

Fifty and Counting

Research History of The Marine Physical Laboratory 1946 - 1996

The forerunner of the Marine Physical Laboratory (MPL) was the University of California Division of War Research (UCDWR). Funds, contracts, salaries etc. were officially transferred to the MPL on 01 July, 1946.

Formal authorization for the forming of the MPL came from President Robert G. Sproul (UC Berkeley) to Dr. Carl Eckart on 7 June 1946. The program received a go-ahead even though the applicable budgets would probably not be prepared until after July 1, 1946. The lab was formed under the direction of Dr. Eckart to carry out Task 10: "Conduct a theoretical and experimental study of marine physical phenomena and associated electronic problems" with an initial yearly budget of \$183,000. This was comprised of \$45K for the salaries of 9 scientific members, \$15K, salaries for 6 Fellows, \$20K for a technical staff of 6, \$10K for a clerical staff of 4, \$10K for travel, \$9K for general Assistance and \$74K for E & E (incl. overhead). An "appreciable amount of equipment and supplies (were) furnished by the U.S. Navy Electronics Laboratory"(NEL).

This staff consisted of Dr. Karl Eckart (Director, 46-52), Dr. Russell W. Raitt and Dr. Leonard Liebermann. Finn Outler managed technical operations and Christine Baldwin was the administrative assistant and staff illustrator.

The initial physical location of MPL was what is now the Admiral Kidd Club from 1946 to 1948, when it moved to Building 106, NEL.

1946 - 1950

In 1948 Eckart assumed directorship of Scripps while simultaneously MPL became part of SIO.

The 1947 Machine Shop consisted of Archie Dunlap and John McAlister. Arnie Force joined in '48. The Electronics Shop was Bill Grimley and Earl Squier, joined in '48 by Dan Gibson.

Eckart

- The theory of non-linear interactions of sound with fluids
- Vortices and Streams Caused by Sound Waves

Raitt

- The acoustic properties and the geology of the sea bottom by seismic refraction using explosive sources [Vic Anderson, grad student]

- Deep scattering layer
- Reflection of Supersonic Waves
- Investigation of undersea geology by seismic means over larger areas of the Pacific [Arthur D. Raff, engr]

Lieberman

- Utilizing aultrasonics in liquids to investigate non-linear hydrodynamic properties predicted by Eckart's theory
- The acoustical absorption phenomens in chemically active liquids, including the magnesium sulfate absorption effect in sea water [stanley Lai, engr., Anderson and F. Outler, engr]

Dan Andrews and Francis Byrnes - Developing the MPL Statistical Analyzer

Phil Rudnick - Acoustic Correlator Techniques, Film reader and Thermistor Bridge Correlator and other analog data processing instruments [with Earl D. Squier]

Vic Anderson

- Sound scattering from a fluid sphere
- Wide band sound scattering in the deep scattering layer

1951 - 1955

Sir Charles Wright, Director from 1952- 1955

Alfred B. Focke becomes Director in 1955 (through 1958)

Fred N. Spiess and bill Whitney joined the lab in 1952, George G. Shor in 1953, Fred Fisher in 1955.

MPL establishes a La Jolla campus branch in 1954

Eckart

- Principals of Ocean and Statistical Hydrodynamics

Raitt

- CAPRICORN Expedition for refraction studies
- MIDPAC Expedition [Raff and Gibson] to conduct acoustic reflection/refraction studies of seafloor geology, from the west coast to the Marshal Islands and 0° - 40°N (with ships MV Horizon and EPCER 857)

Raitt and Shor

- Southern california continntal Borderland refraction cruises
- CUSP expediton of Central California refraction
- Low frequency background noise

Shor

- Equatorial carbonate zone reflection work
- Northeast Pacific surveys

Shor and Fisher

- Middle America Trench CHUBASCO Expedition of refraction studies

Liebermann

- The effect of temperature inhomogeneities on sound in the ocean using a thermocouple thermometer mounted on a submarine [Anderson and Lai]
- Air Bubbles in water. Fundamental research on the persistence of bubbles in the sea (submarine detection)
- Origin of Low Frequency Electro Magnetic Noise

Rudnick

- Sea bottom studies off-shore San Diego using TNT charges [Squier and Anderson with a 35mm high speed film recorder]
- Auto correlation of sound from a sub
- Fluxuation Meter
- Underwater Low Frequency
- Electron magnetic propagation

