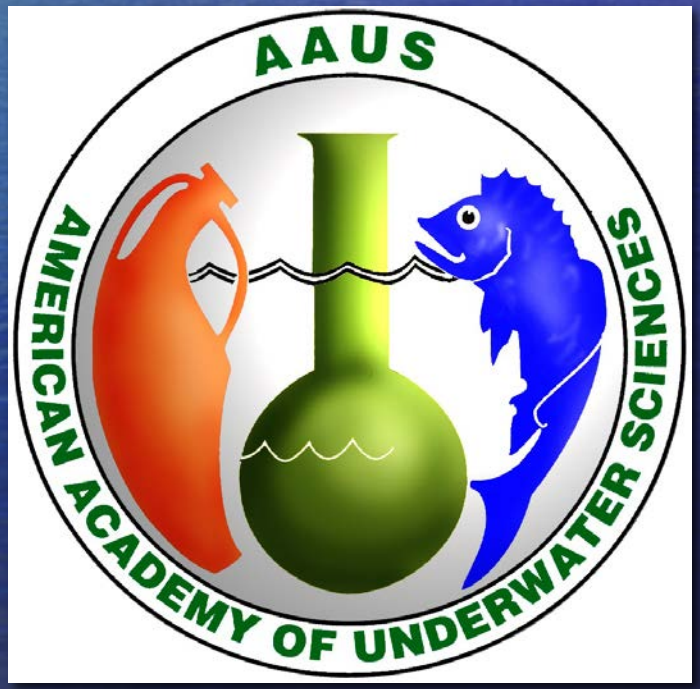
Scientific Diving History and the American Academy of Underwater Sciences

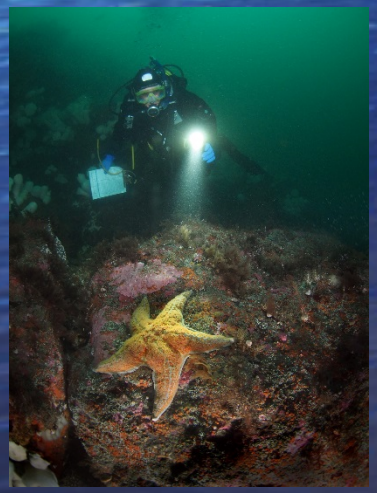


Capt. Nathan T. Schwarck, M.S.

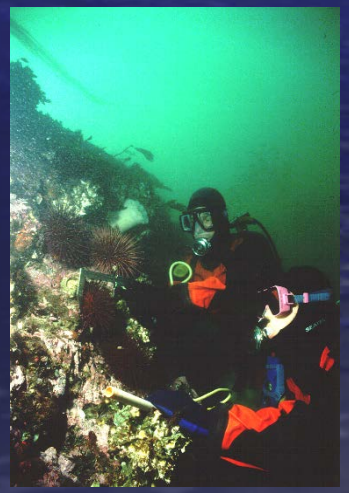
What is Scientific Diving?

Working definition

Use of underwater diving techniques as a research tool for data collection and for conducting scientific investigation



