives was comparable to the number in earlier years. Presentations were generally excellent, and provided helpful information to ARC members.

ALVIN REVIEW COMMITTEE

Meetings

December 8, 1985 and January 12, 1986

The ALVIN Review Committee met following each workshop, to consider modifications to their schedule recommendations for 1986 (from their May, 1985 meeting), to consider operational factors that might affect the 1986 schedule and to hear new information on the potential use of ALVIN at the TITANIC site.

ALVIN Dive Recommendations for 1986. The Committee reviewed three additional dive requests: for comparative microbiological studies at West Florida escarpment sites, for an investigation of hydrothermal processes at the TAG hydrothermal field, mid Atlantic Ridge and for molluscan studies at the West Florida Escarpment site.

The Committee recommended to sponsoring agencies and to ALVIN operators at W.H.O.I.:

The investigation of hydrothermal processes on the Mid Atlantic Ridge be scheduled, provided that certain scheduling, logistical and operational conditions be met.

The investigations for microbiological studies at the West Florida Escarpment site be scheduled, using time (and dives) reserved for such studies in earlier provisional schedules.

Dives be scheduled for molluscan studies at the West Florida Escarpment site to be scheduled, provides that they not impact or displace work recommended earlier.

Potential Use of ALVIN in 1986 of TITANIC SITE. The Committee met in executive session to discuss several issues related to potential use of ALVIN in 1986 at the TITANIC site. The Committee reviewed the ALVIN Review Committee's role in recommending utilization of ALVIN, the chronology of events (and requests) related to potential use of ALVIN at the TITANIC site, and the positions and policies of the Woods Hole Oceanographic Institution (the operators) and of sponsoring agencies concerning potential utilization.

On the basis of their review the ALVIN Review Committee developed a position on TITANIC-related exploration using ALVIN.

Status of ALVIN Overhaul and modifications. Barrie Walden alerted ARC members to the possibility that work on ALVIN would not be completed in time to begin operations in March or tentatively scheduled. (Long lead time on equipment/component acquisition is forcing delays.) If a start delay is necessary, revised schedules will be reviewed by ARC.

ARC Planning and Workshop Conclusions. Committee consensus was that the two workshops provided valuable information, although attendance,

especially at New Orleans, was low. The concern is that input might not be broad enough to serve as a credible basis for definite advanced planning.

Further steps in planning for the ALVIN deep submersible science program, 1988 and beyond:

- . An additional day will be added to the ARC meeting in May, 1986 to plan for the program in 1988 and beyond.
- . A Prospectus for the ALVIN program, 1988 and beyond will be issued in late spring, 1986.

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

An association of institutions
for the coordination and support
of university oceanographic facilities

UNOLS Office, WB-15
School of Oceanography
University of Washington
Seattle, Washington 98195
(206) 543-2203

31 October 1985

Dear Colleague:

This letter, together with attached announcements and forms to note interest, is to advise you of two UNOLS workshops to generate planning information for ALVIN-ATLANTIS II deep submersible science. The first workshop will be held December 8, 1985, in San Francisco, California, just preceding the AGU Fall Meeting. The second will be held January 12, 1986, in New Orleans, Louisiana, preceding the AGU-ASLO Ocean Sciences Meeting. The workshops will consider and hear presentations on interest in or intent to use ALVIN-ATLANTIS II for submersible science during 1988. The ALVIN Review Committee (ARC) anticipates that potential investigators may wish to attend or participate in one but not both workshops.

BACKGROUND: Over the last several years it has become apparent that the talk of matching time on the seagoing ships and platforms operated by UNOLS institutions with requests for the use of those facilities by skilled individual investigators is becoming critical and requires careful advanced planning. The situation is especially critical with respect to the ALVIN, Deep Submergence Vehicle, operated as a National Oceanographic Facility in UNOLS. The ALVIN generates many more requests for dive time than can be accommodated. With the advent of ATLANTIS II as support ship for ALVIN, operations can be considered throughout the world's oceans. Interest and requests for ALVIN dives are for diverse operations and widespread areas.

The ALVIN Review Committee (ARC), Robert W. Corell, Chairman is charged with advanced planning, review of dive requests and making recommendations for schedules and operations for ALVIN. Over the past few years the ARC has solicited statements of interest or intent to use ALVIN two, three and more years into the future, and has organized workshops for the presentation of that interest. (The first ALVIN-ATLANTIS II Workshop, in December, 1982, garnered planning information for 1984 and 1985, and will affect ALVIN-ATLANTIS II operations into the 1987 operating season.)

The ALVIN Review Committee announces and will host two workshops to generate planning information. The workshops (see and distribute to your co-workers the attached announcements) will be held:

December 8, 1985

8:30 a.m. - 2:30 p.m.

Japanese Pavilion

Cathedral Hill Hotel

San Francisco, California

and

January 12, 1986

8:30 a.m. - 5:00 p.m.

Fairmont Hotel

New Orleans, Louisiana

These Workshops will emphasize planning information for 1988 and beyond. The information considered will be Notifications of Intent or interest in ALVIN Submersible Science. Plans for 1988 and beyond are completely open, although an ALVIN overhaul will be required in mid to late 1988. (A tentative schedule has already been devised for 1986 and operating areas have been indicated for 1987; see below.)

It is requested that notifications submitted by individual investigators provide the information indicated on the attached:

ALVIN Submersible Science Planning
Notification of Intent.

At the Workshops, brief presentations are invited from individuals in attendance, within the time available. Written Notifications of Intent will receive equal consideration in the ARC's planning.

Prospective investigators should be aware that these Notifications of Intent are considered by the ARC for planning purposes only. No ALVIN dives will be recommended on the basis of these Notices (although areas of operation or topical research investigations may be recommended by the ARC). Rather the ARC recommends ALVIN-supported investigations for the following year on the basis of ALVIN Dive Requests (submitted in response to appropriate announcements) reviewed at their annual May meeting. Furthermore, prospective investigators are advised that they must seek funding in a timely fashion for their ALVIN-supported investigations--including payment for ALVIN and ATLANTIS II time--from their traditional funding sources, most often NSF, ONR and NOAA. Note that NSF is reluctant to fund field investigations that require support from ALVIN-ATLANTIS II or other sea-going facilities unless proposals are submitted in time for review panels in the summer prior to the year of intended operation.

STATUS OF THE ALVIN PROGRAM. The ALVIN-ATLANTIS II have completed operations for 1985 and returned to Woods Hole for inspection, maintenance and overhaul. During 1985, operations included 150 dives during 157 days on station and 207 days at sea. Only one scheduled dive was not made during 1985. ALVIN-ATLANTIS II personnel and systems work extremely well together, and the ability to conduct ALVIN operations world-wide is realized.

The ARC has recommended a provisional schedule for 1986 (from their 1985 recommendations together with recommendations remaining from their 1984 review) that would have ATLANTIS II-ALVIN take up work in the North Atlantic in about March, support investigations in the Gulf of Mexico along transit to the Panama Canal, and, in the Pacific, work in the Panama Basin and California Basins, ending the year in San Diego.