Spiess and Whitney

- Submarine tactical communications

Spiess

- Gravitational Measurements at sea
- Oceanic turbulence

Spiess and Anderson

- Great stellated icosahedron ambient noise array

Anderson

- Dielectric recorder
- Delay line time compressor (DELTIC)
- Dielectric Multibeamformer for the ambient noise array

Raff

- Measurements of magnetic anomalies at Sea

Whitney

- 2-Channel Frequency Shifting device

1956 - 1960

F. N. Spiess - Director 1958 - 1980)

R. A. Rasmussen and R. F. Friche joined the lab in 1959

Rudnick

- Directional distribution of ambient sea noise using the great stellated icosahedron, a 32-element hydrophone array and the DIMUS beamforming system from the R/V Oconostota [with Squier and Brad Becken]
- Ambient Noise in Shallow Water
- Theory of DIMUS
- Ambient Noise
- Likelihood ratio detection
- Start of theoretical formulation of FLIP

Rudnick and Beckin

- Helicopter-borne Array

Raff and Mason

- Instrumentation for sea surface measurements of geomagnetic intensity. Used over large area west of California coast (Pioneer data)

Spiess

- Digital multibeam steering
- Directional properties of background noise
- Submarine Tactical Communication System [with Whitney]
- Wave Acceleration measurements [with Joy]
- Gravity Measurements in sediments [with MacGhee]

Anderson and Spiess

- Signal Processing
- Albacore array

Anderson

- ARTEMIS (experimental RUM)
- Artemis current meter
- Digital multibeam steering (DIMUS), ambient noise array
- SQS4 DIMUS
- BQR2 DIMUS
- USS Baya DIMUS
- DIMUS LORAD
- RUM I (1958)

Liebermann

- Extremely Low Frequency Electromagnetic Waves
- Pressure dependence of sound absorption of liquids
- Acoustical absorption arising from resonance in solids
- Resonance Absorption and Molecular Crystals II Benzene
- Limitations of acoustic array dimensions [with Tamm]

Shor

- San Miguel Earthquake land seismology studies

Shor and Raitt

Refraction Cruises:

- Alaska, Aleutians, Bering Sea CHINOOK Expedition
- Alaska, Bering Sea MUKLUK Expedition
- DOWNWIND Expedition to SE Pacific
- Gulf of California VERMILION SEA Expedition
- MONSOON Expedition (Indian Ocean)

Fisher

- Phase Flux studies
- Resonant acoustic modes of fluid filled cylinders
- Optical bearing tests
- Sound absorption and velocity measurements

Vaquier

- Geomagnetism [with Raff]

Allen Jr.

- Construction of PFP magnetometer for Deep Tow

Rasmussen

- Acoustic Absorption in crystals

Ewing

- Sea surface studies
- AOG - Applied Oceanographic Group

1961 - 1965

Development of Deep Tow and FLIP begin

Liebermann

- Analysis of rough surfaces by scattering (Simplified analysis of scattering by rough surfaces is given together with experimental verification)
- Propagation of Displacement waves in the sea (Theory and experiments on detection and propagation of acoustical displacement in the sea)

Anderson

- ALBARCORE DIMUS
- Polar DIMUS
- Artemis DIMUS
- Spectral and Spatial Dependence of Reverberation
- Adaptive Beamforming
- Seafloor vehicles and robotics

McAllister

- Basic AOG

Vacquier, Raff and Warren

- The finding of a displacement 1400 nm of a magnetic anomaly pattern across the Mendocino Fracture Zone (When the same pattern of magnetic anomalies displaced across an E-W fault was found on cruise Eltanin 19 in the southern Pacific by Lamont, the creation of the oceans by seafloor spreading became reality.)

Vacquier

- With help of computer program devised by MPL which calculated the direction and magnitude of the magnetization of a seamount from its shape and a magnetic survey above it, surveyed seamounts in western Pacific which stood on Cretaceous seafloor 70 million years old and found that they had drifted northward 30°
- Paleomagnetism
- Anomalies
- Deep Anomalies
- Ocean Heat Flow
- Land Heat Flow

Eckart

- Ver--- Studies of external waves

Raff

- Magnetic anomalies related to geologic faults
- Explorer Bank - A new discovery in the Caribbean [with Stewart, jr. and Jones]
- Magnetic measurements along the Murray Fault
- Magnetic anomaly over Mohole Drill Hole EM7

