Overview of the NDSF

Early Career Science Program

Exploring the Deep Ocean
NATIONAL DEEP SUBMERGENCE FACILITY VEHICLES

Alvin
Human Occupied Vehicle
- Accommodates: 1 Pilot and 2 Scientists
- Depth Capability: Phases 1: 4800m, Phases 2: 6000m

Sentry
Autonomous Underwater Vehicle
- Depth Capability: 6000m (19,685 feet)

Jason
Remotely Operated Vehicle
- Depth Capability: 4500m (14,764 feet)
Early Career Science Program

A: Structure of the NDSF

Rob Munier
VP Marine Ops

Chris German

Andy Bowen
Director, NDSF

Pat Hickey
Alvin Ops. Mgr.

Matt Heintz
Jason Ops. Mgr.

Carl Kaiser
Sentry Ops. Mgr.
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www.whoi.edu/ndsf

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B: Meet The Vehicles

**Exploring the Deep Ocean**

**Alvin**
Human Occupied Vehicle
- Accommodates: 1 Pilot and 2 Scientists
- Depth Capability:
  - Phase I: 4,500m
  - Phase II: 6,900m

**Sentry**
Autonomous Underwater Vehicle
- Depth Capability: 4,900m (16,000 feet)

**Jason**
Remotely Operated Vehicle
- Depth Capability: 8,000m (26,000 feet)
HOV Alvin – Science Mission Requirements

- *In situ* direct **observations** of the deep ocean and seafloor
- High-resolution **imaging** and recording/documentation of observations
- Systematic **exploration** of previously uninvestigated regions
- Systematic **surveys** of the seabed and the overlying water column
- **Sampling** (geological, geochemical, biological/microbiological) at the seafloor and in the overlying water column
- **Interaction with instrumentation** at the seafloor
- **Descent** to the seabed, **transit** between sites, **ascent** back to surface
HOV Alvin – Unique Capabilities
Early Career Science Program
B: Meet The Vehicles

65% of Seafloor <4500m, 98% of Seafloor <6500m

50% of Earth > 3000m
Early Career Science Program

B: Meet The Vehicles

Mission Types (1 of 2)

Mid Ocean Ridges & Flanks

Active Ocean Margins

Deep Sea Corals

Gas Hydrates & Continental Shelves
B: Meet The Vehicles

Mission Types (2 of 2)

Abyssal Plain Ecosystems

Mid-Water Ecosystems

Other Science Initiatives – ODP & OOI

Education & Outreach
Standard Science Tools (Alvin & Jason)

Profiling Sonars
Reson Multibeam Sonar
Imagenex Profiling Sonar
CTFM Scanning Sonar
Tritech Dual Frequency Scanning Sonar

Temperature Devices
High and Low Temperature Probes
ICL Temperature Probe
Heat Flow Probes

Sample Storage Equipment
Biological Sample Boxes (various sizes)
Custom Science Baskets

Sampling and Data Collection
Magnetometer
Major Titanium Water Samplers
Niskin Bottles
Portable CTD
Push Cores
Scoop Nets
Small Capacity Slurp Samplers
Large Capacity Slurp Samplers
Hydraulically-Driven Slurp

Navigation
Long-baseline, Doppler, USBL
Scientist-Provided Tools (Alvin & Jason)

- Gas-tight Fluid Samplers
- McLane Remote Access Sampler Moorings
- McLane Sediment Trap Moorings
- Rock Scoop Sampler
- Stand-alone Acoustic Monitoring Moorings
- Bushmaster Samplers
- HDTV Offload Prototype Camera
- Temperature Sensor Array
- SIPPER Micro Water Sampler
- ARTY -- RNA Preservation Biosampler
- Deep Ocean Mass Spectrometer
- Deep Ocean Gas Chromatograph
- Insulated Bio Boxes
- Colonization Trays
- Ekman Style Box Corers
- IMAX 80mm Camera
B: Meet The Vehicles

Exploring the Deep Ocean
NATIONAL DEEP SUBMERSION FACILITY VEHICLES

**Alvin**
Human Occupied Vehicle
Accommodates:
1 Pilot and 2 Scientists
Depth Capability:
Phase 1: 240m
Phase 2: 450m

**Sentry**
Autonomous Underwater Vehicle
Depth Capability:
3000m (10,000 feet)

**Jason**
Remotely Operated Vehicle
Depth Capability:
6000m (19,680 feet)
Early Career Science Program

B: Meet The Vehicles

ROV Jason - TMS Medea
Early Career Science Program

B: Meet The Vehicles

Imaging Sonar
Mini Zeus On P&T
Kraft Manip
Nav Sonar
LED lighting arrays
NDSF HD camera On Science operated P&T
Schilling Manip
Push Core array Transferable to elevator

Pilots Mini Zeus On P&T
98% of Seafloor <6500m
Baskets & Elevators
Early Career Science Program

B: Meet The Vehicles

**Alvin**
Human Occupied Vehicle
- Accommodates: 1 Pilot and 2 Scientists
- Depth Capability: Phase 1: 4500m Phase 2: 6500m

**Sentry**
Autonomous Underwater Vehicle
- Depth Capability: 6000m (19,685 feet)

**Jason**
Remotely Operated Vehicle
- Depth Capability: 6000m (19,685 feet)
AUV Sentry

- Untethered & Autonomous
- Primarily preprogrammed
- Precisely navigated (USBL or LBL)
- Water Column & Seafloor Ops
- Low bandwidth acoustic comms
  - Vehicle status
  - Snippets of science data
  - Mission reprogramming
Mission Types

Grids (Geophys)

Contour Following

Adaptive (Exploration)

Photo Surveys
Standard Tools

Geophysics
- Reson Multibeam Sonar
- Edgetech Sidescan Sonar
- CHIRP Sub-Bottom Profiler
- 3 x 3-component Magnetometer

Oceanography
- SeaBird CTD
- Optical back-scatter
- Dissolved Oxygen Sensor
- ADCP Capability

Seafloor Imaging
- 1 MPix DSC (upgrade in 2013)
- Strobe Lamp

User-Provided Upgrades

Oceanography
- In Situ Eh/RedOx Probes
- Fluorometer (Organic Carbon)
- In Situ Mass Spectrometer
- In Situ SUPR Sampler (2013)

Seafloor Imaging
- 3D Imaging
Sentry – Upgraded from 4500m to 6000m in 2011
Multiple Vehicle Operations
Planning Your Cruise

• Pre-submission discussions
  (choice of vehicle; technical feasibility; cruise duration)

• Grant submission
  (UNOLS shiptime request)

• Once you are funded
  (Pre-cruise planning; ~6 mths lead; Expedition Leader)

• Once you are at sea
  (Dive planning; responding to “events”)
Accessing Data Post-Cruise

- Complete data sets are provided to lead PI at cruise end (data is proprietary for 2 years, then must be banked/shared).

- MGDS is the core data repository (http://www.ldeo.columbia.edu/research/topics/mgds)

- Archive of all video data is stored off-line* at WHOI

- Quick-look versions of Alvin and Jason data available via:
  Frame Grabber: http://4dgeo.whoi.edu/alvin
  Virtual Van: http://4dgeo.whoi.edu/jason/