For 1987, specific schedule recommendations have not yet been developed. Based on individual investigations already recommended together with additional Dive Requests that might be recommended at the ARC's May, 1986 review, the most likely 1987 schedule would support in the the vicinity of the Hawaiian Islands and mid Pacific enroute to the Mariana region. After completing recommended work near the Marianas (late winter/spring 1987) the ATLANTIS II-ALVIN would return to the eastern Pacific, most likely the Gorda-Juan de Fuca - Oregon margin area. Work there and perhaps in the California Basins and farther south would complete operational availability prior to return to Woods Hole.

NOTICE OF INTENT TO USE ALVIN: Individual investigators who intend to use ALVIN for deep submergence research during 1988 and beyond are invited to inform the ARC by providing the information requested on the attached form for:

**ALVIN Submersible Science Planning
Notification of Intent.**

There is no firm deadline for submitting these forms, but to be most useful to the ARC those related to the workshop in San Francisco on December 8 should be received by November 22, and those related to the January 12 New Orleans workshop should be received by December 20.

Notices of Intent will be considered for any ocean area in 1988 and beyond.

Investigators who requested 1986-87 ALVIN time early 1985 or who intend to submit requests in early 1986 for dives in 1987 need not submit Notices of Intent for that same work. The purpose of these workshops is to plan for 1988 and beyond.

Sincerely,



201 Robert W. Corell, Chairman
ALVIN Review Committee

ANNOUNCEMENT

The
ALVIN REVIEW COMMITTEE
Will Hold an OPEN WORKSHOP
to generate Planning Information on

ALVIN-ATLANTIS II
DEEP SUBMERSIBLE SCIENCE
PROPOSED FOR 1988 and beyond

TIME: SUNDAY, DECEMBER 8, 1985
8:30 a.m. - 2:30 p.m.

PLACE: JAPANESE PAVILION
CATHEDRAL HILL HOTEL
SAN FRANCISCO, CALIFORNIA

Everyone with an interest in the ALVIN program is welcome. The ARC invites concise presentations from investigators who have submitted proposals or letters of intent for the use of ALVIN-ATLANTIS II during 1988 and beyond. For further information contact:

William D. Barbee
UNOLS Office, WB-15
School of Oceanography
University of Washington
Seattle, WA 98195
(Telephone: 206-543-2203)

ANNOUNCEMENT

The
ALVIN REVIEW COMMITTEE
Will Hold an OPEN WORKSHOP
to generate Planning Information on

ALVIN-ATLANTIS II
DEEP SUBMERSIBLE SCIENCE
PROPOSED FOR 1988 and beyond

TIME: SUNDAY, JANUARY 12, 1986
9:00 a.m. - 5:00 p.m.

FAIRMONT HOTEL
NEW ORLEANS, LOUISIANA

Everyone with an interest in the ALVIN program is welcome. The ARC invites concise presentations from investigators who have submitted proposals or letters of intent for the use of ALVIN-ATLANTIS II during 1988 and beyond. For further information contact:

William D. Barbee
UNOLS Office, WB-15
School of Oceanography
University of Washington
Seattle, WA 98195
(Telephone: 206-543-2203)

ALVIN Submersible Science Planning
Notification of Intent

Submit to: Chairman, ARC
UNOLS Office, WB-15
School of Oceanography
University of Washington
Seattle, WA 98195

Principal Investigator:

Name:
Title:
Address:
Telephone Number:

Institution:
Names of Other Co-Investigators:

Principal Program Objectives: (Use additional sheets as necessary):

Areas of Proposed Operations:

Expected Years of Operations (for multi-year proposals):

Anticipated Foreign clearances: (For work within 200 nm of coastal states)

Names and Affiliations of Foreign Collaborators (if any):

Approximate Dates of Proposed Work (Season, year):

Suitable Alternate Dates (Season, year):

Number of Dives Anticipated (by cruise for multi-cruise projects):

Anticipated Size of Scientific Party:

Special Facilities Needs (including SEABEAM on ATLANTIS II):

Special Constraints (time, radio isotope clean ship, etc.):

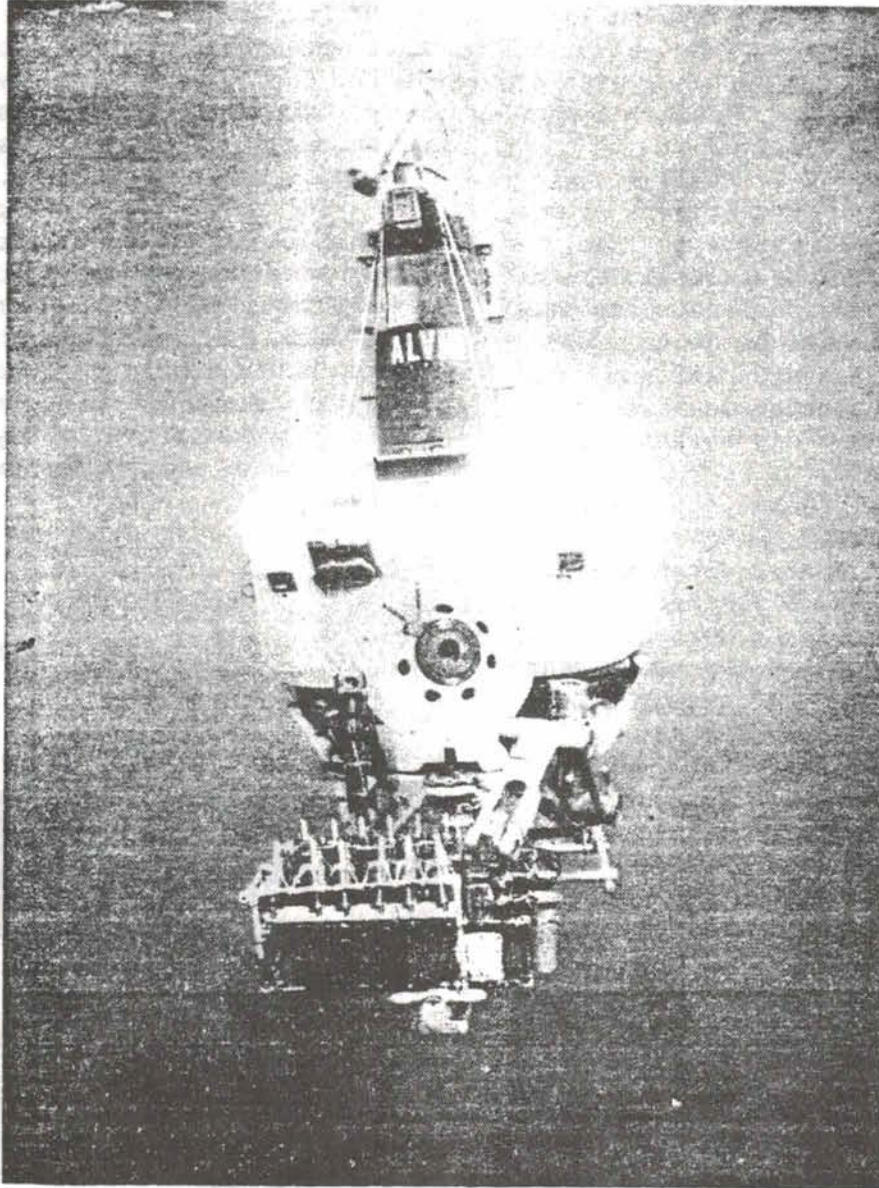
Proposed Funding Sources:

Do you intend to participate in the December 1985 Workshop? Yes or No
in the January 1986 Workshop? Yes or No

Signature:

Date:

Exploring Our Ocean Frontier:



**Deep Submergence Vehicle ALVIN
and the Woods Hole Oceanographic Institution**

1964 — 1985

21 years of deep sea discoveries

21 YEARS OF EXPLORING THE OCEANS' DEPTHS

ALVIN's 21 years have been exciting ones -- it has made scientific discoveries that have astounded the scientific community and aroused the interest of the public. Changing in appearance over the years (from a rounded to a more angular look with a variety of new features -- arms, cameras, etc.), ALVIN has (in the words of the Star Trek introduction) "boldly gone where no man has gone before."