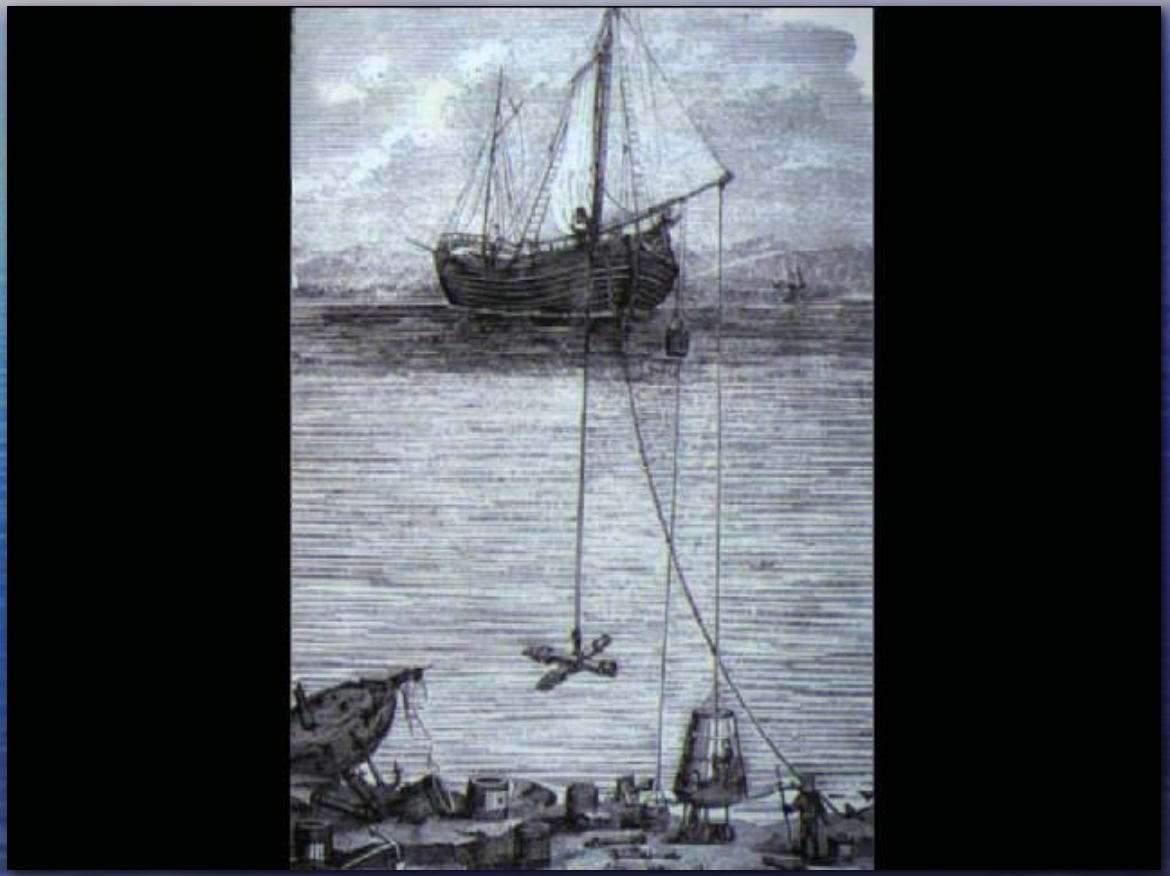




History of Scientific Diving

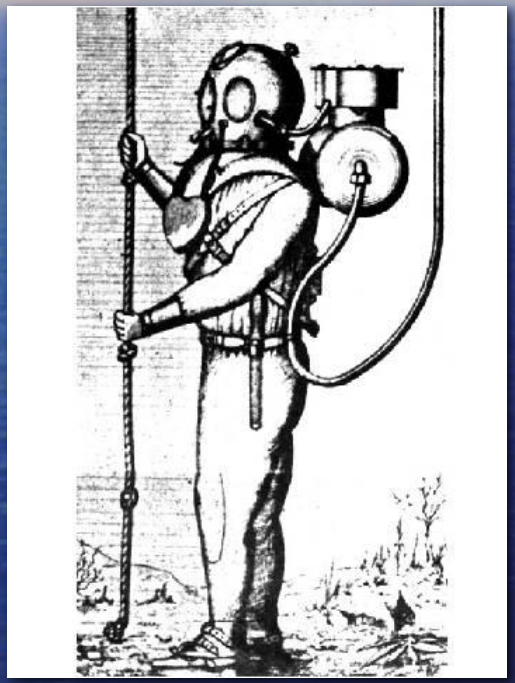
Alexander the Great – 332 BC was
lowered into the Sea to observe marine life

History of Scientific Diving



Early dives were breath-hold or bell type diving

History of Scientific Diving



The first recorded scientific dives were made by Henri Milne-Edwards (Sicily) circa 1844 in a commercial diving suit to a depth of 25 ft.