Mason and Raff

- Magnetic survey of west coast of North America

Shor

- Refraction studies, Alaska, Bering Sea LEAPFROG Expedition (Multiple receiver seismic refraction studies jointly with Canadians, R/V's Baird, Horizon, Oshawa and Whitethroat)
- Molehole Site selection refraction studies, HILO Expedition
- Purchase and upgrade of ARCER reflection profiling system (Operated as a recharge facility after the first year)
- First airgun tests on various tests (Operated as a service facility thereafter)
- Midway Island shallow water refraction studies of coral thickness

Shor and Raitt

- Lusiad Expedition, Indian Ocean, refraction studies
- Anisotropy refraction studies on QUARTET Expedition

Shor and Ross

- Reflection ARCER studies of Middle America Trench

Shor and vonHuene

- Reflection ARCER studies of Alaska fans, Prince William Sound KAYAK Expedition

Shor and Dehlinger

- Reflection/Refraction studies on the Juan de Fuca Ridge, GORDA Expedition with OSU

Raitt

- Refraction studies of deep sea fans, FANFARE Expedition
- Start of Anisotropy investigations
- Anisotropy Refraction measurements, FLORA Expedition

SubRoc Project

While the Deep Tow project and its relatives had roots before 61, the first funding came just about that year from the SubRoc project. SubRoc needed to know how accurately one could determine the direction of a sound source (opposition submerged target at ranges out to 30 miles or so) from the direction of the arriving acoustic signal at one's own submerged submarine. Two kinds of propagation paths are involved - the part in the water, with rays subject to bending due to temperature variations, and, if the path bounced on the sea floor, what strange effects due to the fact that the floor might not be horizontal. FLIP was funded as a platform to study the ray bending (refractive) errors and Deep Tow to provide a near-bottom means for making accurate measurements of the slope of the sea floor.

Subroc thus paid for MPL to build FLIP and the initial parts of Deep Tow, as well as to bring Oconostota out of mothballs and fit her out to support the at-sea operations of both FLIP and Deep Tow, which she did for the first few years of the life of both, when their operations were local. FLIP, however, even at an early time, was towed to farther distant points by other ships - first by the original Horizon, to the north Pacific for studies of ocean waves.

The philosophy of development of both vehicles was that they were to be able to do the jobs required for SubRoc, but that they should be flexible and capable of growth to support a much wider range of investigations.

Spiess

- Chair of the search subcommittee for Deep Submergence Systems Review Group, bringing Navy support for Deep Tow

Spiess and Loughridge

- Oconostota trip to work off Hawaii, surveying the Navy's tracking range off Kauai
- Deep Tow survey of hills off San Diego (Loughridge thesis)

Spiess and Whitney

- Long range sound propagation work (e.g. Triple EOS) from FLIP

Spiess and McGehee

- Sound propagation with Deep Tow

Rudnick [with Squier]

- Ambient sea noise
- Self-noise measurements of FLIP
- Movement of FLIP using the Spiess frequency modulated accelerometers
- Development of a small frequency modulated thermometer for deep sea use
- Development of digital recording equipment for use on FLIP

Mundy and Fisher

- First elements of Deep Tow built (Pressure case, wire termination, telemetry, topside electronics - all to support a near bottom echo sounding capability)

McGehee and Boegeman

- Navigation transponders for Deep Tow

Lowenstein, Mudie, Miller and Spiess

- Related computer techniques for the purpose of navigation of Deep Tow

Mudie

- Magnetometer capability for Deep Tow (Used in a stand-alone mode as one of many things the scientific community put together as parts of the search for the Thresher in 1963)

1966 - 1970

Rob Pinkel joined the lab

Liebermann

- Two dimensional "Ferromagnetism" in Iron (Experiment and theory of magnetism in ultra thin iron films)
- "Dead" Layers in Ferromagnetic Transition Metals (Investigation of the minimum configuration of atoms necessary to provide ferromagnetism)

Raff

- Operating instructions for MPL Proton Magnetometer
- Magnetic survey of a small knoll

Vacquier

- Anisotropic Magnetism
- Sediment Dredging
- Guld Anomalies
- Continental shelf traffic

Vacquier & Sclater

- Heat Flow

Vacquier and Mudie

- Astrometric

Shor and Vacquier

- Deep sea photography & seismic reflection profiling - sea of Japan - Ryukyu Basin