In its explorations, ALVIN has explored the Mid-Atlantic Ridge, part of the earth's vast underwater mountain range, glided past other-worldly black smokers at the East Pacific Rise, and taken samples of water and strange life forms at the vent communities at the Galapagos Islands, East Pacific Rise, Florida escarpment (near Tampa) and at the newly discovered Juan de Fuca Ridge vents.

ALVIN's history parallels the space program. Built by the U.S. Navy in 1964 and given to the Woods Hole Oceanographic Institution to operate, ALVIN became oceanography's "spacecraft" into hostile and unexplored environments. In the early years ALVIN's primary mission was one of pilot training and search and recovery. Science played only a modest role. But just as space flights have become routine with shuttles ferrying astronauts and scientists into space, similarly, ALVIN has made ocean diving a well-used and valuable research tool. With 1,663 dives to its credit, ALVIN is the workhorse of the scientific diving fleet.

According to Barrie Walden, WHOI's manager of submersible engineering and operations, "ALVIN has an unlimited useful life since it is constantly undergoing modifications, allowing it to remain abreast of technology. Although originally constructed in 1964, there is little of the submersible which is 21 years old. In recent years, we have concentrated on data gathering capabilities by adding and improving the sensor suites, incorporating a data logging system and expanding the imaging capability. This winter, we will replace the propulsion and hydraulic systems which should increase our reliability and improve our power budget."

The mission that first showed ALVIN's

usefulness was the infamous case of the missing hydrogen bomb. Dropped in the Mediterranean off of Spain in a 1966 plane collision, the bomb defied all methods of detection. ALVIN located the device and then relocated it when it slipped during the recovery process.

The project that put ALVIN on a valid scientific footing was FAMOUS in 1974. The French-American Mid-Ocean Undersea Study looked at the Mid-Atlantic Ridge, collecting first-ever photos and samples of this major spreading center.

The following highlights from ALVIN's illustrious career have been provided by Ed Bland, research associate in the ALVIN group and a former pilot with over 200 dives to his credit, including the shortest dive on record (4 minutes with an ALVIN associate) and until recently the northernmost dive in the Gulf of Maine by the Bay of Fundy. (The recent Juan de Fuca dives were a bit further north.)



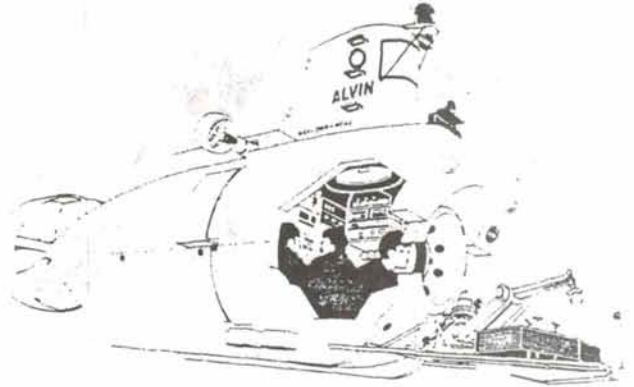
Paul Fye, WHOI's fourth director, presided at the ALVIN commissioning on June 5, 1964. Over 500 people attended the event.



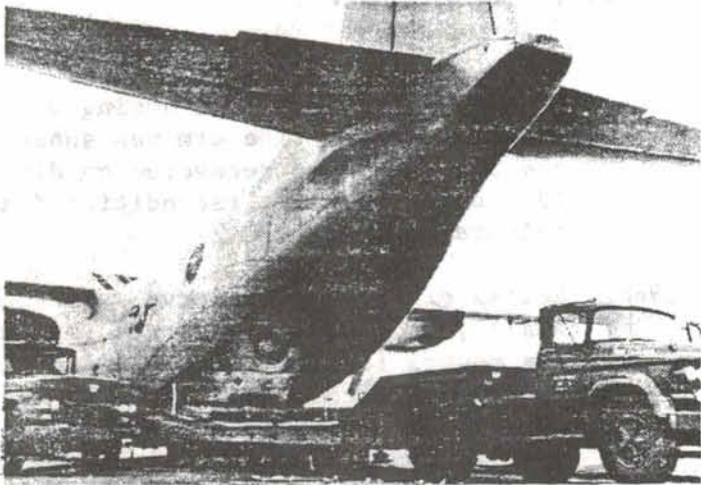
Allyn Vine, a WHOI ocean engineer, was one of ALVIN's chief advocates. Mrs. Allyn Vine christens the sub named for her husband.

HIGHLIGHTS OF ALVIN'S 21 YEARS

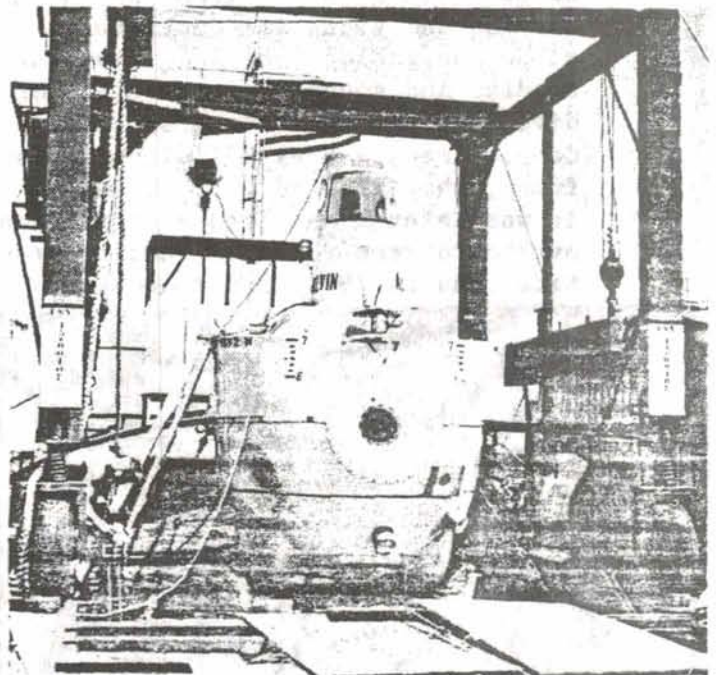
- 1964 ALVIN commissioned at Woods Hole on June 5. A series of test dives in Woods Hole Harbor, Buzzards Bay, and Vineyard Sound go progressively deeper from 12 to 65 feet.
- 1965 R/V LULU constructed from two Navy surplus pontoons. LULU, with ALVIN aboard, towed to Port Canaveral, Florida, for deep trials (unmanned, 7500 ft.; manned, 6000 ft.).
- 1966 An Air Force B-52 and tanker collided over Spain, dropping an H-bomb in the Mediterranean off Cartagena, Spain, in January. ALVIN was called. In



