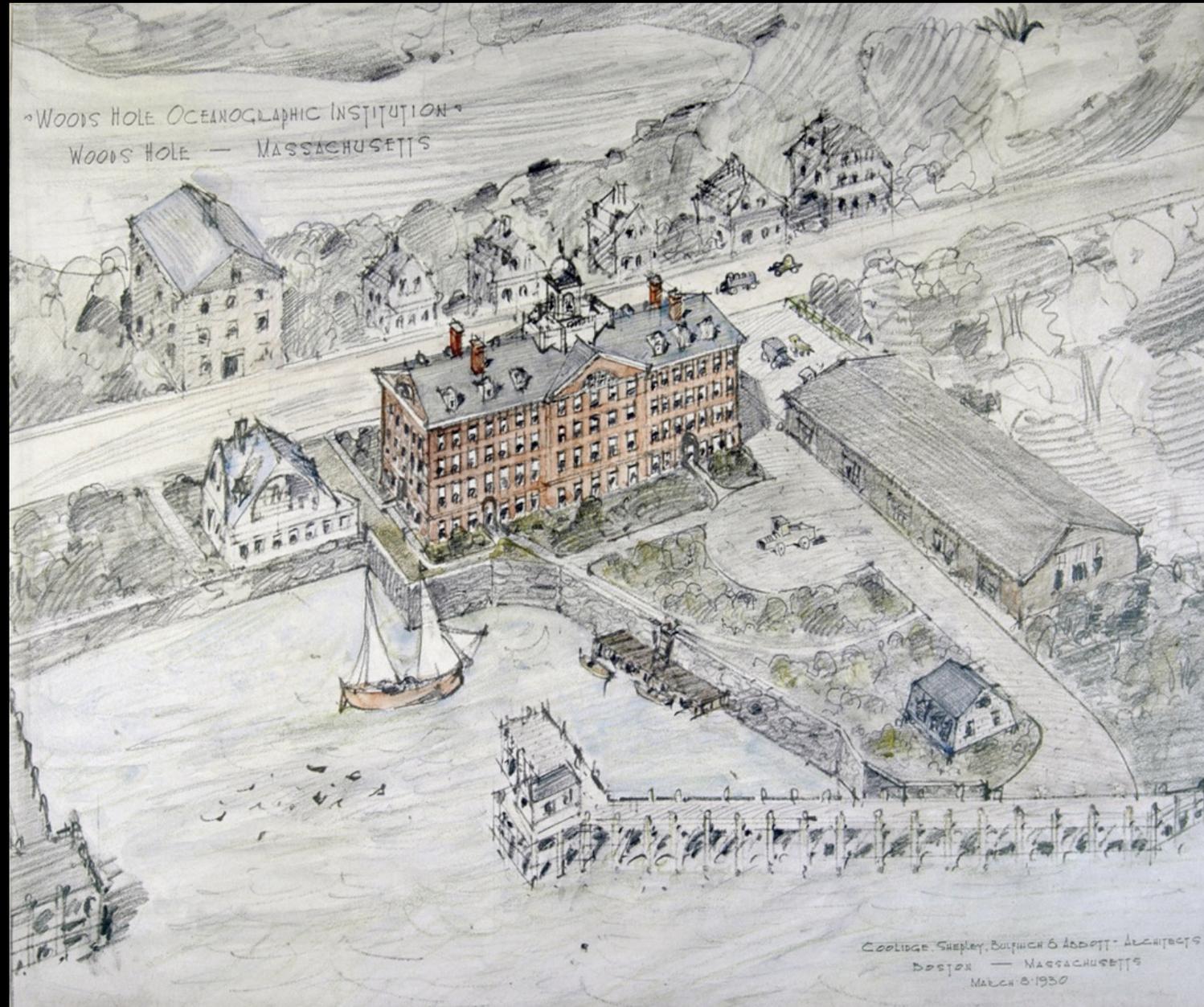


# Established in a Single Building



# Woods Hole Oceanographic Institution

Ocean Research. Discovery. Education.



