Overview of Deep Submergence Science

Now for some alphabet soup:

- UNOLS: University National Ocean Laboratory System
  - A national organization that runs research vessels across the country and world.

- DeSSC: Deep Submergence Science Committee
  - A UNOLS committee:

    Aim to maintain access to the deep sea for all scientists across all career stages

  - Provides input on NDSF (National Deep Submergence Facility) assets and to various funders to advance deep submergence science
  - While mission is NDSF, we all do deep submergence research and aim to work and include all funding agencies and operators

Funding Sources for deep submergence science

Governmental Funding Sources

- NSF: National Science Foundation
  - Funds basic research
- ONR: Office of Naval Research
  - Funds research that aligns with Navy interests
- NOAA: National Oceanographic and Atmospheric Administration
  - Funds exploration based research (Ocean Exploration) among others
  - Also run their own deep submergence assets

Funding Sources & Operators for deep submergence science

Non-governmental funding sources and Operators

- SOI: Schmidt Ocean Institute (funds ship time)

- OET: Ocean Exploration Trust – Exploration Vehicle *(E/V) Nautilus*

- FIO: Florida Institute of Oceanography

- MBARI: Monterey Bay Aquarium Research Institute

Operators

- ROPOS: Canadian ROV

NDSF: National Deep Submergence Facility

☐ Operates 3 vehicles:

Human Occupied Vehicle (HOV) Alvin

Remote Operated Vehicle (ROV) Jason

Autonomous Underwater Vehicle (AUV) Sentry

Located and run through the Woods Hole Oceanographic Institution (WHOI)

HOV ALVIN

- Submersible

- 3 people go in it

- 6500m working depth

- Stays on the bottom for 6ish hours

- Dives once a day

- Only sails on the RV Atlantis

Bryan Christie Design @ Wired.com

NDSF NATIONAL DEEP SUBMERGENCE FACILITY

HOV ALVIN: What can it do?

- Pick things up and put them down (instruments, critters, sediment cores, "landers")
- Suction sample up things
- Take video and still images
- Collect water samples
- Take measurements (temp)
- Map the seafloor
- Integrate user supplied other instruments
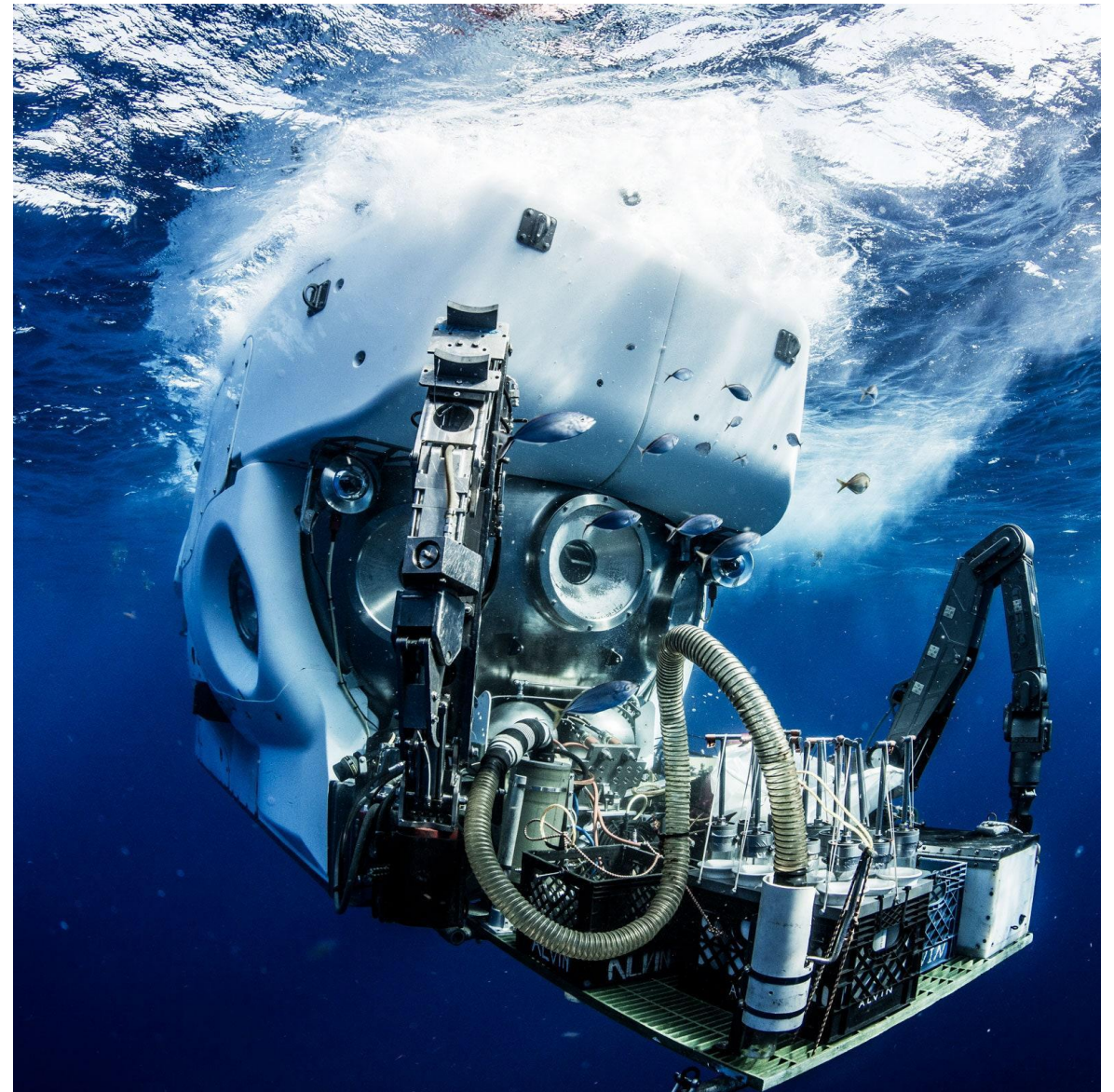
Wired.com but it's a WHOI image