History of Scientific Diving

In the early 1900's "hard-hat diving" was available for a few select individuals

W.H. Longley – 1910
First U.S. Scientific Diver

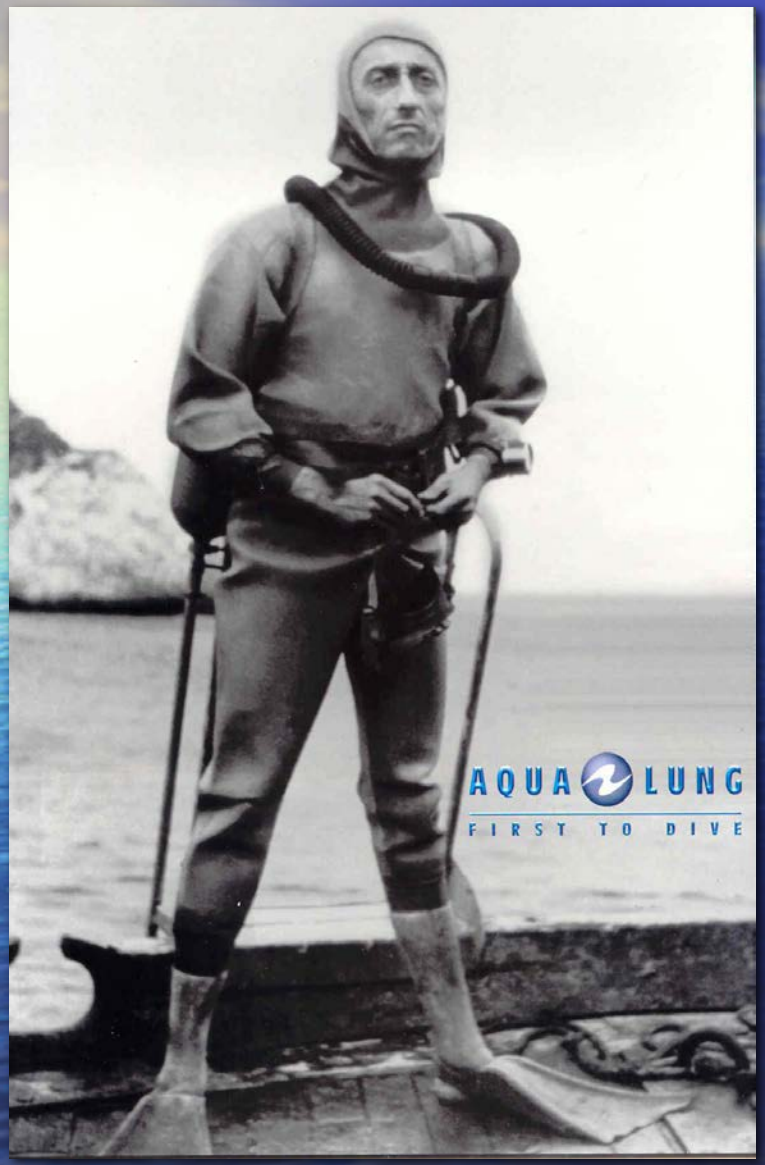
Underwater color photography was born with this shot of a hogfish (left), photographed off the Florida Keys in the Gulf of Mexico by Dr. William Longley and *National Geographic* staff photographer Charles Martin in 1926. Equipped with cameras encased in waterproof housing and pounds of highly explosive magnesium flash powder for underwater illumination, the pair pioneered underwater photography.

Photograph by Charles Martin & W.H. Longley

History of Scientific Diving

- Mid 1900s - Scientific diving is conducted around the U.S.

A U. Miami class conducting science dives in Crystal River, 1934



Jacques-Ives Cousteau and Emile Gagon developed the Aqua Lung (Demand Scuba Regulator) in 1942

Cousteau and Fredric Dumas used the Aqua Lung for U/W Archaeology to excavate a large amphora mound off the Island of Grand Cogloue, Near Marseille

Scientific Diving in The U.S.

1949 – Conrad Limbaugh introduced self-contained, scientific diving at Scripps Institute of Oceanography

Conrad Limbaugh

- Doctoral Student at Scripps Institution
- Became Scripps first Diving Safety Officer in 1954
- His research diving course was the first civilian course of instruction in the U.S.
- Wrote the first Scientific Diving Manual
- Tragically died in a cave diving accident in 1960

