

Innovate Explore Share

Advancing Ocean Sciences with Innovative Technologies aboard RV *Falkor*

23 February 2017 NOAA OEAB



Understanding the ocean through technological advancement, intelligent observation and analysis, and open sharing of information.

Structure



Board of Directors
Eric Schmidt,
President
Wendy Schmidt,
Vice-President

Research Program
5 staff
(research planning & outreach)

Operations
60 crew,
technicians &
staff

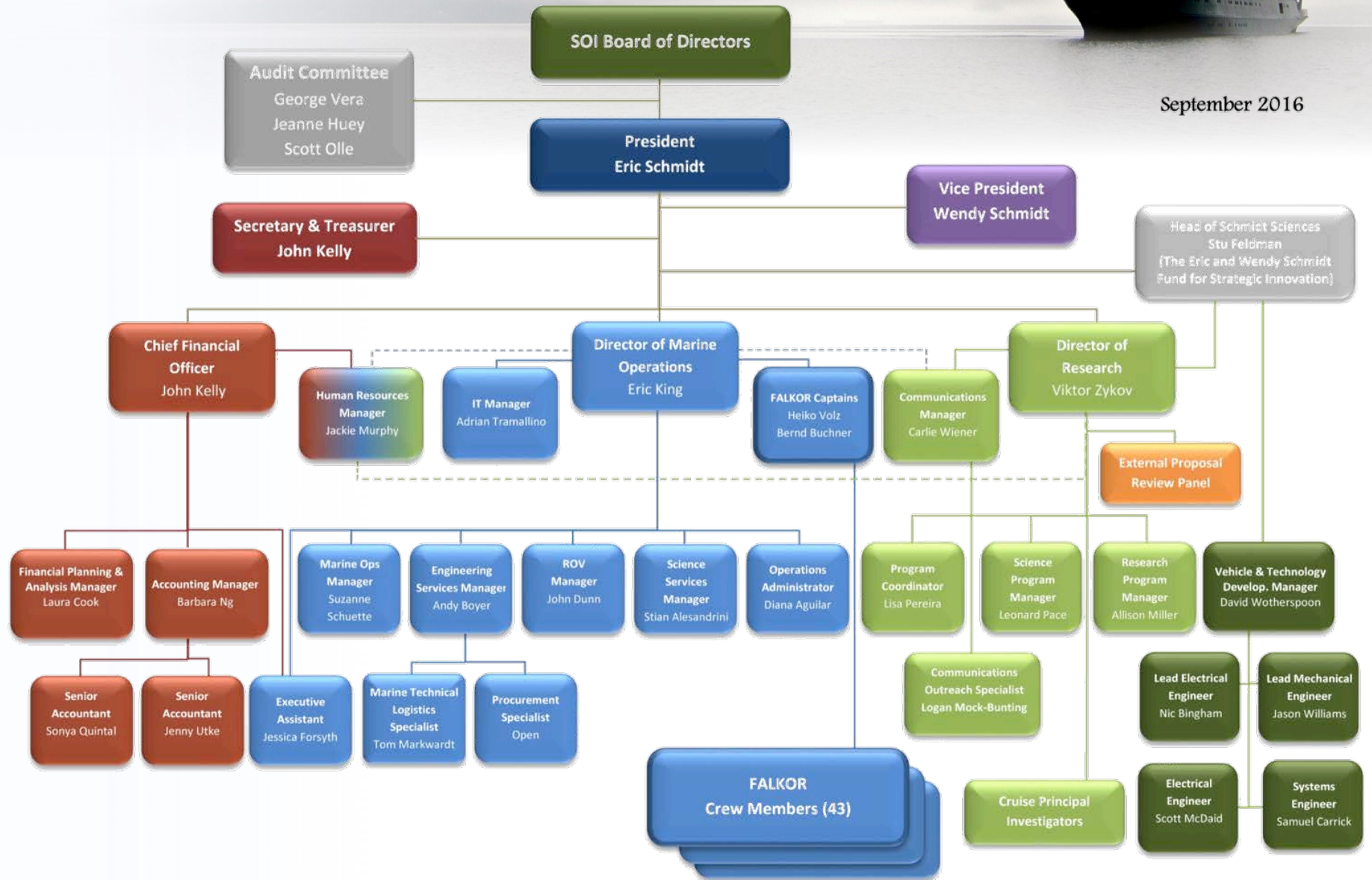
Finance & Admin
6

U.S. 501(c)3 private non-profit operating foundation, not a grant-giving organization