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ROV Jason and Medea

- Remote (tethered) vehicle

- Operated (flown) by people on the ship

- Limitless power

- 6500m depth

- Can be used on a diversity of vessels, including non-US vessels and shipped around the world
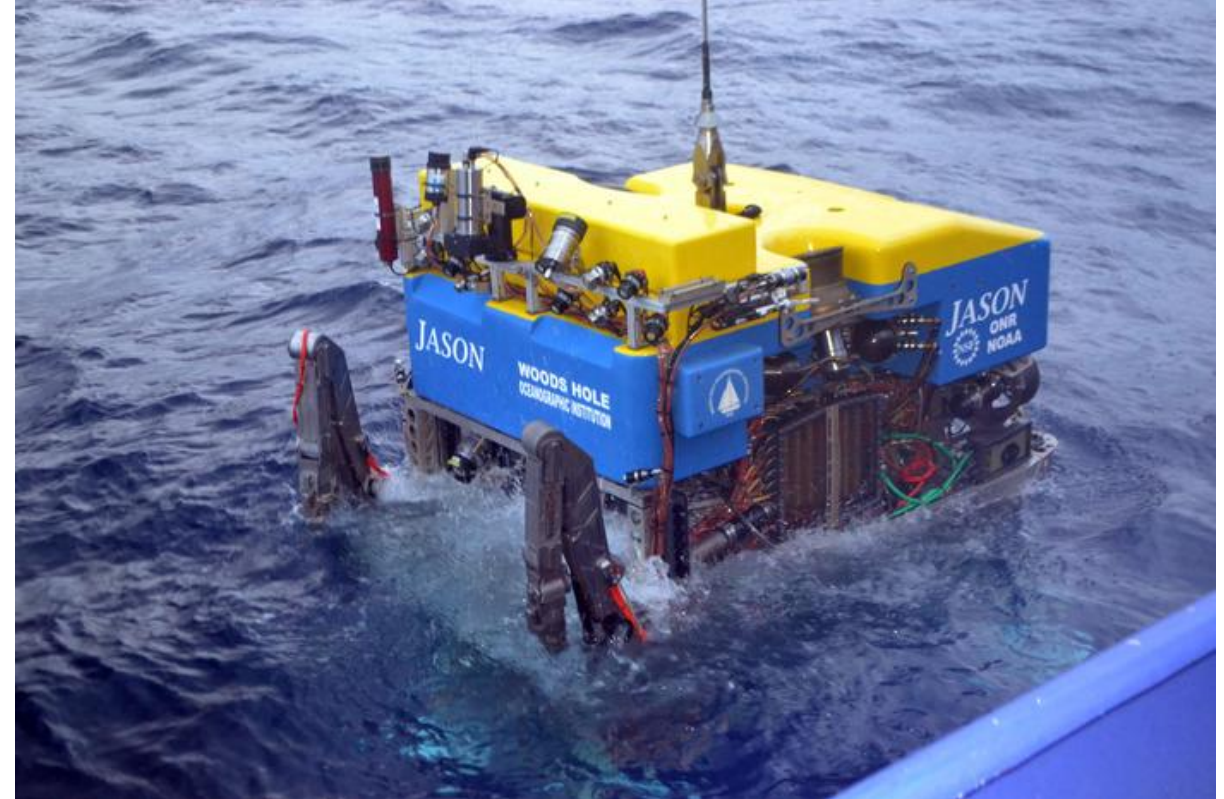
- Can stay down for hours to days

Photo credit: UW

ROV Jason: What can it do?