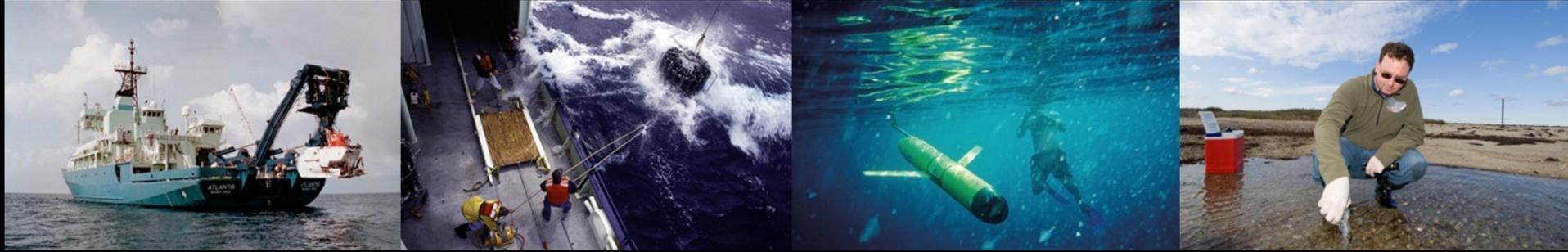
# Now on Two Campuses



Woods Hole

Quissett Campus

# Woods Hole Oceanographic Institution (WHOI)



- Leading efforts to explore and understand the ocean since 1930
- Home to more than 450 ocean scientists and engineers
- \$240 million annual operating budget, nearly \$200 million sponsored research (~800 projects)
- Broad range of ocean experience, expertise, capabilities, and resources
- Goal to advance knowledge of ocean science and technology
- Unparalleled research facilities, technology, and sea-going capabilities
- MIT-WHOI Joint Program in Oceanography, over 900 students since 1969

# Why Marine Robotics?

Ocean is a vast, complex, and often hostile place to work

- Robotics open the ocean to humans in new & surprising ways
- Improve efficiency, lower costs, and reduce risks
- Advance ability to predict, manage, and adapt to our future
- Meeting unique challenges: inaccessibility, extreme pressures, sensing and communicating through water, corrosion, complex environments and habitats