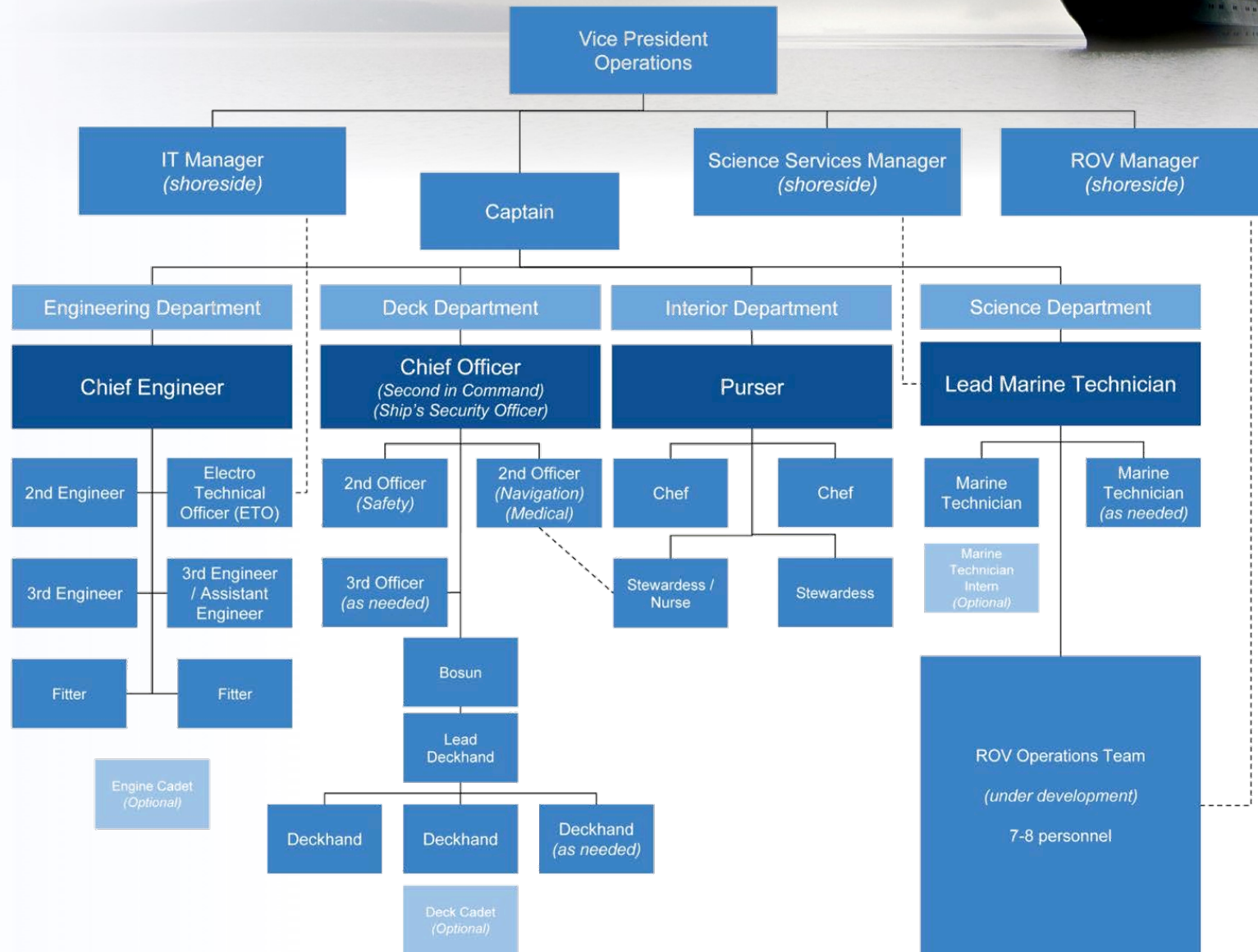
Organizational Chart



September 2016



RV *Falkor* Orgination Chart



RV *Falkor* 2011-2016 Planning & Operations



2011 – SOI initial strategy developed, proposal solicitation and review process established, first call for proposals for 2013

2012 – RV *Falkor* refit completed, shakedown cruises

2013 – Imaging K-T Boundary, HROV Nereus in Mid-Cayman Trench, ROV ROPOS at Axial Seamount & in Pacific NW dead zones

2014 – Map PMNM, AUV Sentry, Marianas landers, deepest fish ~8.7km

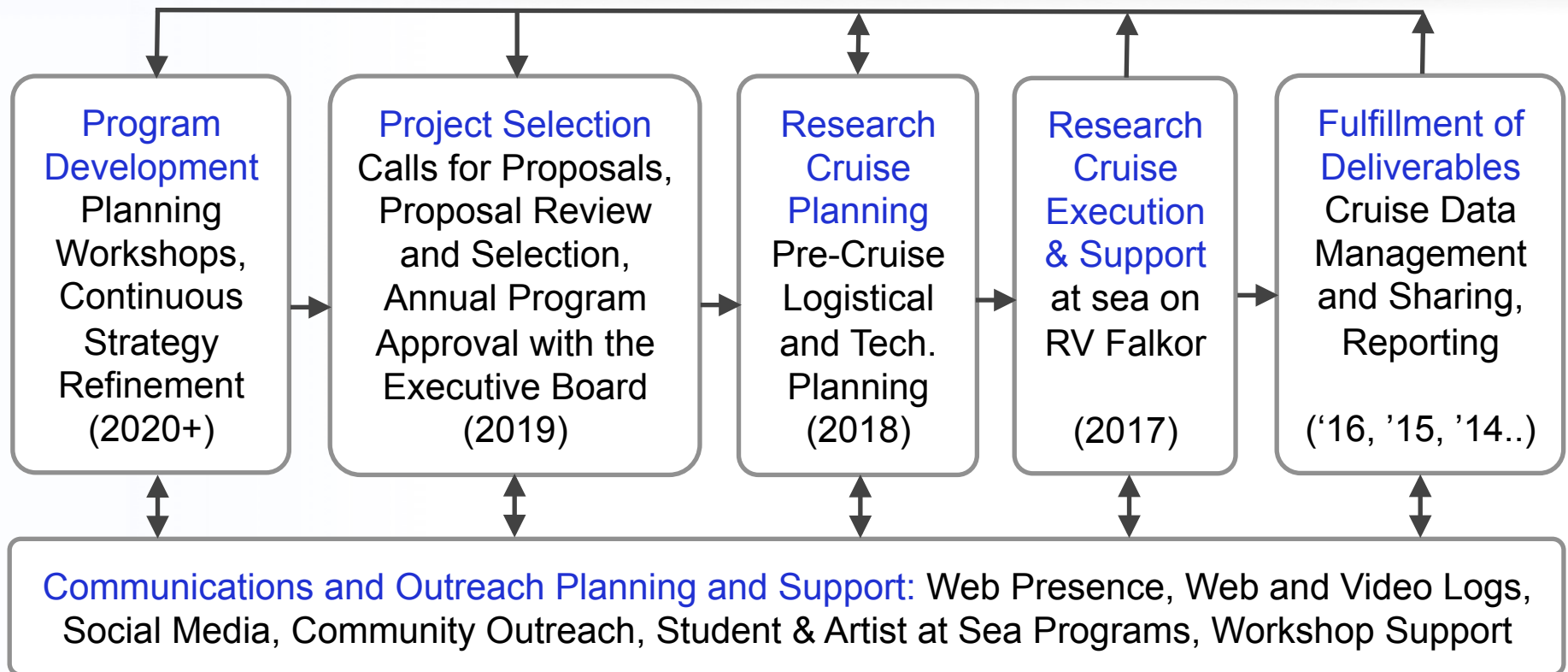
2015 – ROV in Perth, collaborative robotics at Scott reef, Mentawai Gap in Indonesia, updated strategy reviewed and approved by the Board

2016 – Virtual vents in Lau Basin, hydrothermal vent community dynamics, air-sea interactions, 4500m ROV built