Shor

- Drilling surveys for DSDP for several years, reflection and refraction studies
- Tested moored Kite Balloon Buoy work for anisotropy studies
- Balloon anisotropy work in Kamchatka basin from R/V Melville
- Took Melville to EXPO 70 Worlds Fair in Osaka, Japan

Shor and Raitt

- Mohole Surveys, SHOW Expedition off Hawaii, R/V Horizon, Argo, Teritu, Yaquina and R/P FLIP for refraction, anisotropy and reflection studies
- Southwest Pacific, NOVA Expedition

Fisher

- Conductivity
- Pressure and magnesium sulfate reaction in sea water

Anderson

- USS Dolphin DIMUS
- FLIP DIMUS
- Ocean Research Buoy (ORB)
- RUM II
- Digital Interference Cancelling Adaptive Null Network Equipment (DICANNE)

Anderson and Squier

- In depth survey of the effect of acceleration on a group of hydrophones

Zalkan and Squier

- Internal wave studies using three isotherm followers from FLIP
- Development of a flowmeter using the doppler shift in a high frequency acoustic beam

Pinkel and Squier

- Internal wave studies by the profiling of the sea temperature at three points from FLIP

Northrup

- Shot location

McAllister

- Total heat flux measurements
- Infrared 2 wave length system for total heat flux

Spiess and Mudie

- Fine Scale aspects of seafloor

Spiess and Whitney

- Develop vertical array

Spiess

- Ocean Research for Superior Oil
- Sound channel bearing accuracy
- Deep sea gravity work
- Side looking sonar added to Deep Tow thanks to the Navy Deep Submergence Program

- Study of abyssal hills off San Diego, then Hawaiian Arch, then south of Cabo San Lucas, where the Deep Tow fish was lost due to a broken cable

Spiess and Mundy

- Design and fabrication of a cable grabber, testing it in the Mission Bay mud flats

Spiess and Larson

-First expedition to the East Pacific Rise at 21°N (Roger Larson's thesis)

Lowenstein and Mudie

- Computerized navigation for Deep tow

PhD Theses produced in this period from Deep Tow research:

Loughridge, 1968

Normark, 1969

Larson, 1970

Luyendyk, 1970

FLIP

- BOMEX - Barbados Oceanographic Meteorological Experiment (Operating out of Puerto Rico)

- FLIP in the Atlantic (NOAA)

- SPAR - Seagoing Platform for Acoustic Research (FLIP's unmanned sister ship)

- Dec 69 - 3-pt mooring in Hawaii w/ 80' swells

1971 - 1975

Peter Lonsdale, Ted Foster and Hugo Bezdek joined the lab

Spiess

- ARPA - SIO/MPL Model "Sea Legs - sea platform for a floating airfield

- Deep tow money from Kennecott

- Successful towing of Deep Tow at 7 km depth in the Aleutian Trench requiring two winches and connection of two sections of wire to have the required 12 km

Spiess and Mudie

- Samoan Passage Studies

Spiess and Pinkel

- ARPA OWEX (Ocean Waves EXperiments)

- Doppler sonar concepts tested

Spiess and Whitney

- Deep sea vertical arrays deployed from FLIP
- LRAPP (Long Range Acoustic Propagation)
- Ambient noise studies
- Deep Tow manganese nodule studies

Foster

- Air-Sea Interaction Studies
- Infrared radiometry of sea surface

Rasmussen

- Signal Processing compact Vehicles

Anderson

- Advanced Detection Array (ADA)
- Scattering Acoustic Array (SCAR)
- Sea Floor work systems
- Scattering Studies
- Separable submarine system & array work

Bezdek and Squier

- Pressure dependence of sound wave attenuation in the Pacific Ocean

Shor

- Cocos Plate studies, R/V EB Scripps, IGUANA Expedition for refraction and anisotropy
- Sonobuoy refraction, DSDP surveys, TASADAY Expedition, refraction and reflection studies
- Built digital recording refraction system, as part of ONR infrasonics program
- Beginning of studies of East Asia Tectonics and Resources program (SEATAR) in cooperation with LDGO, WHOI and Cornell
- Deep hydrophone work for amplitude measurements, attenuation studies

Liebermann, Rasmussen and Shor

- Infrasonics, Explorations with low frequency sound

Sclater

- Heat flow in Bolivia

Fisher

- Attenuation, EYEWASH, Boric Acid

Lonsdale

- Sedimentation and erosion on Horizon Guyot [with Normark and Newman]
- Abyssal dunes of foraminiferal sand on the Carnegie Ridge [with Malfait]