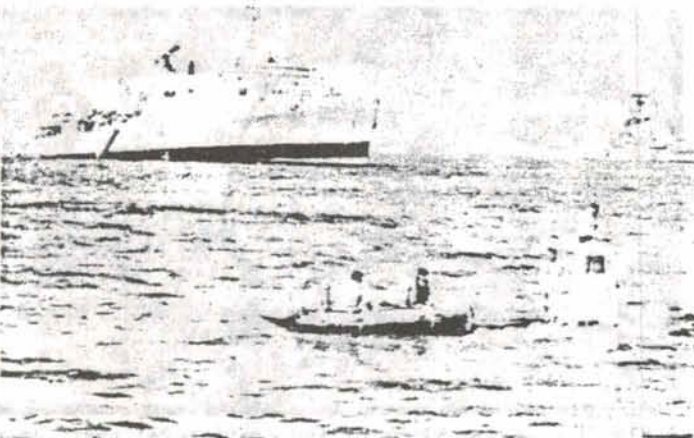
February 1966 ALVIN and her support vans were loaded into an Air Force cargo aircraft at Otis and flown to Kota, Spain. During the next two months ALVIN searched the ocean floor off of Cartagena for the lost H-bomb, operating from a Navy LSD. Bomb was located for the first time on March 15 but subsequently lost during attempt to attach lift lines. Bomb slid down-slope to deeper water; the search continued. Bomb relocated on April 2 by ALVIN and finally recovered on April 7. ALVIN returned to Woods Hole in LSD for overhaul.



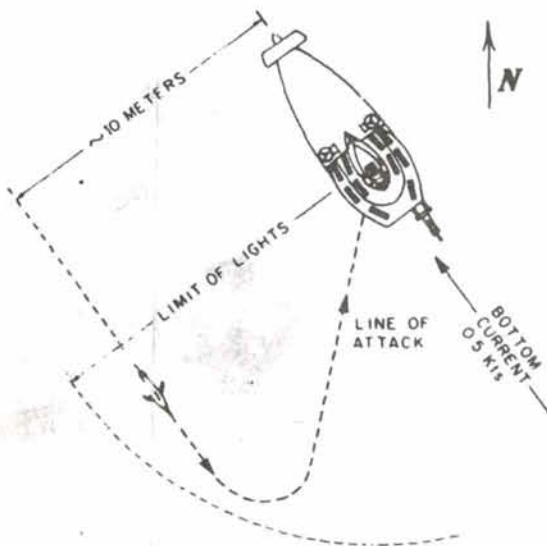
ALVIN is loaded into an Air Force plane at Otis Air Force Base (Cape Cod) for shipment to Spain where she assisted in the search for a missing H-bomb in 1966.



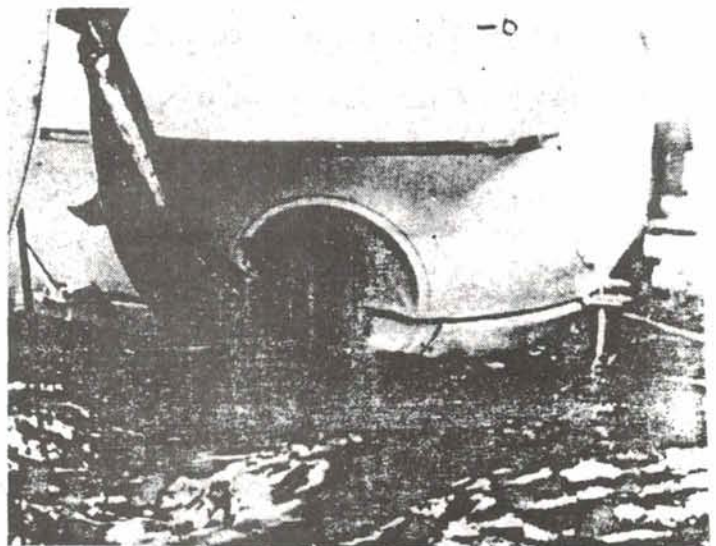
In the early days of ALVIN/LULU operations, ALVIN was lowered with support cables from a launching cradle. ALVIN fell into the ocean when one of the cables failed due to corrosion.



ALVIN joins naval ships assigned to the search.



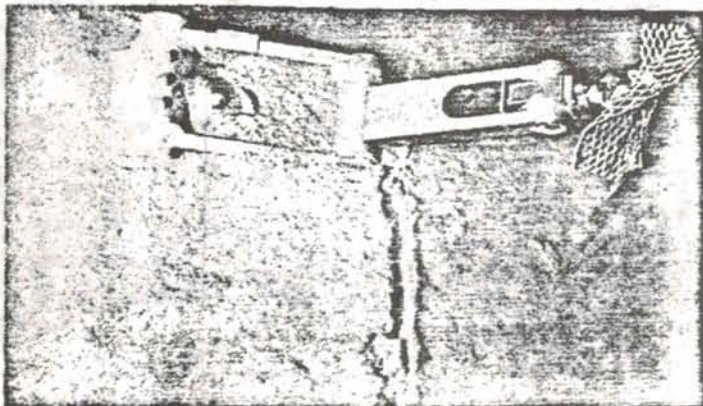
ALVIN survived a swordfish attack during 1967, bringing the fish back up as a trophy; it was served for dinner that evening. Later research projects tested



the strength of the plexiglass windows and their ability to withstand direct swordfish strikes. The windows survived all tests.

1967 Return to Bahamas for Navy dives. Subsequent transit north for biology/geology dives on the Blake Plateau and off of Cape Charles. During dive #202 on July 6, ALVIN was attacked by a swordfish on the bottom at about 2000 ft. The fish became trapped in ALVIN's skin and was brought back to the surface intact.

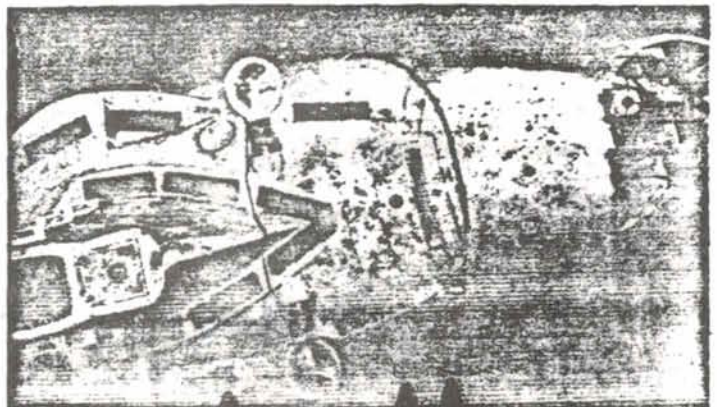
ALVIN completed a long series of dives south of New England in the Canyons and along the continental slope for geology, biology, thermal studies and sound measurements. On dive #209, in the Hydrographer Canyon area, a Navy F6F aircraft was found, photographed, and surveyed. It was later identified as being lost overboard from a carrier during practice runs in 1944 (pilot escaped).



ALVIN lost her mechanical arm on Dive #224 when a handling line became fouled on the catamaran.