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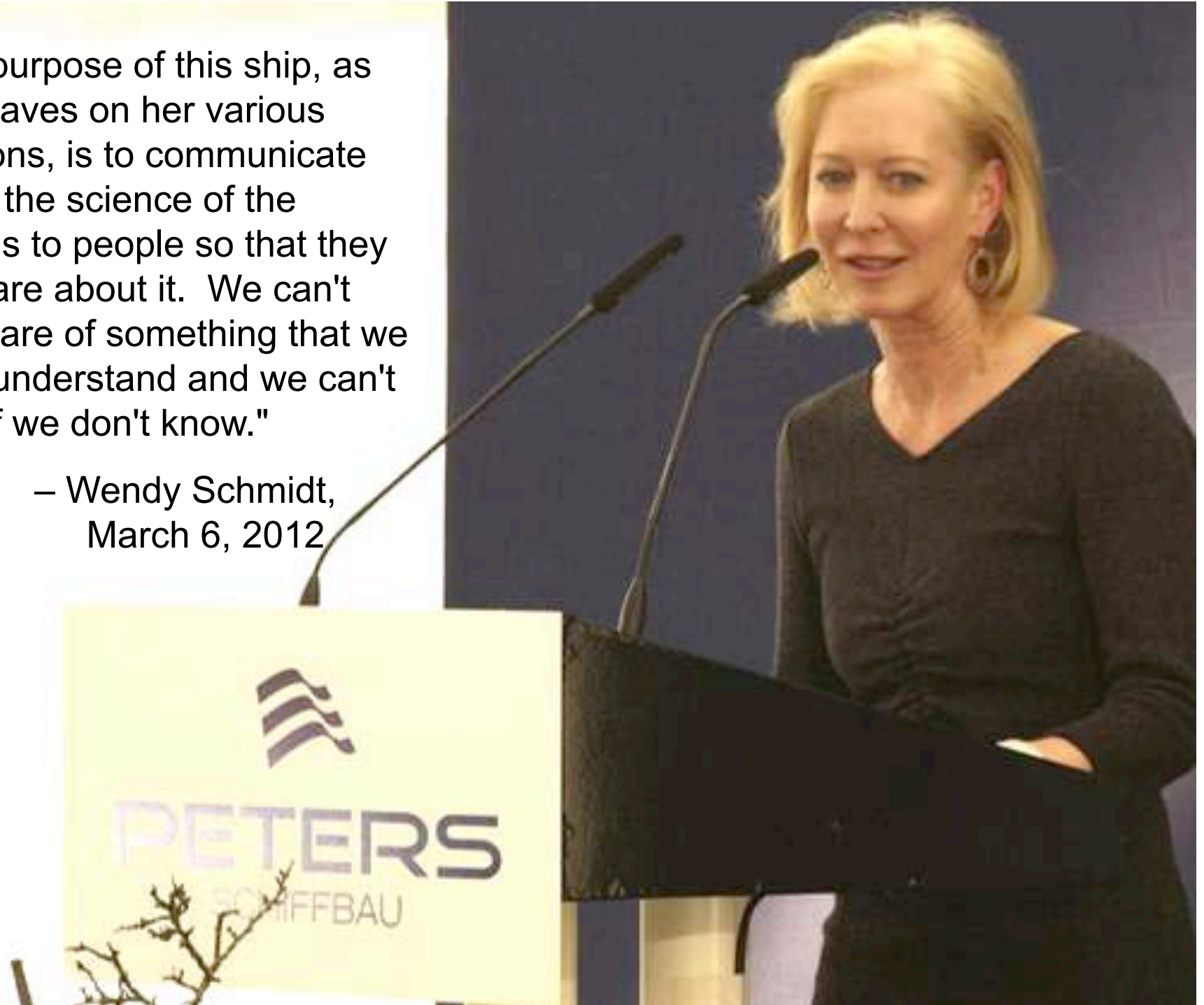
2017 – Sunken reefs and rates of global warming, deep ocean connectivity in NW Pacific, Volcanic Activity in the Lau Basin, calibration of ocean color imagery for microbial and particle satellite surveys

Workflow

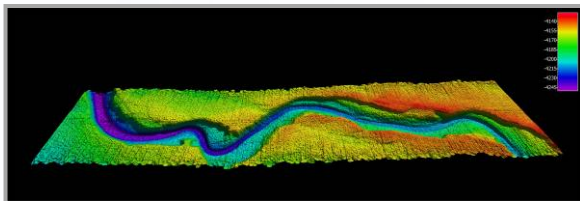


"The purpose of this ship, as she leaves on her various missions, is to communicate about the science of the oceans to people so that they can care about it. We can't take care of something that we don't understand and we can't care if we don't know."

– Wendy Schmidt,
March 6, 2012



Schmidt Ocean Institute was established to advance the frontiers of ocean research and exploration through innovative technologies, intelligent observation and analysis, and open sharing of information.



Our five focus areas:

- Commitment to Excellence in Oceanographic Research Operations
- Infrastructure, Platform, and Technology Development for Marine Sciences
- Collaborative Scientific Research aboard *Falkor*
- Communications, Education, and Outreach Program
- Open Sharing of Information, Data, and Research Outcomes

A Unique Organization

structured as a **facility operator**, SOI provides scientists with access to the research vessel, best technologies, and tech. support in exchange for open sharing of information and data



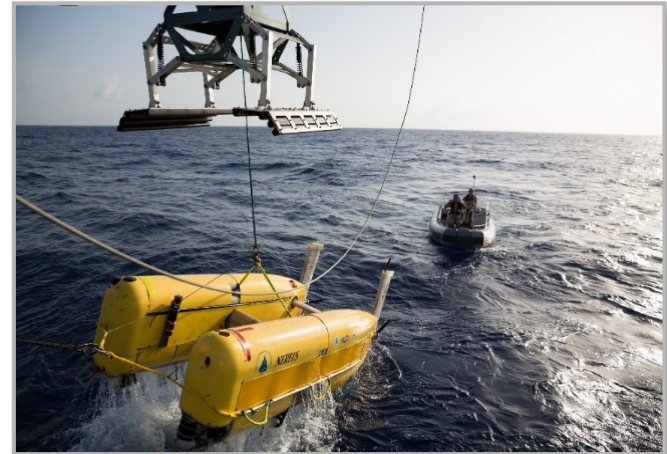
What We Don't Support:

- No grant making
- No funding for shore side research
- No research scientists on staff
- No home base for R/V *Falkor*
- No occupied submersibles

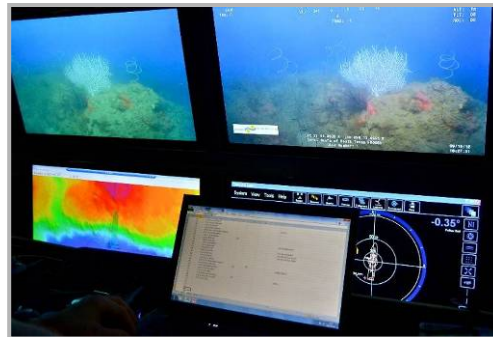


Challenge and Opportunity:

- Demonstrate innovation in ocean sciences with original methodologies and practices, externally developed research prototypes, and/or state of the art COTS technologies

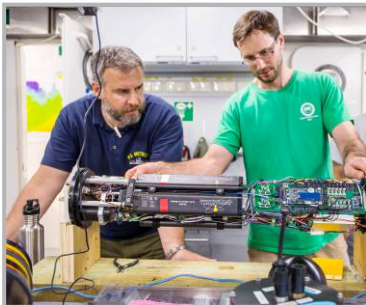
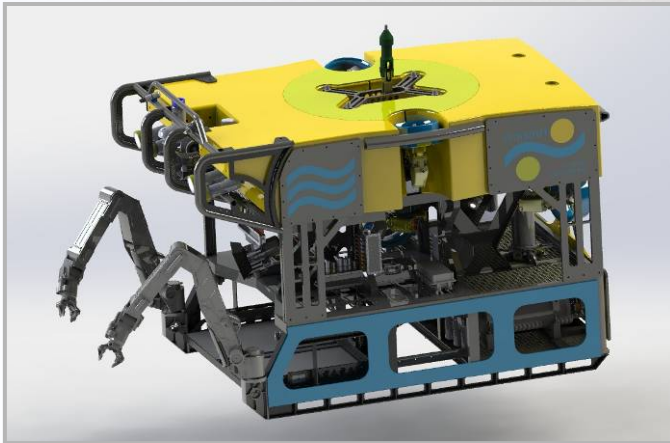


1. Excellence in Oceanographic Research Operations



- Technical and operational improvements of *Falkor* as a research platform
- Embedded scientific instruments & systems: full sonar suite, video matrix, etc.
- Remote research via Telepresence and satellite Live Data and Video Streaming
- Shipboard High Performance Computing for at-sea modeling and data analysis

2. Infrastructure, Platform, and Technology R&D for Ocean Science



- Building 4500m Remotely Operated Vehicle to support underwater research
- Falkor deployed numerous scientific platforms: ROVs ROPOS, Global Explorer, AUV Sentry, Sirius, Iver, Slocum glider, WaveGlider, HROV Nereus, etc.
- At-sea technology R&D: multi-robot autonomy, robot tracking, crowdsourced image annotation, etc.

3. Collaborative Scientific Research aboard *Falkor*

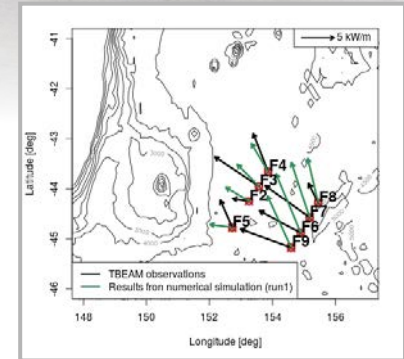
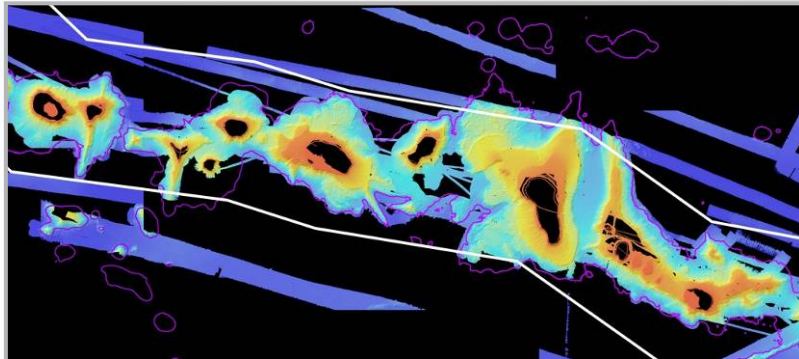


photo: NOAA/ Bishop Museum
Struhsaker's Chromis fish
(*Chromis struhsakeri*)



Rare Hawaiian pigfish
(*Bodianus bathycapros*)