PhD Theses produced in these years from Deep Tow Research:

Johnson, 1971

Atwater, 1972

Grow, 1972

Klitgord, Lonsdale and Malfait, 1974

MacDonald, 1975

1976 - 1980

Tom Kaye, Bob Tyce and Bill Hodgkiss joined the lab

Spiess, MacDonald, Normark, Luyendyk and Larson

- Deep Tow final leg of Indomed Expedition on the East Pacific Rise at 21°N with Alvin and Lulu and the Black Smokers

Spiess

- Deep Tow photo expeditions on the deliberately sunk Blackfin submarine
- Deep Tow on the first leg of Indomed Expedition on the Melville from San Diego to Panama
- Deep Tow out of Hawaii to Japan on the Silas Bent
- Deep Tow from Mauritius [with Martin Benson]
- Deep Tow in the Mediterranean [with Kim Kastens]
- Vertical directivity of ambient noise
- Search for the Titanic

Lonsdale and MacDonald

- Deep Tow of the Red Sea

Lonsdale

- Deep Tow in the eastern Atlantic
- Deep Tow of the Marianas Trough
- Abyssal bedforms explored with Deep Tow
- Clustering of filter-feeding macrobenthos near abyssal hydrothermal vents at oceanic spreading centres
- Structural geomorphology of a fast-spreading rise crest: the East Pacific Rise near 3°25'S
- A high-temperature hydrothermal deposit on the seabed at a gulf of California spreading axis
- Hyaloclastite and lava flows on young plate-boundary seamounts, a submersible study

Vacquier and Lawver

- Heat flow studies
- South East Asia tectonics
- Work in the Gulf of California

Vacquier and Becker

- Galapagos Spreading Center heat flow studies

Hodgkiss

- Reverberation cancellation
- Cross Spectral / Component Relatedness
- Inverse beamforming

Pinkel

- Doppler Sonar work
- Ocean Remote Sensing
- Surface generated internal waves

Kaye

- SCAR - Scattering Acoustic Array

Tyce

- Vertical Directinality
- Multibeam echo sounder investigation

Gibson

- Shell Pipeline Repair Controls (SPRC) an experimental design study based on RUM experience
- Shell Buried Pipe Study

Fisher

- Multipath and Caustics
- Layering Studies
- Differential sound absorption
- Ion pairing of electrolytes

Fisher and Squier

- Development of a high-resolution narrow beam echo sounder
- Detection of sand movement on the sea shore by a laser beam
- Development of a high resolution sound velocimeter for deep sea use

Shor

- Philippine Sea, Banda Sea SEATAR programs, refraction work
- INDOPAC Expedition joint with R/V Chiu Lien (NTU) and Atlantis II (WHOI)
- Summarized and published southern California Borderland work

Raitt

- Refraction work in Andaman Sea, R/V T. Washington

Jacobsen

- Deep hydrophone work

Anderson

- Dynamic beamformer
- RUM III
- TV/Sonar imaging system

PhD theses produced during this time from Deep Tow research:

Crane

Tyce

Shih

Wishner

Mayer

Alexander

1981 - 1985

Ken Watson joined the lab and became director (1981 - 1991)

Henry Abarbanel, John Hildebrand and Andrew Dickson joined the lab.

Spiess

- Deep Tow work on the Manganese Nodule Project
- Deep Tow studies of VEMA Transform Fault

Spiess, Lai and Hodgkiss

- SWALLOW floats for ambient noise measurements

Lonsdale and Spiess

- HEBBLE high energy benthic boundary layer experiment

Lonsdale

- Overlapping rift zones at the 5.5°S offset of the East Pacific Rise
- Hydrothermal plumes, hot springs and conductive heat flow in the Southern Trough of Guaymas Basin [with Becker]
- Middle America Trench studies [with Moore]

Vacquier

- Thermal conductivity of rocks

Tyce

- Work on a SeaBeam System

Pinkel

- Deep Ocean Doppler Current Profiling (1200 km)
- Arctic internal wave studies

Hodgkiss

- Dynamic beamforming
- Spectral estimation technology
- Under ice reverberation

Shor

- SEATAR work in central sSumatra Transect and Mariana/Philippine Transect

Anderson

- RUM III [with Ron Horn]

PhD theses produced during this time from Deep Tow Research:

Kastens

deMoustier

Weydert

1986 - 1990

Christian de Moustier, Spahr Webb, LeRoyDorman, Grant Deane, Jules Jaffe, Jerr Smith, Dick Johnson, Janet Shields, Michael Buckingham and Ken Melville joined lab

Vacquier

- Origin of terrestrial heat flow

Spiess

- Deep Sea instrument placement and recovery
- Borehole seismometry and borehole reentry
- West Florida Carbonate Escarpments [with Paull]
- Multibeam Deep Towed Earth Mapping Sounder
- Investigation of Deep Ocean Benchmarks for GPS
- Fine Scale Investigation of Blanco Trough
- Televiewer for Deep Sea Wireline Reentry

Lonsdale

- Tectonic and magmatic ridges in the eltanin fault system, South Pacific
- Submersible studies of geology and geomorphology
- Fiberling Guyot Studies
- Structural Geomorphology of the Pacific/Antarctic East Pacific Rise

de Moustier

- SeaBeam as a scientific instrument
- Volumetric studies
- Seafloor classification
- Evaluation and Verfication of Seafloor Acoustic Scattering Models
- Investigation of 12 KHz Deep Scattering Layers using Seabeam
- Seabeam Navigation System
- Survey of Dowd Seamount
- SeaMARC II Investigation of Norwegian-Greenland Sea

Johnson and Shields

- Whole Sky Imagry
- Imagery Based Day/Night System

Pinkel

- Small-Scale Overtuns in the Upper Ocean
- Sea Surface Current Measurements
- Surface Waves, Ship Wakes & Langmuir Cells & Bubbles
- Self-Contained Sea Surface Scanning Sonar [with Macdonald]

- Shallow Water Doppler Acoustics

Smith

- Modulation of Short Wind Waves & Surface Drift
- Interaction of Surface Waves of Near Surface Currents

Pinkel and Smith

- Doppler sonar measurements of surface waves
- Upper Ocean Dynamics
- Remote Surface Wave Elevation Sensor
- Oblique Transmitting Transducer

Hodgkiss

- Adaptive Array Processing
- SEA SNAKE Surveillance Systems
- Detection & Estimation in the presence of Boundary Reverberation
- Slack Line Arrays
- Fluctuations of Ambient Noise
- Arctic Ambient Noise

Hildebrand

- DVLA Exp) Digital Array Design Studies
- Fine Scale Seafloor Magnetism

Hodgkiss, Hildebrand and Fisher

- Downslope conversion of ambient noise
- High Gain, High Resolution of Vertical Directionality (200 element vert. array)

Hildebrand, Dorman and Webb

- Ultra Low Freq. Seafloor Displacement Sensor

Hildebrand and Dorman

- Ocean bottom seismographs
- Extended range cable telemetry
- Seismic tomography

Jaffe

- Real time 3-D ultrasonic imaging
- Shallow Water Swath - Mapping System
- Ocean Optics, Ocean Imaging & Optical Tomography

Watson

- Generation of Internal Waves by Surface Waves

Watson and Abarbanel

- Nonlinear dynamics
- Surface internal wave interactions
- Capillary wave interactions

Webb

- Seafloor pressure and electromagnetic studies
- Very Low Frequency Coherency Studies
- Pressure Fluctuation & Benthic Boundary Layer
- Transient Electromagnetic System for Seafloor Geo. Mapping
- Climatology of Deep Sea Infragravity Waves
- SAMSON Long Transect Seafloor Seismic Array

Anderson

- Peristaltic thruster
- Sea surface sound scattering
- Monomolecular Films on Ocean Surface
- Wind Generated Surface Noise
- Black Smoker Vents for Ocean Thermal Power
- Very Large Mid-Frequency Array System

Dickson

- Electrochem Instrumentation & Analysis of Seawater
- Sodium Ion Sensors as References
- Carbon Dioxide System in Sea Water
- Development of Models for Assessment of Waste Repository
- Coulometric Determination

Melville

- Bubble Breakup & Ambient Sound in the Ocean

Buckingham

- Canonical Model of Acoustic Properties

Denny

- Research on Arctic Eddies

1990

deSpain High Resolution Beamforming

MacDonald & Pinkel

Webb
deMoustier Curved Transducer Array
Pinkel
deMoustier Interactive Computer Bathymetry Swath Mapping
Lonsdale Geophysical Dives w/ALVIN
Hildebrand, Webb & Dorman ULF/VLF Array Studies from FLIP
Webb
Hodgkiss A ROV- Study of Surface Waves/Bubble Inject.
Webb BASIC: Beaufort Ambient Seismo-Acoustic
Hodgkiss
Lonsdale
HDIA Non-periodic Broadband Signals
Dickson