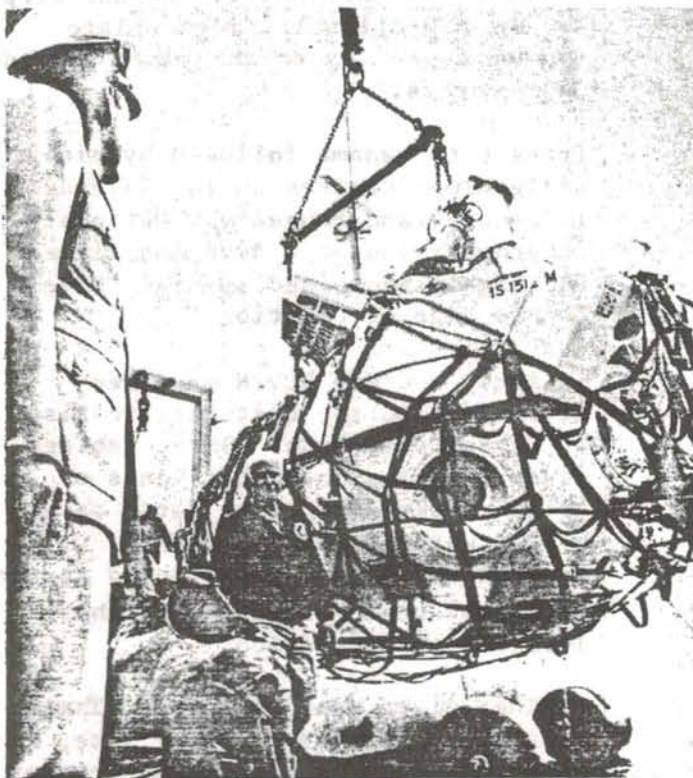
On dive #224, September 24, the mechanical arm was lost during a rough recovery. The arm was subsequently found and recovered on dive #236 on October 15, reconditioned and reinstalled.

1968 Series of dives to observe submerged whales, Navy dives to survey tops of sea mounts for new range, geology and biology studies. During launch for dive #308 on October 16, ALVIN's cradle support cables failed and ALVIN slid into the water and sank to the bottom in 1535 meters of water. Ed Bland, pilot, received some bruises and a sprained ankle. Uneaten lunches sank too. Poor weather conditions and insufficient recovery equipment prevented recovery during the rest of the year.



ALVIN sits on the floor of the continental shelf near Hydrographer Canyon in 1,535 meters of water.

1969 ALVIN remained on the bottom until Labor Day. The DSV ALUMINAUT (a submersible from the Reynolds Aluminum Company) and the R/V MIZAR assisted in the recovery, which required placement of a toggle-bar into the hatch (ALUMINAUT had to break the sail in order to accomplish this). MIZAR then raised ALVIN to 50 ft., where divers then wrapped her with lines and nets to prevent loss of any pieces. ALVIN towed to the Vineyard, where a crane mounted on a barge pulled her out of the water. Overall, very little structural damage to the submersible (except for sail). Lunch on board, soggy but edible. Close to freezing temperatures and lack of decay at depths led to new areas of biological and chemical research at the Institution.



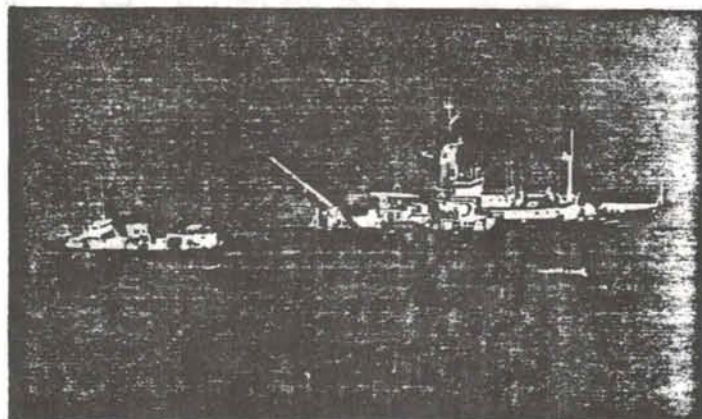
ALVIN's sail had to be broken in order to insert the toggle bar for lifting. Divers wrapped harnesses around the sub when it reached 50 feet to prevent any loss of parts during the tow back to Martha's Vineyard.

- 1970 ALVIN undergoes overhaul after her ten-month dunking.
- 1971 ALVIN's first post-loss dive is #309 on May 17.

In mid-June a permanent bottom station was established on the continental slope south of Martha's Vineyard. The station has been regularly re-visited at least once each year. Dr. Ruth Turner was ALVIN's first female scientist-passenger on dive #345 to the station on August 13.

Series of dives in the Gulf of Maine and the Straits of Florida. On dive #364 ALVIN was attacked and hit by a large blue marlin while on the bottom off of Grand Bahama Island. The fish did some damage to the underwater lights and sail and much damage to himself.

- 1972 Series of dives at Martha's Vineyard station (biology), Hudson Canyon (geology and biology), Gulf of Maine (geology), navigational and rock drill experiments.
- 1973 During the spring, a new titanium pressure hull and variable ballast system were installed. After a series of test dives, ALVIN was officially certified to 12,000 ft.
- 1974 Project FAMOUS (French-American Mid-Ocean Undersea Study) provided first look at the Mid-Atlantic Ridge along with French submersibles CYANA and ARCHIMEDE. National Geographic ran articles on the Project in the May 1975 issue, one by Bob Ballard and the other by Jim Heirtzler.



R/V KNORR, with ALVIN aboard and LULU in tow, departs for the Azores and Project FAMOUS. There the sub was transferred to LULU for the trip to the dive site some 200 miles southwest.

1975 Series of dives at Bahamas (biology), Grand Bahama Island (geology), Blake Plateau (biology), NOAA radioactive waste dump survey. Establishment of a new deep (12,000 ft.) station south of Cape Cod.

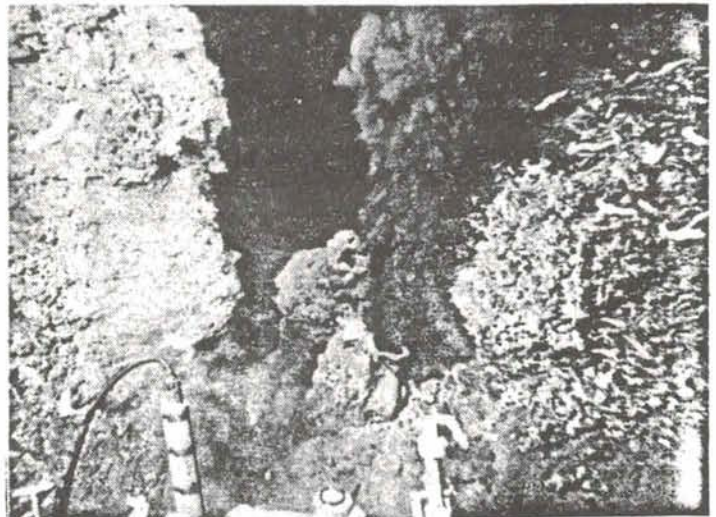
1976 ALVIN certified for 4,000 meters (13,000 ft.). Navy dives near St. Croix and Tongue of the Ocean, biology on the shelf, slope, and canyons south of Cape Cod, recovery of waste drum from radioactive waste site (RADWASTE) off of New Jersey.