Undescribed butterflyfish

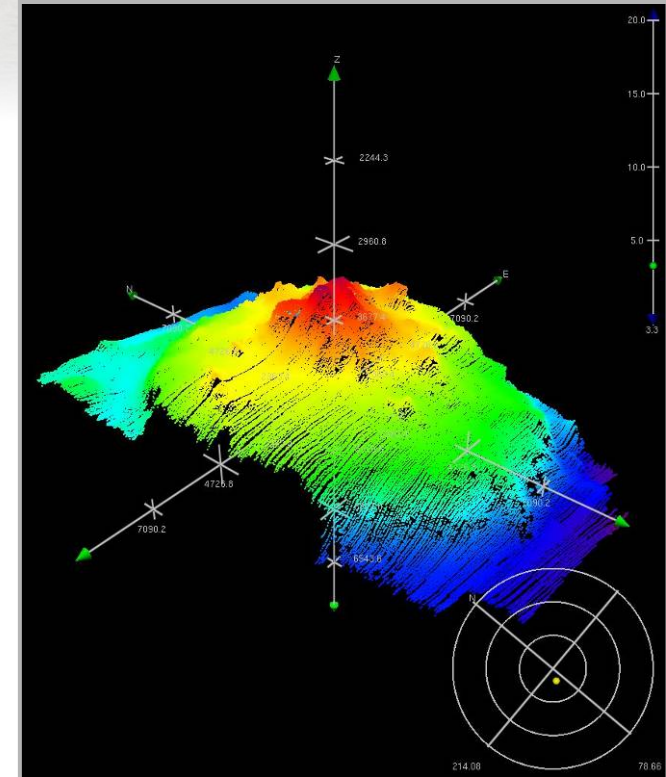
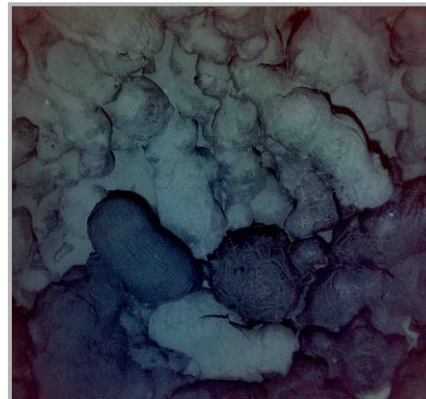
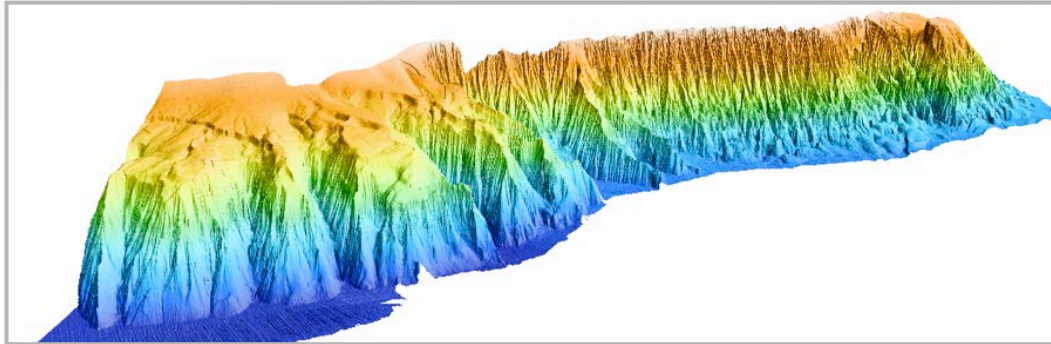


Undescribed wrase



- No active scientists on staff, our success depends on collaborating scientists
- Socially relevant: deoxygenation, oil spills, baselines, invasive species, etc.
- Deep insights: origins of life, life at extremes, microbial interactions, dynamics..
- New technologies: 1-cm scale 3D modeling of vents, shipboard modeling, etc.

3. Collaborative Scientific Research aboard *Falkor*



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- Socially relevant: deoxygenation, oil spills, baselines, invasive species, etc.
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4. Communication, Education, and Outreach Program

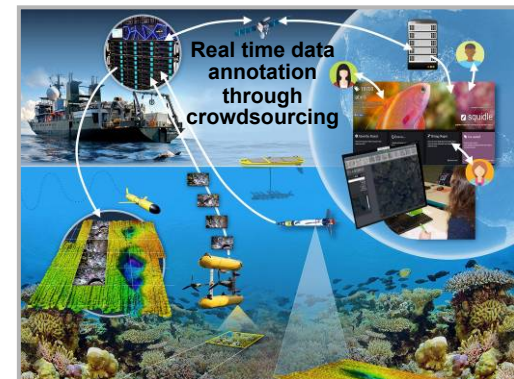
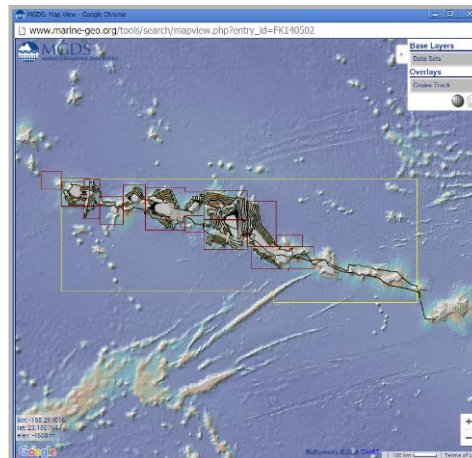
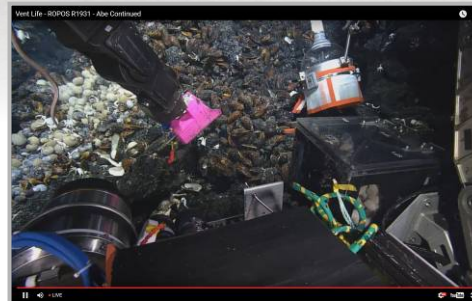
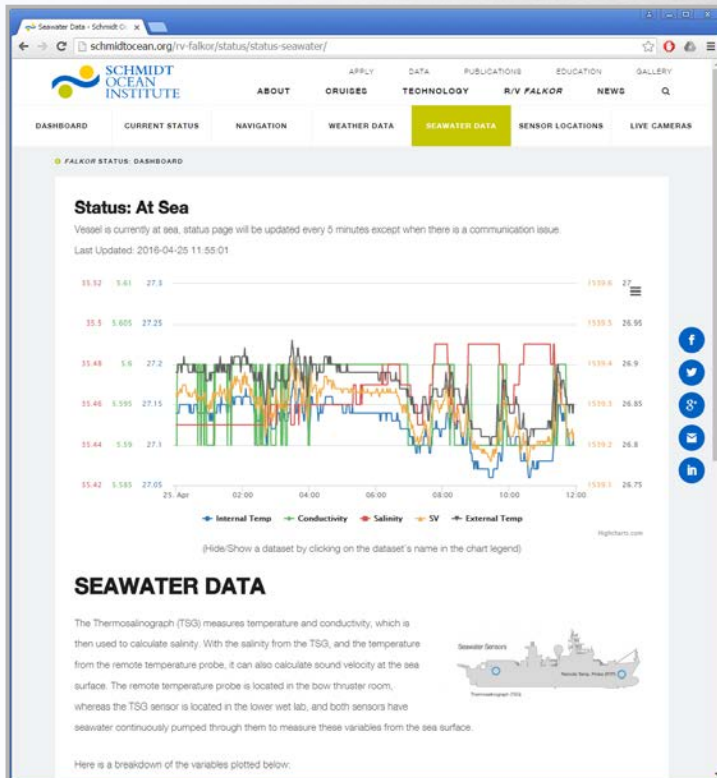


ANNUAL REPORT
2015



- Online presence: new website, social media, videos, blogs, press, etc.
- Cruise outreach: dedicated multimedia journalist for each research cruise
- Live video streaming: HD live video streamed and recorded for all ROV dives
- Educational initiatives: student participation on cruises, citizen science, etc.