Spiess
Dorman NOBS -OBS Task 1
Hildebrand & Smith, J. ULF/VLF NOBS - OBS

1991 - 1996

William Kuperman became director in 1991 - present
Development of ROVER

Buckingham

- Acoustic daylight near-surface acoustic waveguide
- Acoustic Daylight Camera for Imaging the Ocean

Buckingham and Deane

- Geo-acoustic Stratification Deep in Seabed from Ambient Noise

Melville

- Sea surface sound and bubble layer studies
- Interaction of Nonlinear Waves
- Theoretical & Numerical Study of Surface Waves

Melville, Kuperman and Hodgkiss

- Shallow Water Ambient Noise Experiments

Hodgkiss

- Shallow water adaptive array processing
- ROV study of surface waves / Bubble injection
- Water Column & Near Surface Characteristics
- Bottom Reverberation
- Shallow Water Adaptive Array Processing
- Vertical Source Array Development
- Advanced Undersea Surveillance Techniques
- Acoustic Communication in Shallow Water

Hodgkiss and Kuperman

- Acoustics & Signal Processing in Waveguides
- Adaptive Beach Monitoring

Kuperman

- Acoustic inversions for source and environmental estimation, deep and shallow water
- Inversion of Geophysical Parameters in Shallow Water
- Influence of Propagation on Ambient Noise Fluctuations

Kuperman and d'Spain

- Marine Mammal Vocalizations for Tracking

Watson

- Excitation, Generation & Propagation of Short Capillary Waves

Deane

- Acoustic propagation in the surf zone, near shore
- Characterizing the Surface Zone w/Ambient Noise

Jaffe

- 3-D integrated acoustic optical studies
- Acoustic Sensing of Pelagic Fish Stocks
- Smart Sensor for Extended Range Optical Imaging
- Girman FTV System

Jaffe and Smith

- Acoustic - Optical Measurements in Coastal Environment

Spiess

- Deep Tow Surveys of Atlantic Diapers
- Investigation of Kane Fracture Zone & Mid-Atlantic Ridge
- Deep Tow Volcano Survey
- Broadband Borehole Seismometer [with Orcutt]

deMoustier

- ROV Experiment in Arctic Waters
- Temporal Model of Seafloor Acoustic Backscatter
- Synoptic Time-Scale Survey of the Seafloor
- Software for HydroSweep

Lonsdale

- Origin & Adjustments of Transform Offsets
- Geomorphology of Eltanin Transform System
- Geomorphological & Geomorphometry of EPR Flanks

Dorman, Hildebrand and Lonsdale

- Crustal Structure at the Hess Deep

Dorman and Hildebrand

- Seismic Study of Lau Backarc Spreading System

Hildebrand, Webb and Crawford

- Seafloor Sediment Shear Structure

Hildebrand, Spiess and Chadwell

- Geodesy Component of a Coastal Marine Observatory

Hildebrand

- FOSS - Fiber Optic Seafloor Strainmeter [with Zumberg]
- Continental Borderlands Shear Structure
- Measuring Aging of the Magnetic Source Layer
- Vertical Deformation Measurements at Juan de Fuca Ridge [with Zumberg]
- Blue Whale Noise Impact [with MacDonald]
- Metavolcanic Studies

Johnson

- LIMDAS Host Enhanced Short-Term CFARC

Dickson

- Indicator Dyes for Measuring Oceanic pH
- Underway Chemical Instrumentation

Shields and Fisher

- Daytime Cloud Field Imagery

Dorman

- Depth Dependence Seafloor Noise
- Acoustic & Scholte Waves
- Intraplate Earthquake Swarm in the Pacific Basin

Dorman and Lonsdale

- Active Faulting of Seabed Sediments

Webb

- Survey of Middle Valley
- Beaufort Sea ambient noise
- Electric Fields Induced by Turbulence [with Cox]
- Drilling Induced Seismicity in Middle Valley [with MacDonald]

Pinkel and Smith

- Coherent Structures in the Ocean
- Surf Wave Sonars

Pinkel

- Integrated Sensing System for R/V Revelle

Pinkel and MacDonald

- Mixing in Upper Arctic Ocean SHEBA Ice Camp

Smith
- Acoustic Optic Integration