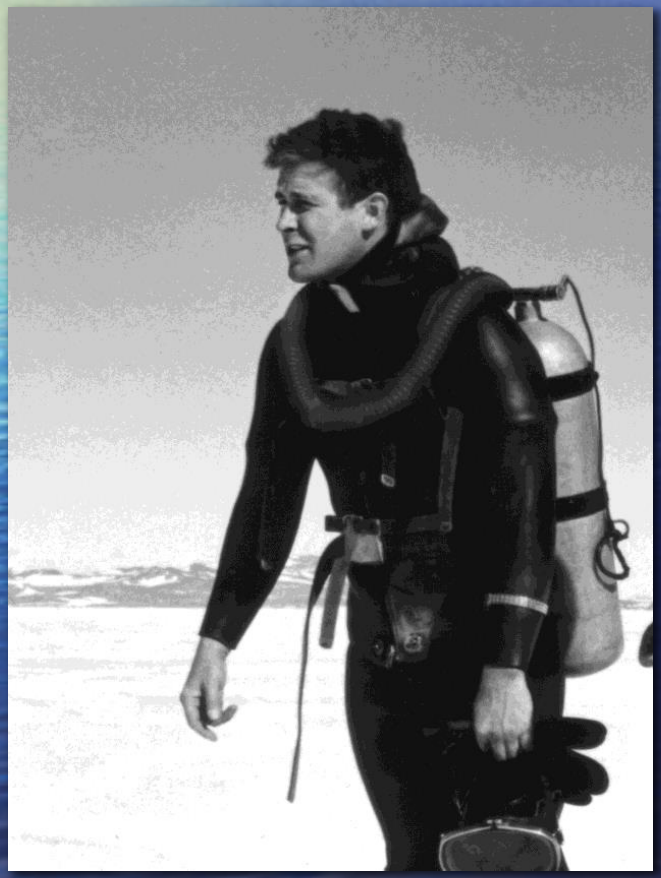
History of Scientific Diving

1951 - following the deaths of two of their scientific divers, Scripps determined that there was a need for formalized scientific diver training

1954 - Scripps Institute of Oceanography (SIO) developed a formal scientific diving program, the first in the country

Scientific Diving Safety

“Scripps Model”



Two-fold purpose:

- A research support function that assists the diving scientist with specialized underwater equipment, advice, and diver support

-A risk management function that protects the safety and health of the individual scientist and the employing organization from excessive liability exposure

History of Scientific Diving

In the 1950s & 70's Scientific diving is conducted by different organizations using similar but informal standards

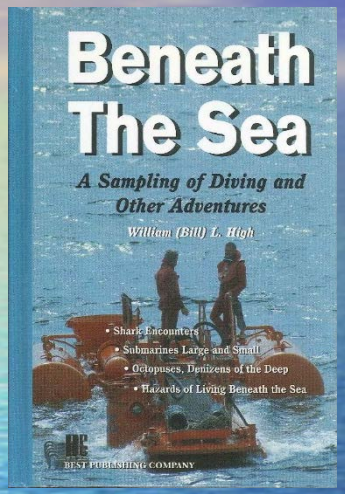
During this time scientific diving was self regulated

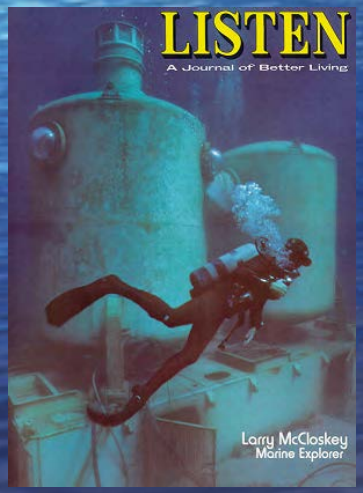
Early Washington State Scientific Diving

1954 U.W. Friday Harbor Labs –Paul Sund

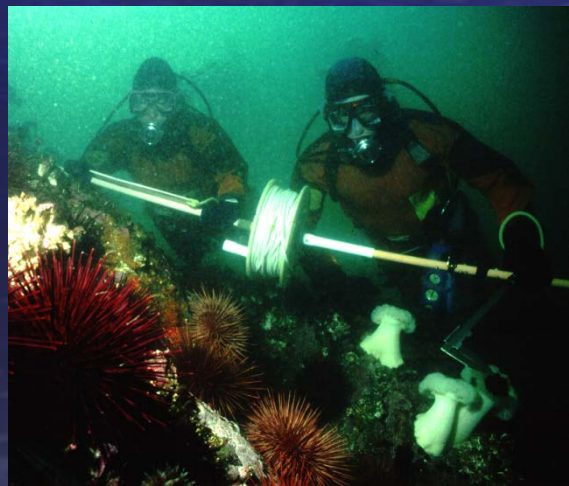
- Was a colleague of “Connie” Limbaugh
- Dove using mail ordered equipment –self taught
- Spent time Internationally with Connie at various marine labs helping set up their scientific diving program
- Routinely did dives in excess of 150’
- Lives in Anacortes, WA