# The Evolution of Alvin



1964



1968



1970



1977



1984

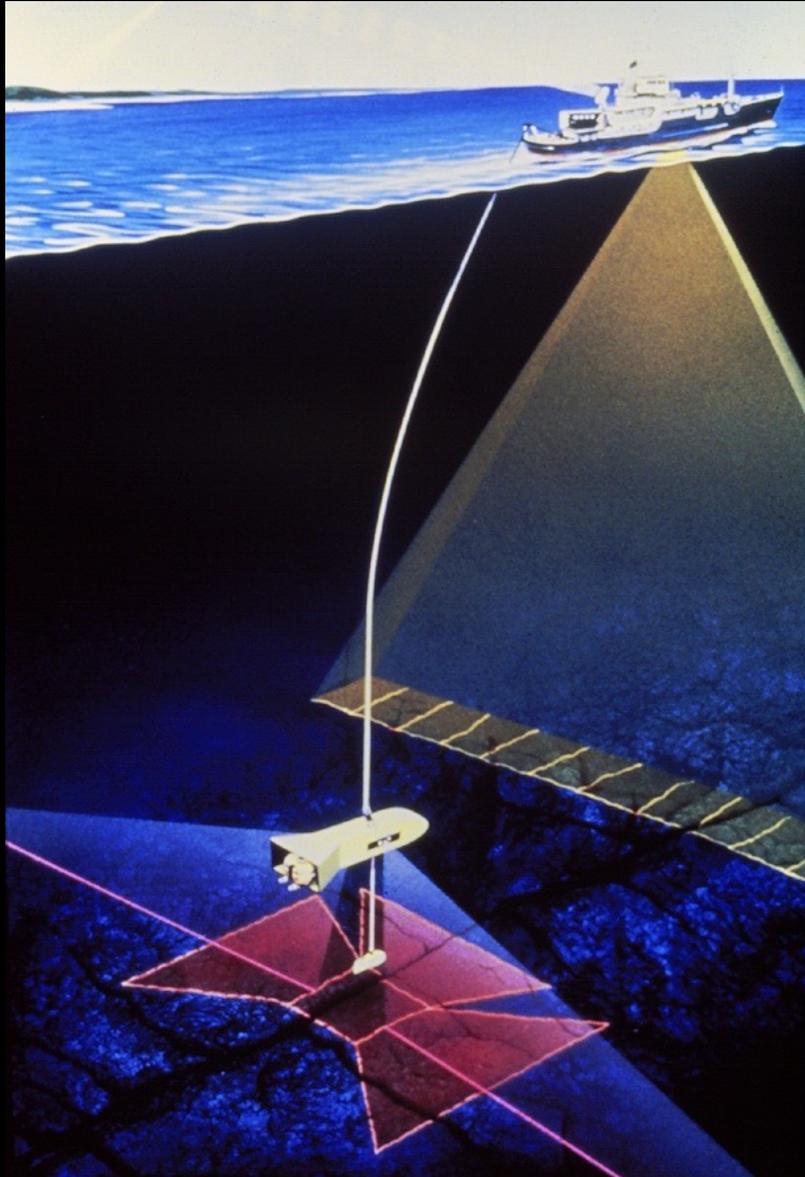


1989

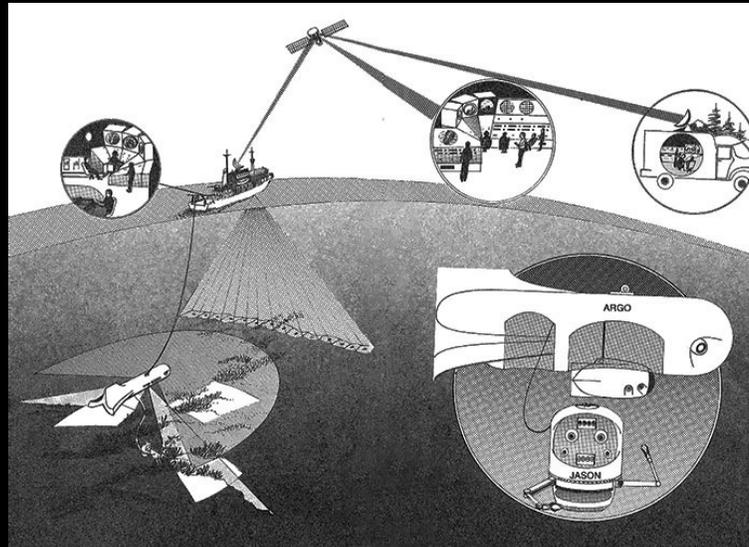


Today

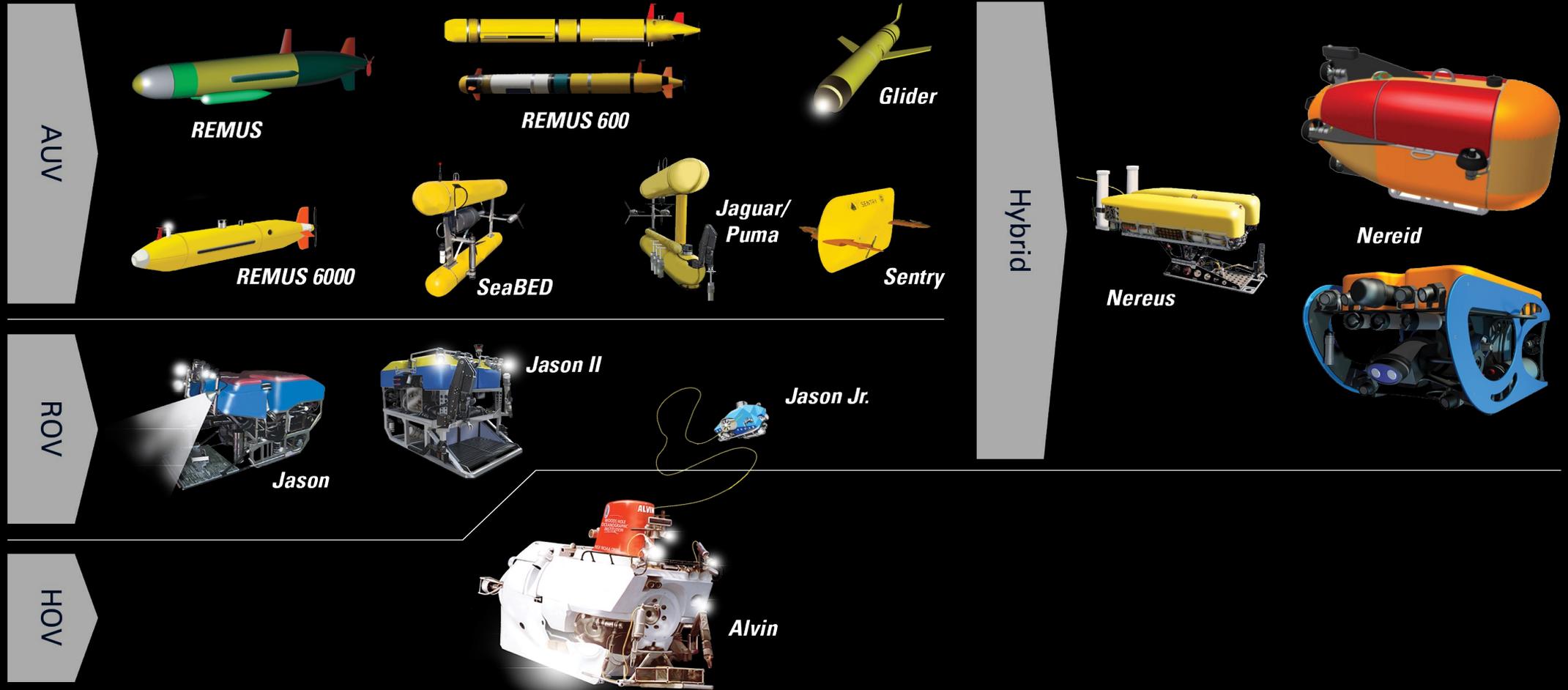