5. Open Sharing of Information, Data, and Research Outcomes



- All scientists commit to openly share scientific data and research outcomes
- All data (257+ data sets) freely available through SOI and partner web sites
- Live scientific data sharing through Falkor Dashboard on SOI website
- 13 Journal papers (9 in 2015) and 107 conference papers (48 in 2015)

Excellence in Oceanographic Research Operations



- Technical and operational improvements of *Falkor* as a research platform
- Support of innovative shipboard embedded scientific instruments and systems
- Support of remote research via telepresence and satellite data streaming
- Shipboard high performance computing for at-sea modeling and data analysis



Infrastructure & Instrumentation: *R/V Falkor*



R/V Falkor, SOI's Largest Infrastructure Development Project

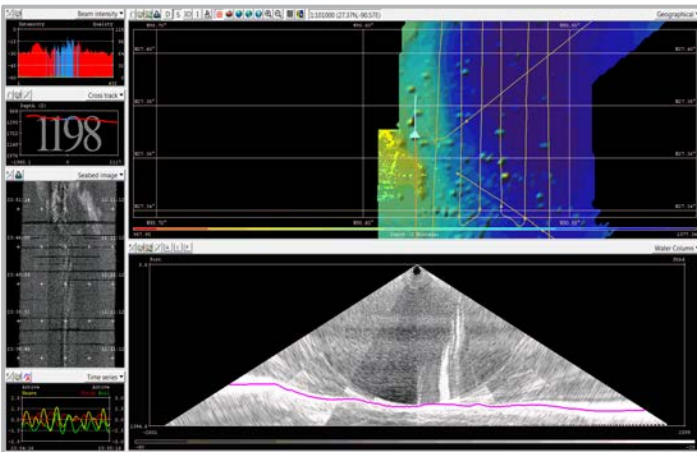
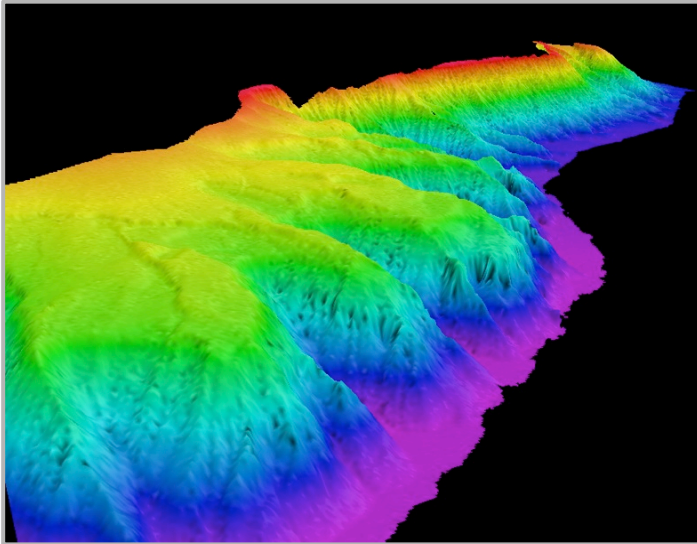
- 82.9 m (272 ft) LOA
- Cruising Range 8,000 nm
- 36 days of steaming
- Speed 12 knots
- 24 international crew
- 20 special personnel berths
- 2 classic diesel engines
- controllable pitch propellers
- 6.3 meter aluminum hull
- 350 HP jet-drive work boat



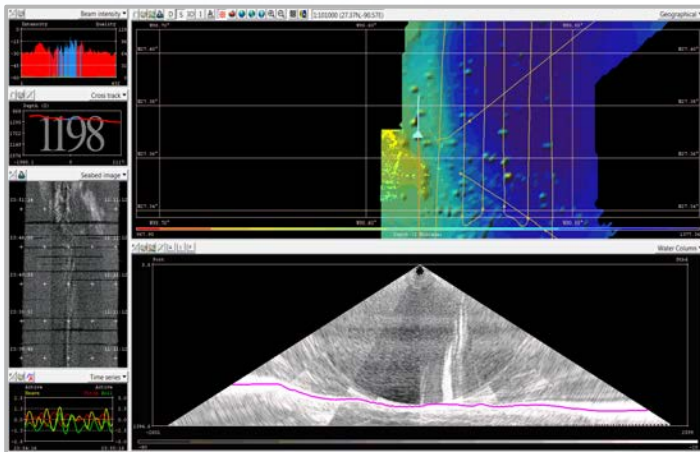
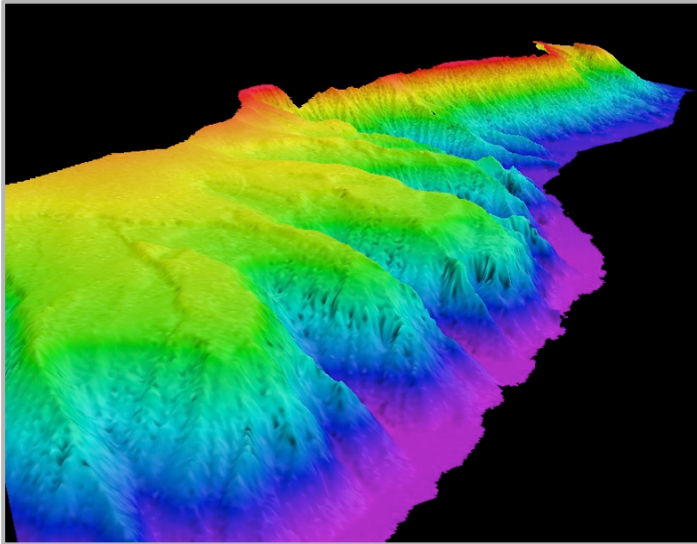
R/V *Falkor* Onboard Research Infrastructure