Early Washington State Scientific Diving





- 1955 U.W Icicle Creek –Bill High/Tony Novotny
- 1957 (summer) Walla Walla College Rosario Beach Marine Station –L.R. McCloskey
- 1960's (early) Seattle Pacific University –Ron Phillips
- 1968 Washington Dept. of Fisheries
- 1970's (early) Point Defiance Zoo and Aquarium
- 1970's (mid) Western Washington University –Carter Broad/Paul Cassidy
- 1970's (late) Seattle Aquarium



George Bass, Ph.D.
Considered the "Father of Nautical Archaeology"

- Professor emeritus, Texas A & M University
- First project Cape Gelidonya Wreck (1200 B.C) in 1960
- Leading pioneer in the field of underwater archaeology, setting the standards for others to follow
- Most of his work has been in the Mediterranean

Diving becomes regulated

1975 - Petition filed by United Brotherhood of Carpenters and Joiners of America AFL-CIO

Urged an emergency temporary standard (ETS) be issued with respect to diving operations

ETS issued on June 15, 1976 to be effective July 15, 1976

OSHA® Occupational Safety and Health Administration
www.osha.gov

UNITED BROTHERHOOD OF CARPENTERS AND JOINERS OF AMERICA
LABOR OMNIA VINCIT

Commercial Diving Standard

Challenged in U S Court of Appeals by several diving contractors

ETS withdrawn in November 1976 and permanent standard was formulated

Final Standard for Commercial Diving became effective October 20, 1977

Scientific diving was not considered

Impact of OSHA Regulation

What this meant was that ALL diving that had an employee/employer relationship was to follow the OSHA commercial diving regulations!

The scientific diving community became aware that it fell under these regulations

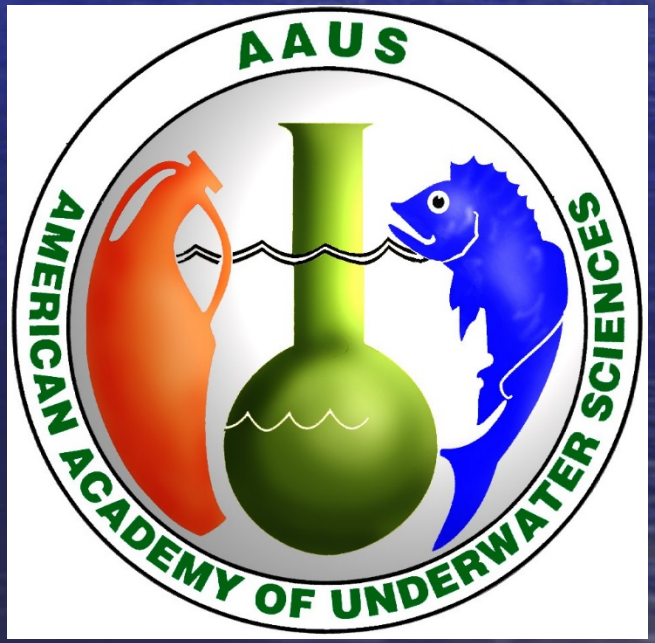
Upon carefully reviewing the ruling it realized that it would not be able to operate as it had in the past

The Creation of AAUS

1977 - the scientific diving community united to form the American Academy of Underwater Sciences (AAUS)

Founding Institutions “likely included”

- Scripps Institution
- U. of Washington
- U. of Main
- U. of Miami
- and several others…



Early Actions of the Academy

The Academy submitted arguments to OSHA on October 15, 1979, citing:

- Self regulation and consensual standards for over 20 years
- An accident/incidence rate lower than the Commercial Diving Industry