# Argo and Jason are Born



Dr. Robert Ballard  
builds a team



# Family Tree of Underwater Vehicle Technology



# Exploring the Deep Ocean

NATIONAL DEEP SUBMERGENCE FACILITY VEHICLES

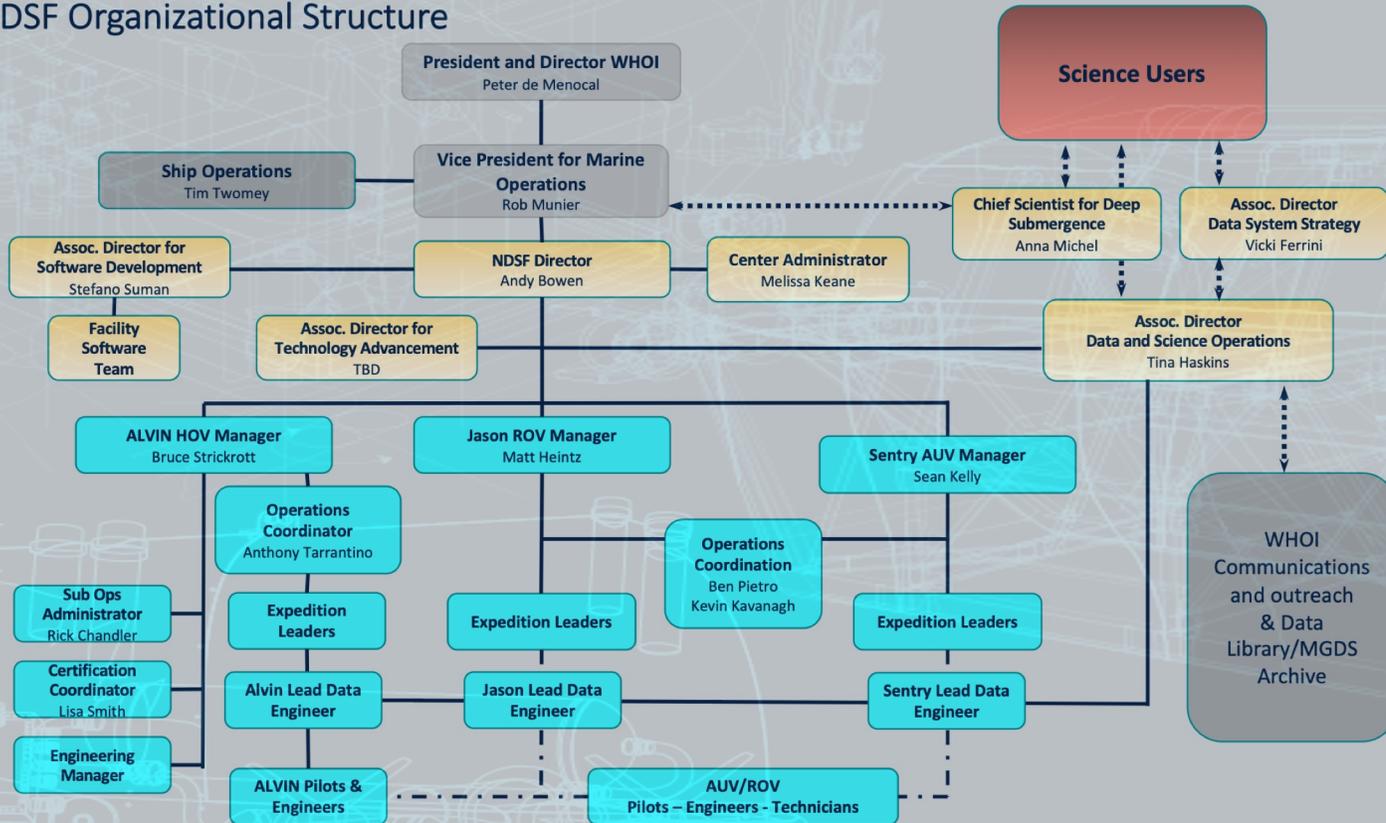


Medea



# National Deep Submergence Facility

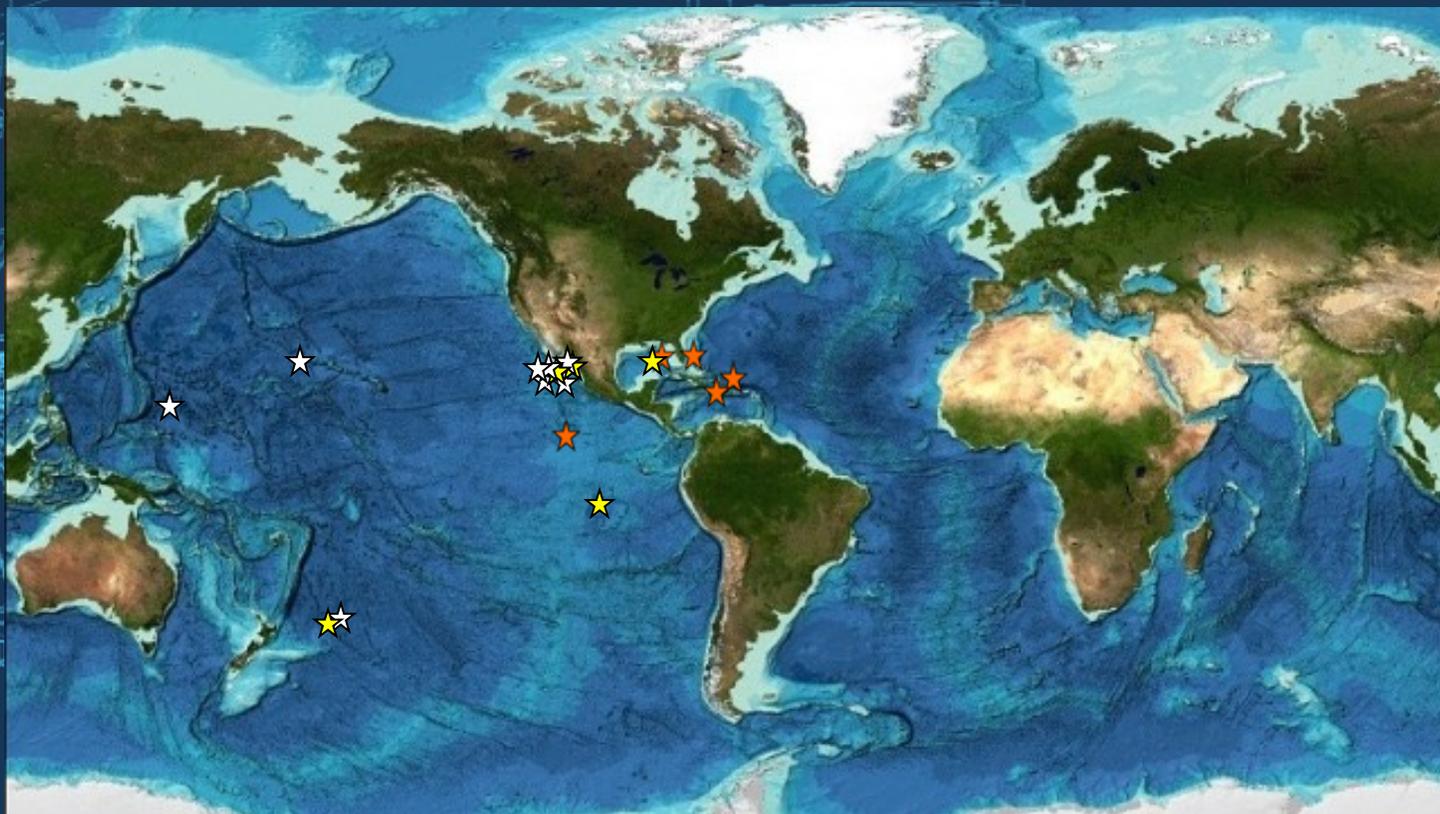
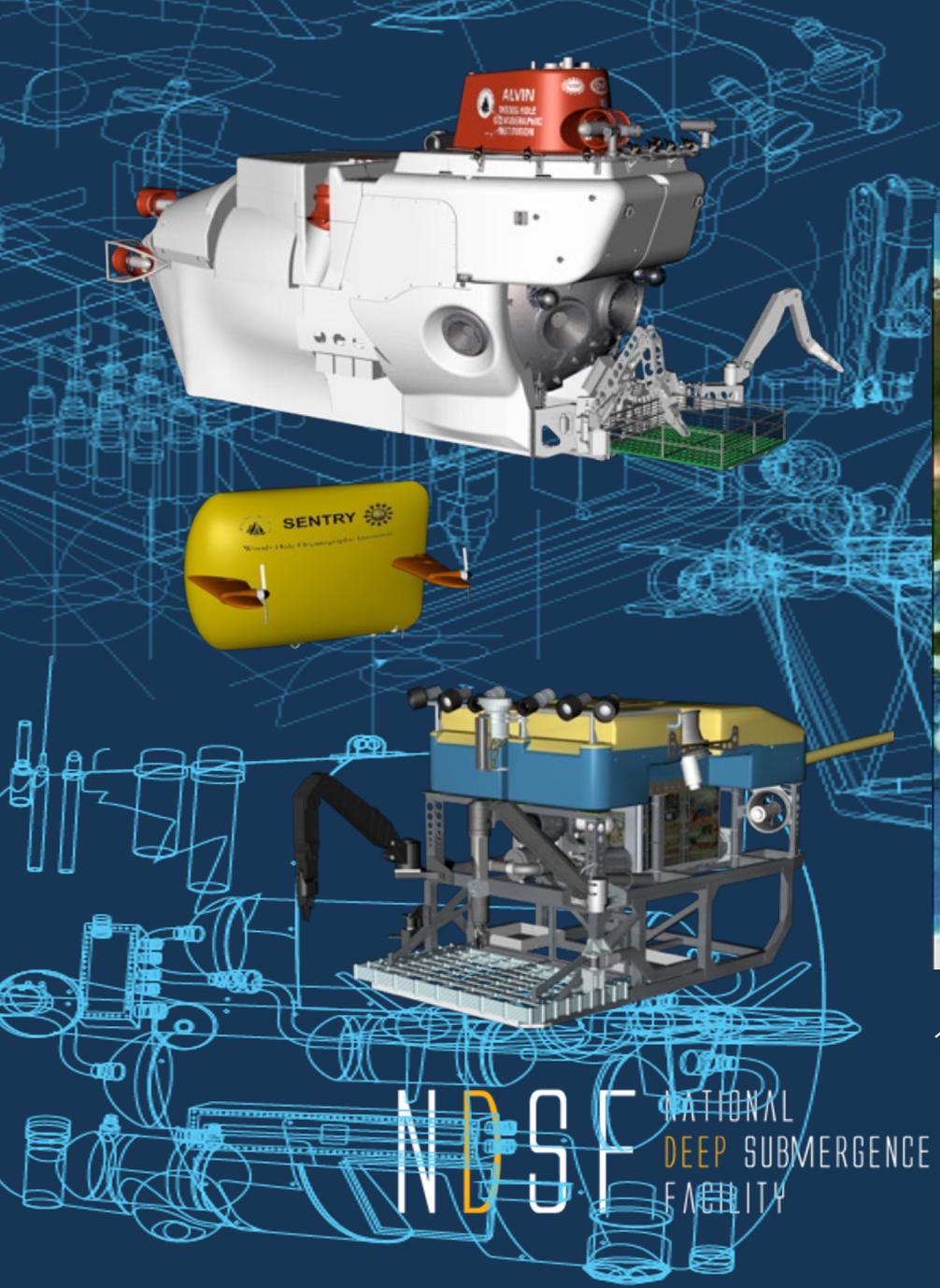
## NDSF Organizational Structure



**NDSF** NATIONAL DEEP SUBMERGENCE FACILITY



# 2022 Alvin, Jason & Sentry Operation Areas



★ 183 Sentry days/ 6 Cruises – ★ 226 Jason days/ 7 Cruises – ★ 113 Alvin days/ 5 Cruises