1977 Transit to Panama and Canal passage (for the first time) and geology work in the Galapagos Rift during February and March. A major discovery was the abundance of warm water animal life on and in the immediate proximity of the warm water vents. Since no light can penetrate through the deep waters, scientists concluded the animal chemistry is based on chemosynthesis.

Return through the Canal for dives in the Cayman Trough in April (a continuation of geology investigations). During this series the Nicaraguan earthquake occurred and was plainly felt by ALVIN while submerged.



This portrait of ALVIN at the Galapagos Rift was taken with a remote-controlled 16 mm motion-picture camera. ALVIN placed the equipment on a stable surface, backed up, and then made a grand entrance for the camera. Photo by Emery Kristoff and Alvin Chandler, © National Geographic Society.



Black smoker at East Pacific Rise with ALVIN's basket in foreground. Photo by Dudley Foster.

1978 New titanium frame installed. Continuation of RADWASTE and biology studies off East Coast. Second trip to the Mid-Atlantic Ridge (plate tectonic geology on the plate spreading centers).

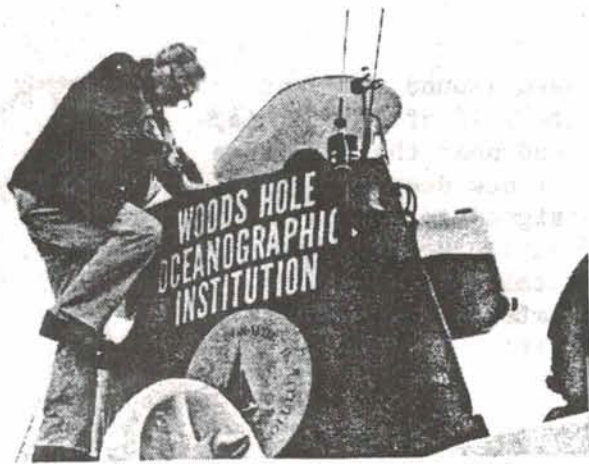
1979 Transit to Panama followed by biology and geology cruises to the Galapagos in January and February. National Geographic bought a dive and filmed the highly acclaimed special "Dive to the Edge of Creation."

In April and May ALVIN made her first trip to the East Pacific Rise at 21 Degrees North. These geology dives revealed hot water vents or "black smokers" spewing forth superheated water at 350°C (650°F). Many of the same animals found at the Galapagos vents are found at this location off of Mexico.

Further dives near San Diego, Tamayo Fracture Zone, East Pacific Rise, and Galapagos from June through December.

1980 ALVIN completes 1,000th dive at the Galapagos Rift in January.

ALVIN returns to the Mid-Atlantic Ridge and Kane and Oceanographer Fracture Zones during June and July for geology studies. Additional dives along East Coast, Bahamas, St. Croix. BBC films special.



Walter Cronkite enters ALVIN on Dive #1211 which was filmed for his Universe television series.

- 1981 Extensive work in St. Croix area. Return to Galapagos and East Pacific Rise. Dives in the Panama Basin.
- 1982 Dives at East Pacific Rise and Guaymas Basin. Walter Cronkite made dive #1211 to the hot vents. Dives at the Panama Basin followed by long transit to the Mid-Atlantic Ridge. Returned to Woods Hole in August and completed local studies for biology, geology, and corrosion. Dives in the Florida Straits and the Providence Channels.
- 1983 A major ALVIN overhaul took place at Woods Hole including design of a new frame to allow for a single-point lift system. During the same time, work on R/V ATLANTIS II continued, preparing her for her new role as

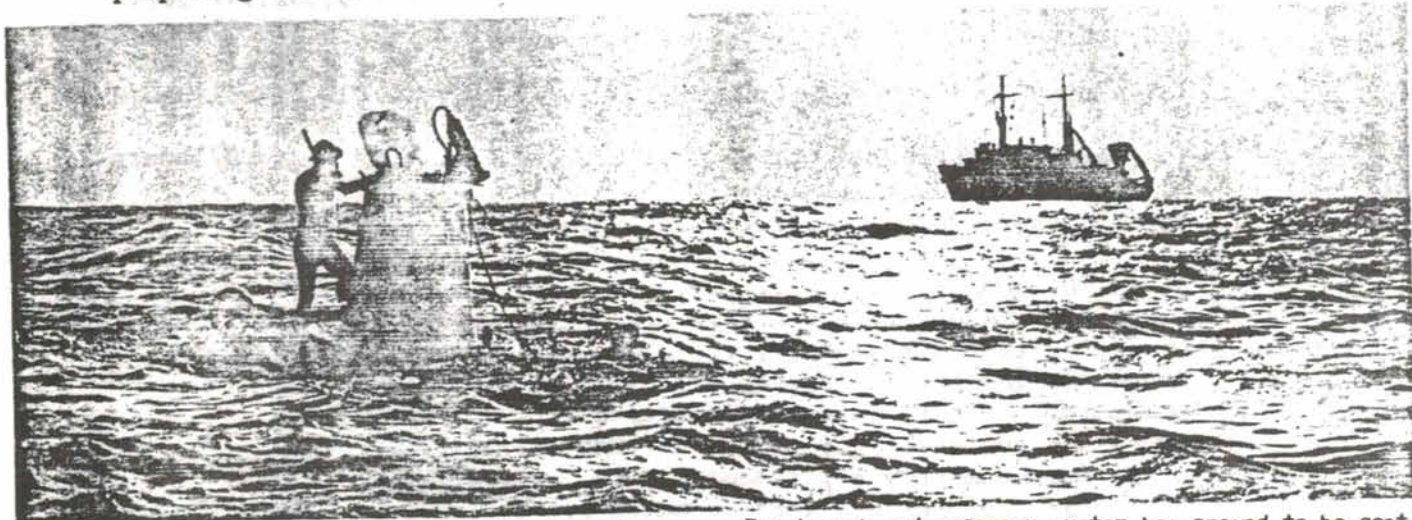
mother ship and tender for ALVIN. These extensive modifications were conducted during A-II's regular mid-life refit. A large A-frame was added to the stern for ALVIN launch and recovery.

1984 ALVIN and ATLANTIS II departed Woods Hole in January for Charleston, S.C. Final preparations and harbor tests include first actual ALVIN launch and recovery using A-frame, followed by geology cruise to the Blake Plateau. Several rough water recoveries were made at sea, proving the A-frame system could work under less than ideal conditions.

March geology/biology cruise out of Tampa on the West Florida Escarpment in the Gulf of Mexico discovered a series of bottom cold water vent communities containing animals very similar in appearance to those in the Pacific.

Transit to the Pacific for further dives in the Panama Basin and the East Pacific Rise. In mid-April ANGUS discovered a new vent field to the south of the dive area which A-II and ALVIN visited.

Dives at the Juan de Fuca and Gorda Ridges off of Oregon/Washington in July reveal black smokers in this northern spreading center.



ALVIN surfaces as Support Vessel ATLANTIS II, with newly installed A-frame, approaches for recovery.

The launch and recovery system has proved to be gentle to passengers yet capable of operating in rather rough sea conditions. Photo by Rod Catanach.