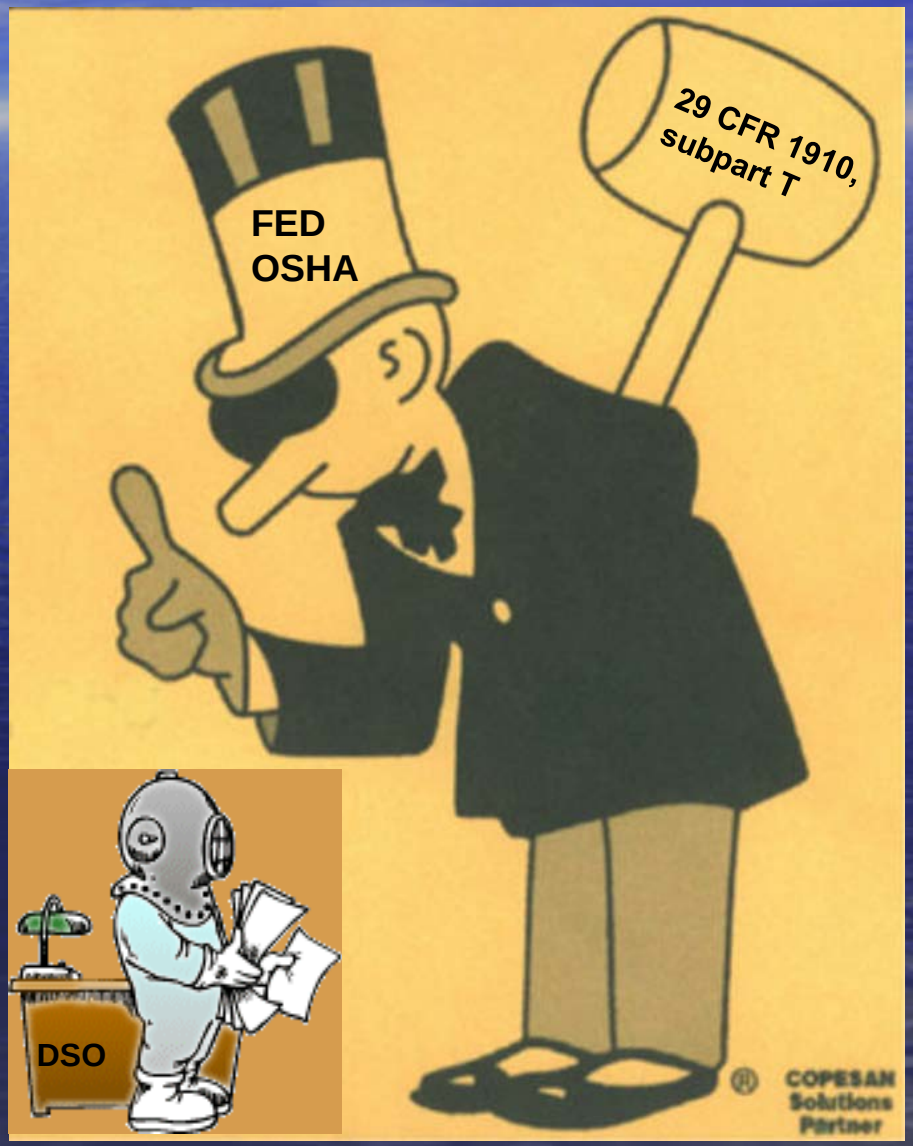
A Partial Exemption

1982 - After extensive negotiation and Congressional Hearings, the scientific diving exemption to the commercial diving standards was issued

1984 - OSHA re-examined the scientific diving exemption for the UBCJ

Final Guidelines

The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No. 6, p. 1046)



The “OSHA” Definition
29 CFR 1910.402

“Scientific diving is diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.”

Scientific Diving Exemption 29CFR 1910.401(2)(iv)

OSHA exempted from commercial diving regulations any diving operation defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements:

29CFR 1910.401(2)(iv) Appendix B to Subpart T

The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation

-approve and monitor diving projects, review and revise the diving safety manual, assure compliance with the manual, certify the depths to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving

29CFR 1910.401(2)(iv) Appendix B to Subpart T

- The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary
- The tasks of a scientific diver are those of an observer and data gatherer
- Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving

29CFR 1910.401(2)(iv) Appendix B to Subpart T

Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training

AAUS

AAUS is an organization of Organizations

AAUS certifies Scientific Diving Programs, NOT (until recently) individual divers

The strength of the Academy is this Organizational Membership

Purpose and Goals of AAUS

To develop, review, and revise standards for safe scientific diving certification and the safe operation of scientific diving programs

To collect, review, and distribute statistics relating to scientific diving activities and scientific diving incidents

To conduct symposia and workshops to educate the membership and others in safe scientific diving programs and practices

To represent the scientific diving interests of the membership before other organizations and governments agencies