**NDSE** NATIONAL DEEP SUBMERGENCE FACILITY



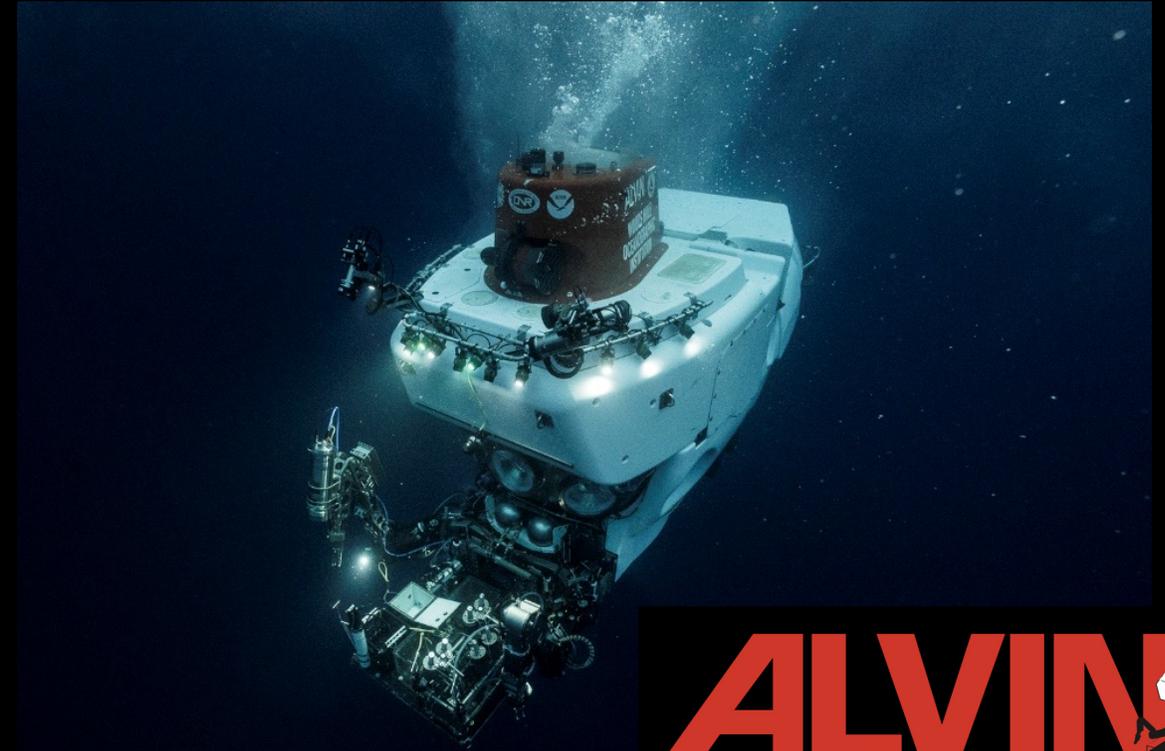
# NDSF 2022 Vehicle Operations Summary

## Alvin Operations

### 5 Cruises in 2022/2023

- Fornari (January)
- Arellano (December)
- Young (October/November)
- Valentine (September/October)
- Alvin SVC (July/August)

- **Dives Since Certification: 68**
- **Average Time Submerged: 7.08 hrs**
- **Average Bottom Time: 4.71 hrs**
- **Max Depth: 6,310 m**
- **Average Depth: 2,555 m**