1985 - Much of ALVIN's work during 1985 focused around the vent communities at the Guaymas Basin in the Gulf of California, the East Pacific Rise off of Mexico, and near the Galapagos Islands. Successful tests were made of new deep ocean sampling and photography equipment designed to be controlled from within ALVIN. Since 1964, the vehicle has traveled vertically (up and down) a total of 3,535 miles. The final months of 1985 will be dedicated to maintenance and upgrade of the vehicle in Woods Hole.

ALVIN DIVE STATISTICS FOR 1985

TOTAL DIVES	161
Total depth	390,746 meters
	1,269,925 feet
Average depth per dive	2,426.99 meters
	7,887.72 feet
Total time submerged	1,190.51 hours
Average time submerged per dive	7.39 hours
Total passengers	296
Dives for geology	88
Dives for biology	59
Dives for chemistry	7
Dives for engineering tests	5
Dives for equipment recovery	1
Dives for photography	1

ALVIN DIVE STATISTICS FOR 1964 - 1985

TOTAL DIVES	1,663
Total depth	2,871,676 meters
	9,332,947 feet
Average depth per dive	1,726.80 meters
	5,612.11 feet
Total time submerged	10,097.51 hours
Average time submerged per dive	6.07 hours
Total passengers	2,754
Dives for geology	564
Dives for biology	490
Dives for test & training	176
Dives for inspection, survey, recovery	120
Dives for VIP & scientist orientation	68
Dives for engineering & equipment tests	32
Dives for chemistry & geochemistry	75
Dives for geophysics & vent dynamics	29
Dives for U.S. Navy tests & survey	14
Dives for miscellaneous oceanography	73
Dives for dump site survey & recovery	13
Dives for public relations purposes	9

ALVIN MODIFICATIONS -85/86 OVERHAUL

The ALVIN submersible is presently undergoing an overhaul which includes major modifications intended to improve capability and reliability, and to allow a longer period of time between major overhauls. Initial planning was centered on correcting a problem involving the two main electric motors which has plagued operations since conversion to a 4000m depth capability in 1973. These specially constructed brush type DC motors mounted in an oil filled, pressure compensated box are used to drive hydraulic pumps which in turn provide power to the main and side propellers, rudder ram, mercury trim system and one manipulator. At depths between 3000 and 4000 meters, the increased viscosity of the compensation oil frequently caused excessive brush arcing, destroying the motor's commutator. Repairs have been both costly and time consuming.

Various solutions exist but the best appeared to be replacement of the entire hydraulic propulsion system with thrusters directly driven by brushless DC motors. This approach would improve system efficiency and greatly reduce complexity thereby increasing reliability. Unfortunately, although fractional horsepower motors and controllers of this type were readily available, the multi-horsepower size required for ALVIN was not.

After months of discussions with vendors and experimenting with prototypes, a decision was made to change the primary DC voltage used on the submarine in order to ease the motor procurement problem. This has advantages in itself but most importantly, it allowed selection of a motor vendor and therefore commitment to the propulsion system change.

As overhaul planning and engineering proceeded, it became obvious that modifications beyond those of the power and propulsion systems could be desirable to amplify the benefits of the required changes. As a result, the total replacement of the submersible's two primary systems will be accompanied by major improvements in many other areas. A brief summary follows:

BATTERY SYSTEMS

Replace batteries, racks, boxes, guides, release mechanisms and power control systems. Convert from 30/60 VDC to 30/120 VDC.

EXPECTED RESULTS:

Capacity Improvement -

- Double existing propulsion and lighting power.
- Provide additional 30V system for special applications.

Improved Safety -

- Increased release system reliability.
- Double battery systems droppable weight.

Increased reliability -

- Additional battery monitoring sensors.
- Elimination of series/parallel charging requirement.

PROPULSION SYSTEM

Replace stern and lift propellers plus associated hydraulic system (main propulsion box) with six thrusters directly driven by 3HP brushless DC motors.

EXPECTED RESULTS:

Increased Reliability

Increased Efficiency

Increased Performance

Speed Increase -

Horizontal 1.4 Kts to 1.9 Kts

Vertical 0.6 Kts to 1.3 Kts

Lateral None to 0.5 Kts

HYDRAULIC SYSTEMS

Replace with simpler version using brushless DC motor driving a load sensing pump.

Total capacity -

1500 - 2500 PSI

3 - 4 GPM

EXPECTED RESULTS:

Increased Efficiency

Improved Capability -

Provides 5 sets of hydraulic power connections at the science basket.

CABLING/WIRING SYSTEMS

Provide two forebody to afterbody penetrator cables (with explosive cutter) which bypasses the hull disconnect in order to decrease resistance and electrical noise problems in selected release, monitoring and instrumentation circuits.

Rewire personnel sphere to decrease electrical noise problems in data systems and provide clean power circuits.

COMPENSATION SYSTEMS

Redesign to improve intersystem separation, provide capacity monitoring and insure positive oil pressure on all compensated boxes.

DATA LOGGING/DISPLAY SYSTEM

Replace prototype data logger with finalized version which will incorporate self-diagnostics. Hardware will be configured for system

replacement rather than board or component replacement for trouble shooting and/or repair.

PAYLOAD

Double existing normal payload to provide approximately 1,000 pounds for science basket, sphere equipment and reserve buoyancy. NOTE: Science basket payload will not change since foundations cannot be modified at this time.

Provide an additional 1,000 pound payload capacity for special operations.

ALVIN/ATLANTIS II
Notification of Intent Summary

December 1985, and
January 1986

Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	No. Dives	Remarks
1. Batiza, R.	Simkin, T. Fornari, D. Smith, T. Allen, J. Koppel, E.	12-43N, 102-35W (Volcano 6)	Mapping of hydroclastite deposit to test hypothesis for formation	?	Not Specified	—	6	
*2. Taylor, B.R.	Sinton, J. Craig, H. Perfit, H.	Western Pacific, 1. E. Woodlark Basin 2. W. Woodlark Basin 3. Manus Basin	Investigations of ridge subduction volcanism associated with continental rifting and fast back-arc spreading	NSP, AID, Australia	1988/1989	—	1.5 2.10 3.20	Total of 45 dives on three basins
*3a. Hammond, S.	Curl, H. Embley, R. Masoth, G. Morton, J. Normark, W.	Axial Seamount, Southern Juan de Fuca Ridge	Detailed mapping on Axial Seamount and characterization of physical and chemical properties of vent fluids.	NOAA	Beyond 1987	—	20/year	Continues dive request for 1987
*3b. Normark, W.	Hammond, Curl, Morton, Koski, R. Shanks, W., Holcomb, R.	Southern Juan de Fuca Ridge	Detailed geologic mapping, sampling and hydrothermal effluent monitoring.	USGS	Beyond 1987	—	16/year	Continues dive request for 1987
*4. McMurtry, G.	Karl, D. Kroenke, L. Malahof, A. Sinton, J.	North Fiji Basin, (South Pordota Ridge, NFB central spreading Center, Fiji Fracture Zone)	Investigation of hydrothermal systems in North Fiji Basin	NSF USAID	Winter 1988/89	Fall-spring 1988-1989	20	
5. Craig, H.	Hey, R. MacDougall, D. Ballard, R. Fox, J. MacDonald, K.	East Pacific Rise 13S-35S	Investigation of EPR: hydrothermal vents, tectonics, petrology and geomorphology between Garrett and Chile Fracture zones	NSF	January- March 1988	December 1987	60 (3 legs)	Reiterates 1984 Notice
**6. Hessler, R.	Smith, K. Wishner, K. Butman, C.	Galapagos spreading Center-00-48N, 86-13W	Structure and dynamics of a deep sea, hard bottom community; benthos and immediate overlying plankton	NSF	Good Weather 1987, 88 or beyond	—	20 1st yr. 10-15 second	Presented by K. Wishner, 1/12/86
*7. Abbott, D.	Lyle, M. Simoneit, B. Kadko, D. Collier, R.	Southern Gorda Ridge (Escanaba Trough)	Characterize on a 1-200m. scale heat loss, sediment alteration, water column chemistry and density structure of sedimented active vents	NSF	Summer, 1988	—	21	
*8. Kulm, L.	Suess, E. Thornburg, T.	Central Peru Cont. Shelf 11-12S, 9-10S	Determine nature of tectonic structures/processes that characterize metamorphic Andean cont. and accreted marine sediments, and transverse E-W structures	NSF	Jan-Apr 1988	May-Nov 1988	20 (10 ea. site.)	Presented by Bender, 1/12/86
*9. Batiza, R. Longmuir, C. Bender, J.	Kappel, E. Fornari, D. Allan, J.	EPR, 8-30N to 12-30N	Observations and samples for petrologic and tectonic investigation of DeVal's on EPR	Not Specified	1987	?	20	