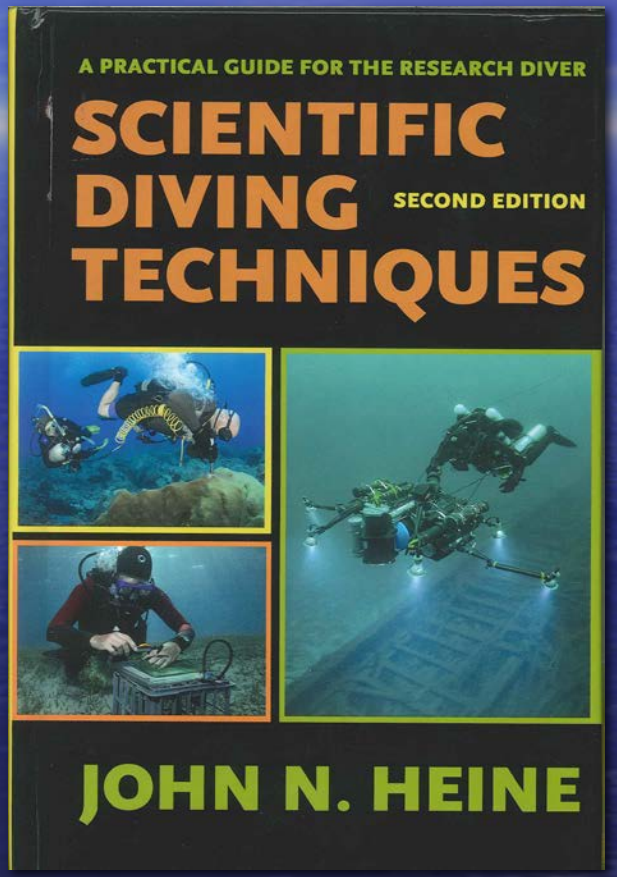
To fund research, education, and development of safe scientific diving programs and practices

AAUS OM's conduct diving operations in various environments

- subtropical seas
- temperate waters
- freshwater rivers and lakes
- karst formations
- polar environments
- blue water (open ocean)
- submarine canyons
- estuaries
- aquariums
- offshore platforms
- hot springs and hypersaline environments
- caves and caverns

Diving Technologies

- Regulators & Full Face Masks
- Hookah
- Umbilical (Surface-Supplied)
- Communications
- Tethered Diving
- Zero Visibility Conditions
- Blue Water Diving
- Cold Water & Ice Diving
- Mixed Gas & Technical Diving
- Rebreathers
- Underwater Habitats and Saturation Diving
- Lock-out Diving
- Diving Bell
- Diving Propulsion Vehicles and Towed Sleds
- Diving with ROV's
- Lift Bags
- Cave and Cavern Diving
- Night Diving
- Free Diving/Snorkeling
- Ice Diving
- Altitude
- Saturation



Heine JN. Scientific Diving Techniques: A Practical Guide for the Research Diver. Second Edition Flagstaff, AZ: Best Publishing, 2011; 232 pp.

Diving is a research tool

Scientific divers must be trained to use this tool to a level of proficiency that allows them to focus on the research task.

Most scientific institutions and universities require extensive training and specialized experience before authorizing their scientists and research support staff to conduct underwater research using scuba or other wet - diving technologies.

Diving Safety Officer

- The liaison between the DCB and the day to day operations of the Scientific Diver/ Research Diving program
- Verify training
- Train and qualify scientific divers
- Approve dive plans
- Collect dive logs (for AAUS statistics)

AAUS Scientific Diver Certification

- ***OMs Certify Scientific Divers to AAUS Level***

REQUIREMENTS FOR CERTIFICATION

- Scuba Certification
- Swimming evaluation
- Skin diving evaluation
- Current and approved Scientific Diving Medical Examination
- 100 hours of theoretical and practical study
- Test of knowledge/written examination
- Current CPR, First Aid and Oxygen Administration Training
- 12 supervised training dives

MAINTANCE OF CERTIFICATION

- 1 logged dive every six months
- 12 logged dives per year
- Hold current certification in CPR, First Aid and O_2 Administration
- Approved Diving Medical Examination

AAUS RECIPROCITY

Based on the idea that all AAUS OM are training to the same minimum AAUS Standards

This process allows interaction between AAUS OM programs with minimum overlap in paperwork and training

This process usually utilizes the “Letter of Reciprocity” which is a verification of training

Some AAUS OM may require additional steps to be taken before full reciprocity is granted

Contracts providing reciprocity may be established with outside organizations – (e.g., NOAA, NPS)