- Pick things up and put them down (instruments, critters, sediment cores, "landers")
- Suction sample up things
- Take video and still images
- Collect water samples
- Take measurements (temp)
- Lift heavy things
- Map the seafloor
- Integrate user supplied other instruments

Photo by Cherie Winner, Woods Hole Oceanographic Institution

AUV Sentry

□ Autonomous: follows a program/plan

□ Can navigate terrain

□ Works with other attachments:

    □ Wave Glider

    □ SyPRID plankton sampler

□ Works on many vessels

Henry Dick, Woods Hole Oceanographic Institution

Arellano lab @WWU

AUV Sentry: What can it do?

- Map the seafloor, subseafloor, and water column
- Collect plankton samples
- Collect imagery
- Make chemical measurements
- Integrate user supplied instruments
- It is getting smarter and smarter

WHOI: Ocean Robots

When to use which vehicle?

Jason vs Alvin

My answer: Let scheduling decide. Ask NDSF if unsure

JASON: Need LOTS of bottom time.

ALVIN: Unique view of the ocean floor. Creates hypothesis. Can fly to places (so good for transects)

Sentry

Seafloor mapping

Planning dives

Mapping water column features

It plays well with others (Including Alvin and Jason)
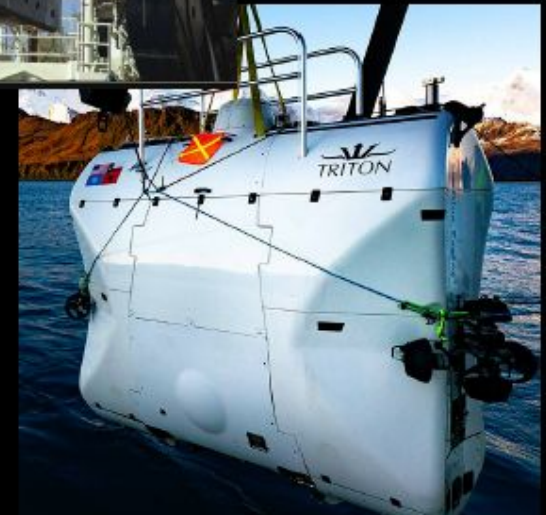
NDSF vs other assets/vehicles

Human Occupied Vehicles

French HOV *Nautile*

Shinkai – Japanese HOV

Alvin Submersible

Pressure Drop

From Jeff Marlow, Boston University

NATIONAL DEEP SUBMERGENCE FACILITY

ROV *ROPOS*

ROV Hercules
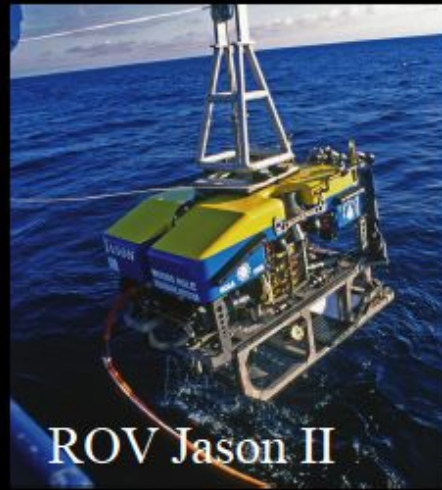
ROV Jason II

Remotely Operated Vehicles

ROV *Victor*

ROV Doc Ricketts

ROV Subastian

From Jeff Marlow, Boston University

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Who is funding you?

- Many resources but more planning can be needed
- NDSF is (often) not a $$ in NSF grants
- NDSF vehicles are a national resource, available to everyone

But use the right tool for the job – it leads to funding.

HOV ALVIN

REMUS SERIES

AUV *SENTRY*

ROV *JASON*

HROV *NEREUS*

SEABED SERIES

GLIDERS

ARGO FLOATS

ICE-TETHERED PROFILER

From Ocean Robots, WHOI

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