ALVIN/ATLANTIS II
Notification of Intent Summary

December 1985 and
January 1986

Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	No. Dives	Remarks
*10. Rona, P. Edmond, J. Thompson, G.		MAR, TAG area	Follow up investigations on black smokers	NSF, NOAA	1988	Beyond	7	Presented by Rona 12/8/85
11. Hey, R.N.	Sinton, J.L. et al	Galapagos spreading centers 2N, 95W	Investigation of how spreading centers fail.	NSF	early 1988	late 1988	20	
**12. Hecker, B.	Grassle, J.F. Grassle, J.P. Lutz, R. Turner, R. Wishner, K.	West Fla. Escarpment seeps 26N, 85W	Structure and dynamics of deep-sea communities at West Florida Escarpment seep side	NSF	Spring, Summer 1988	any good weather	18	Presented by F. Grassle 1/12/86
**13. Levin, L.	DeMaster, D.	Cont. Slope W.N. Atlantic 39-48N, 70-55W	Identify role of agglutinating protozoans in structuring soft-sediment environments and faunal communities in deep sea.	NSF	1986 1988 1989	good weather	5-86 8-88 5-89	Total of 18 dives
**14. Lutz, R.	Hecker et al	West Fla. Escarpment Seeps 26N, 85W	Molluscan studies. Deploy arrays for long term incuba- tion and recovery in 88 et seq. (See #12, Hecker).	NSF	1986 1988	good weather	2-86 7-88	Presented by F. Grassle 1/12/86
15. Hawkins, J.	Lonsdale, P. MacDougall, J.D. Hessler, R. Craig, N.	Lau Basin 16 to 19S 176W	Multidisciplinary studies (petrology, geochemistry, biology morphology) of Lau Basin.	NSF	1986- 1987	1987- 1988	24	Reiterates 1984 Notice and Request
**16. Grassle, J.F.	Gagosian, Lutz Sayles, Martens Jannasch, Manrique Karl, Molina-Cruz Soto-Gonzalez Romero-Jarero	Guaymas Basin	Biology and chemistry of Guaymas hydrothermal vents	NSF	Spring 1988	Late Fall 1988	19 dives 21 days	
**17. Kappel, E.	Ryan, W.B.F. Langmuir, C. Christie, D. Franklin, J.	Explorer and Endeavor Ridges 49 to 50N, 47-50 to 48N NE Pacific	Vulcanism, tectonics, petrology, structure, stratigraphy, gravity on mid-ocean spreading center.	NSF and EMR, Canada	Spring or Fall 1988 or beyond		15	Presented by W.B.F. Ryan, 1/12/86

ALVIN/ATLANTIS II
Notification of Intent Summary

Investigator	Associates	Area	Purpose	Sponsor	Date	Alternate	No. Dives	Remarks
18a. Cacchione, D. 18b. 18c.	Hampton, M. Gardner, D. Field, M. Drake, D. Edwards, B. McCulloch, D. Karl, H.	Western EEZ, at a. 40-30N, 125W b. 46N, 126W and c. 37N, 126W	Geological research and mapping in Western U.S. EEZ (At Gorda Escarpment and Fan, Astoria Fan and Cascadia Channel and Tanney Seamount	USGS	1987	1988 or 1989	a. 15 b. 10 c. 8	
**19. Childress, J.	Johnson, K. Hessler, R. Somero, G. Felbeck, H. Fisher, C. Vetter, R.	Galapagos Rift	Ecology, physiology, biochemistry of hydrothermal vent organisms at Galapagos Rift.	NSF	Late 1987	Early 1988	2 legs, 15 each	Coordinated with and includes 2 dives requested by R. Lutz. Requests Melville to accompany. Update of 1983 Notice of Intent (#40). Timing similar to Jumars et al in 86/87
**20. Smith, C.	Jumars, P.	Continental borderlands off S. Calif. (esp. Santa Catalina Bas.)	Megafounal bioturbation and infaunal succession at the deep sea floor.	NSF	Summer and Fall, 1988 or 1989	Spring or Winter, 1988 or 1989	3 cruises, 6 dives each	
**21. Flood, R.	Shor, A.	Hudson Channel/ Upper cont. rise to 4000 m.	Study recent sedimentary processes on the Hudson Rise Channel. Precise sampling of channel floor and wall.	NSF	Summer, 1988	Spring 1988	12	Use SEA BEAM, gravity and piston corers.
**22. Flood, R.	Hecker, B. Shor, A.	Amazon Fan off NE Brazil	Study of surficial sediments and organisms in submarine fan channels and the canyon of the deep sea fan.	NSF	1988		15	Brazilian clearance. Dr. M. Gorini, Collab.
**23. Flood, R.		Blake Outer Ridge, eastern U.S. margin	Deploy, recover and follow up long- term (1 yr.) experiments on bottom current effects on bed forms and bed form dynamics.	NSF	June 1988 June 1989 June 1990	Spring, Summer	10 per year	SEA BEAM, gravity coring
6. Hollister, C. Flood, R.		Rockall Basin, NE Atlantic	Notices Pending From 1983, 1984 Sediment dynamics of Rockall trough.	NSF or ONR	Midsummer 1988		20	
47. Karig, D.	Hussong, D.	Tincor Transect	Geophysical study of: role of diapers NSF slumps, etc., deformation, water egress, age control.	NSF	After 1986		10	

**Presented at New Orleans, 1/12/86
12. Presented by F. Grassle, 1/12/86
14. Presented by F. Grassle, 1/12/86
17. Presented by W. F. B. Ryan, 1/12/86

7. Presented by Abbott, 12/8/85.
3a. Noted on 12/8/85

*Presented at San Francisco, 12/8/85
2., 4. Presented by McMurtry 12/8/85
9. Presented by Bender, 12/8/85
8. Presented by Kulm, 12/8/85
10. Presented by Rona, 12/8/85
3b. Presented by Morton, 12/8/85