2014 AAUS Organizational Members

Aecom	Coastal & Marine Ecology Consultants, Inc.
Alaska Pacific University	Coastal Carolina University
Alaska SeaLife Center	Coastal Eco-Group, Inc.
AMEGEN Consulting, LLC	Coastal Planning & Engineering, Inc.
American Museum of Natural History	CSA Ocean Sciences Inc,
Applied Research Laboratories: The University of Texas @ Austin	Dauphin Island Sea Lab
Aquarium of the Pacific	Dept of Ecology and Evolutionary Biology, Cornell University
Arizona State University	Dial Cordy and Associates Inc.
Atkins	Duke University - Nicholas School of the Environment - Marine Laboratory
Bermuda Institute of Ocean Sciences	East Carolina University
Boston University	Fathom Research, LLC
Broward County, FL Natural Resources Planning & Management Division	Florida Atlantic University
California Academy of Sciences	Florida Institute of Technology
California Department of Fish & Wildlife	Florida International University
California Polytechnic State University San Luis Obispo	Florida Keys Community college
California Science Center Foundation	Florida State University
California State University	Florida State University Panama City
California State University Monterey Bay	FWC/Fish and Wildlife Research Institute
CIEE Research Station Bonaire	George Mason University

2014 AAUS Organizational Members

Georgia Aquarium Inc.	Moss Landing Marine Laboratories
Glendale Community College	Mote Marine Laboratory
Hawaii Division of Aquatic Resources	National Aeronautics and Space Administration
Hawaii Preparatory Academy	National Association of Black Scuba Divers Foundation
Humboldt State University	NC Aquarium at Ft Fisher
ISSD Onlus	New York Aquarium
J. F. White Contracting Company	NIWA New Zealand
James Cook University	Noble Odyssey Foundation
Junior Scientists In The Sea	North Carolina Aquarium at Pine Knoll Shores
Khaled bin Sultan Living Oceans Foundation	North Carolina Aquarium at Roanoke Island
Los Angeles County Sanitation Districts	Northeastern University
Louisiana Universities Marine Consortium	Nova Southeastern University Oceanographic Center
Maine Maritime Academy	Occidental College, Vantuna Research Group
Marine Biological Labratory	Old Dominion University
Marine Science Group -University of Bologna	Oregon Coast Aquarium
MBC Applied Environmental Sciences	Oregon Health & Science University
Merkel & Associates, Inc.	Oregon State University
Monterey Bay Aquarium	Oregon Zoo
Monterey Bay Aquarium Research Institute (MBARI)	Pennsylvania State University
Moody Gardens	Point Defiance Zoo and Aquarium

2014 AAUS Organizational Members

Prince William Sound Science Center	Stanford University
R. Christopher Goodwin and Associates	State University of New York College of Environmental Science and Forestry
Richard Stockton College	Teen Research Underwater Explorers
Ripleys Entertainment	Tenera Environmental
Ruppin Academic Center	Tetra Tech
Rutgers University	Texas A&M University - Corpus Christi
Saint Marys College of California	Texas A&M University at Galveston Diving Program
San Diego State University	Texas Parks and Wildlife Department
San Francisco State University/Romberg Tiburon Center	Texas State Aquarium
Scripps Institution of Oceanography	The Downtown Aquarium Denver
SCUBAnauts International, Inc.	The Florida Aquarium
Sea Life Park Hawaii	The Leon H.Cnarney School Marine sciences University of Haifa
Seattle Aquarium	The Nature Conservancy Caribbean/Florida Programs
Shannon Point Marine Center	The Nature Conservancy, Hawaii Field Office
Shark Reef at Mandalay Bay	The University of Maine
Shoals Marine Laboratory	The University of New Hampshire
Smithsonian Institution	The University of Texas at Austin
South Carolina Aquarium	The University System of Georgia
Southeastern Archaeological Research	Tierra Data Inc.
Southern California Ocean Restoration Divers	Under Water World Guam

2014 AAUS Organizational Members

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University of Delaware - College of Earth, Ocean, and Environment	University of Washington
University of Florida	Urban Assembly New York Harbor School
University of Guam Marine Lab	VersarGMI
University of Hawaii	Victoria University of Wellington
University of Maryland Center for Environmental Science	Virginia Institute of Marine Science
University of Maryland College Park	Washington State University Vancouver
University of Miami/RSMAS	Woods Hole Oceanographic Institution
University of Mississippi	

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