**ALVIN** 

Woods Hole Oceanographic Institution

# NDSF 2022 Vehicle Operations Summary

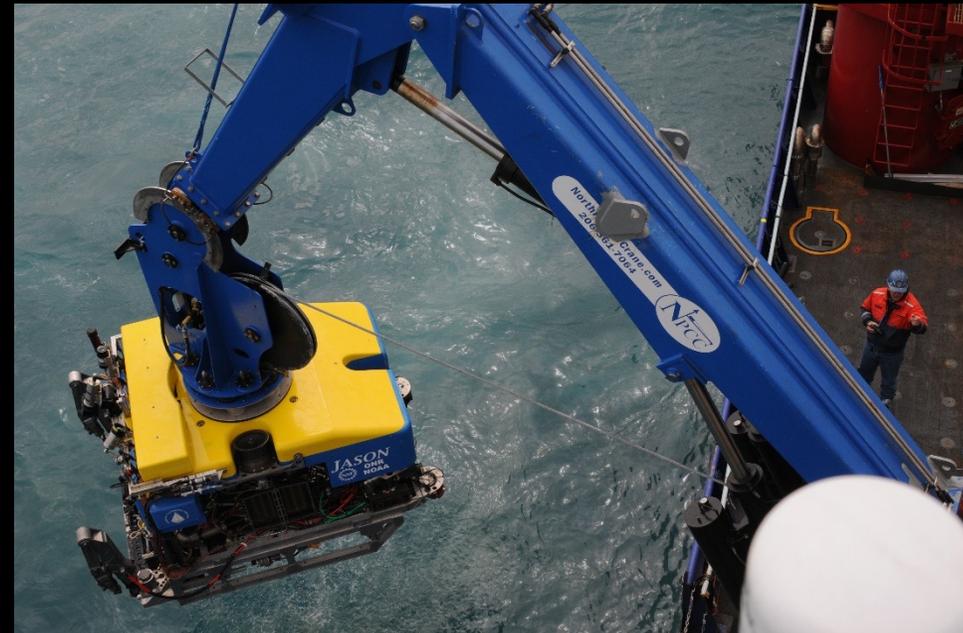
## Jason Operations

78 dives

1089.3 hours of bottom time

1708.6 meters avg depth

- 158 operating days
- 7 cruises
- 78 dives
- On bottom: 1089 hrs
- Longest: 71 hrs
- Average: 12 hrs
- Vessels used: *Thompson, Kilo Moana*



# *NDSF 2022 Vehicle Operations Summary*

## **Sentry Operations**

**183** operating days 2022

**26** operating days 2023 so far

**2022 Cruises Completed**

**Boettcher - GOFAR**

**Beinart - Lau Basin**

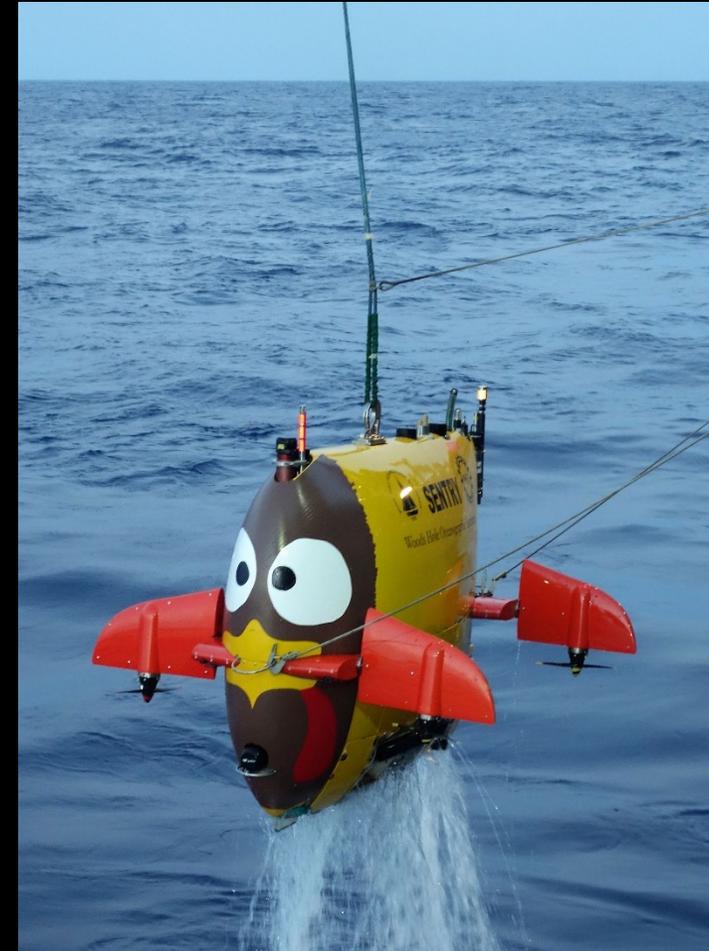
**Gartman – Escanaba Trough**

**Nooner – Axial**

**Valentine - GoM**

**43 dives -2022**

**Total survey time: 740 hrs**



# Diversity, Equity, and Inclusion at NDSF

- Intentionally building a more diverse generation of engineers and technicians
- Making internal processes more equitable in hiring and recruitment
- Providing training in every one of our groups
- Developing outreach efforts to engage historically marginalized student populations
- Building a culture that invites and nurtures the potential of all the engineers and technicians

**NDSF** NATIONAL  
DEEP SUBMERGENCE  
FACILITY