- Multibeam mapping/ scientific echosounders



R/V *Falkor* Onboard Research Infrastructure

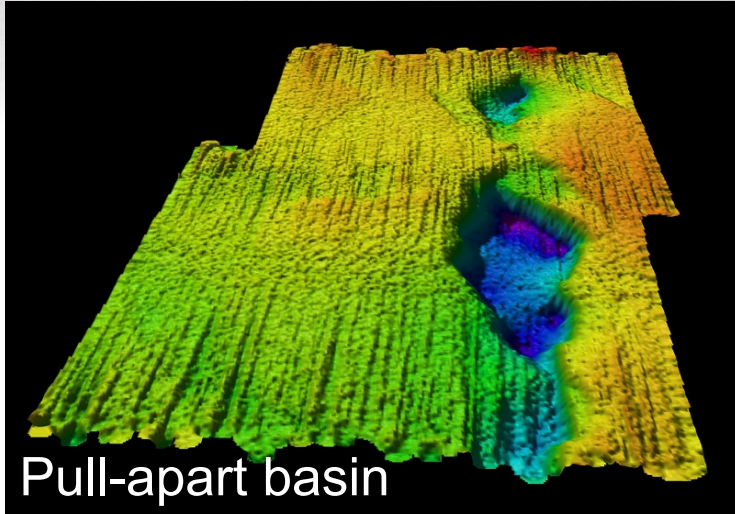
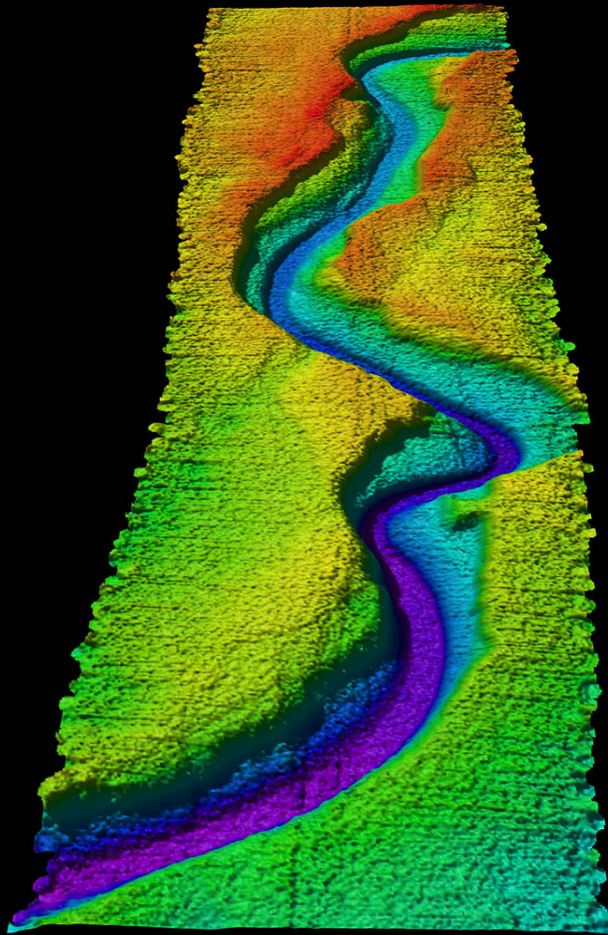


- Multibeam mapping/ scientific echosounders
- **Kongsberg EM 302** 1x1 degree multi-beam echo sounder
- **Kongsberg EM 710** 0.5x1 degree multi-beam echo sounder
- **Kongsberg EA 600** single beam echo sounder, 12/38/120/200 kHz
- **Simrad EK60** fishery research system, 18/38/70/120/200/710 kHz
- **Simrad SH90** high definition omnidirectional fishery sonar, 114 kHz
- **Knudsen CHIRP 3260** sub-bottom profiling system, 12kHz
- **Teledyne Ocean Surveyor** Acoustic Doppler Current Profiler, 75 kHz
- **Teledyne Workhorse** Mariner Acoustic Doppler Current Profiler, 300 kHz
- **Sonardyne Ranger 2** ultra-short base line system

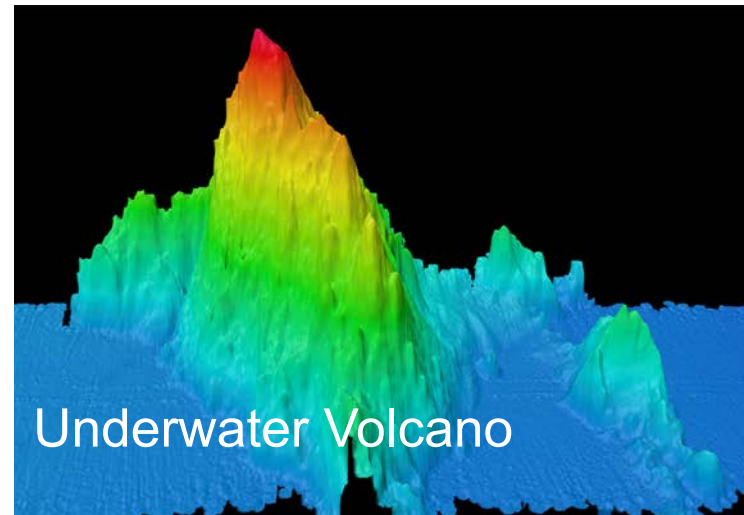
Underwater Maps (examples)



Underwater Canyon



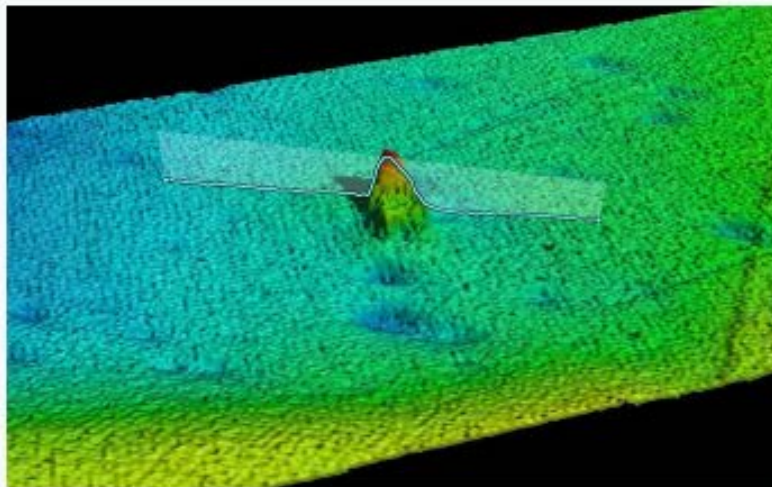
Pull-apart basin



Underwater Volcano

SCIENCE SYSTEMS

Falkor supports the following science systems:



Scientific Echosounders

- 8000 meter deep water multi-beam echo sounder – Kongsberg EM 302 1×1 degree
- 2000 meter shallow water multi-beam echo sounder – Kongsberg EM 710 0.5×1



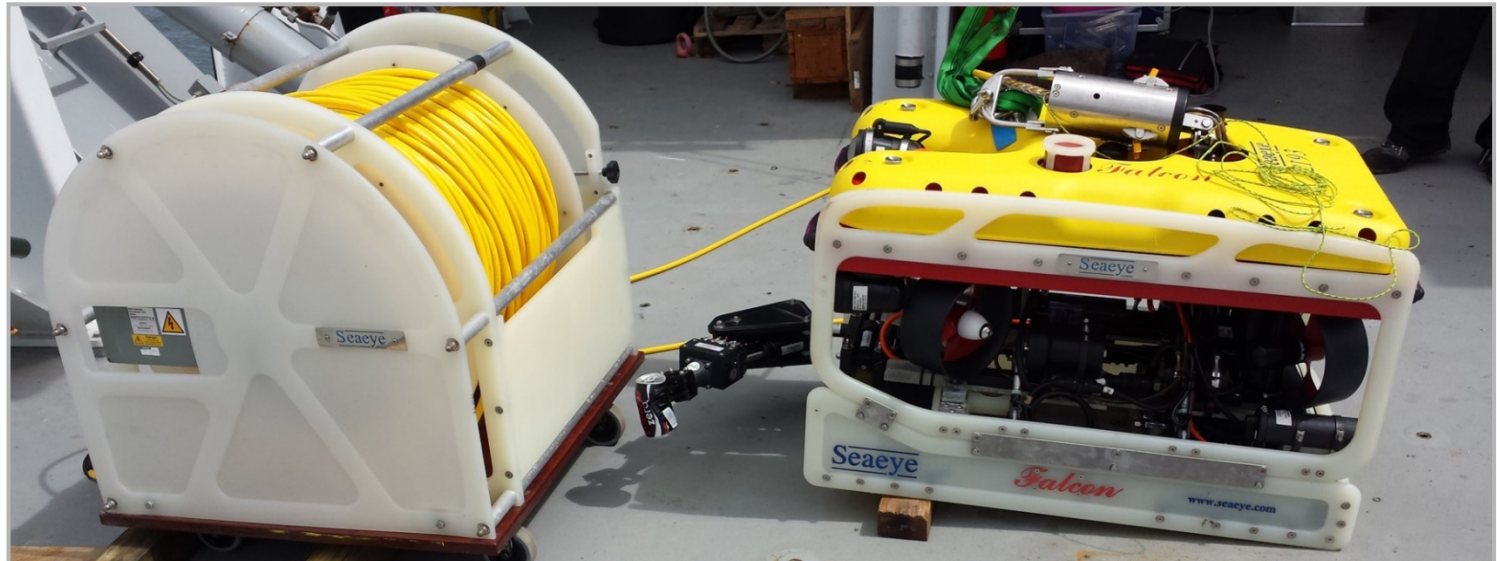
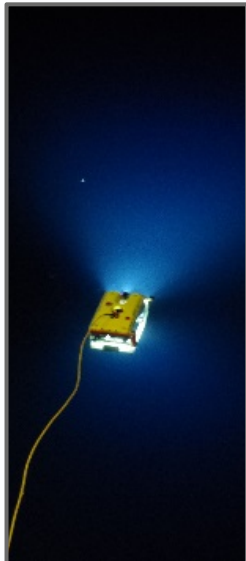
Subsea Acoustic Positioning System

- Sonardyne Ranger 2 Ultra-Short Base Line (USBL) acoustic positioning system
 - Transceiver unit fits on a deployable

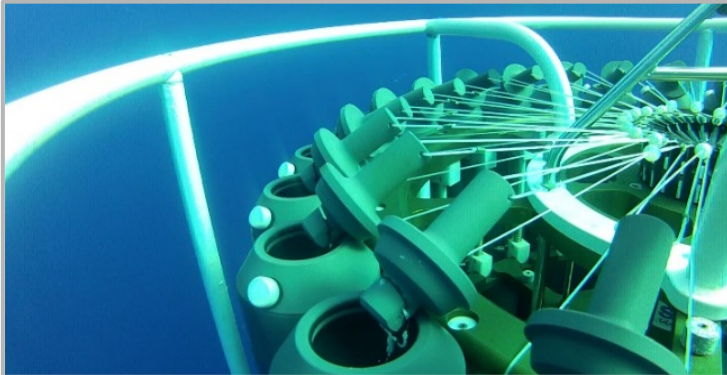
R/V *Falkor* Onboard Research Infrastructure



- Multibeam mapping/ scientific echosounders
- SAAB SeaEye Falcon ROV (300m depth rating)



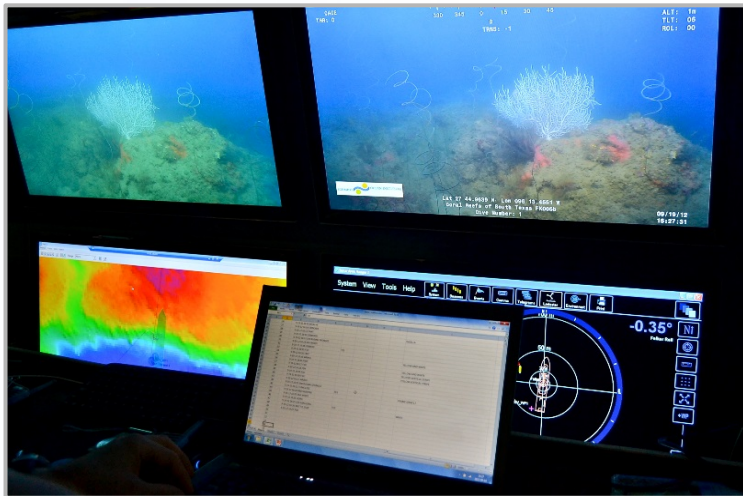
R/V *Falkor* Onboard Research Infrastructure



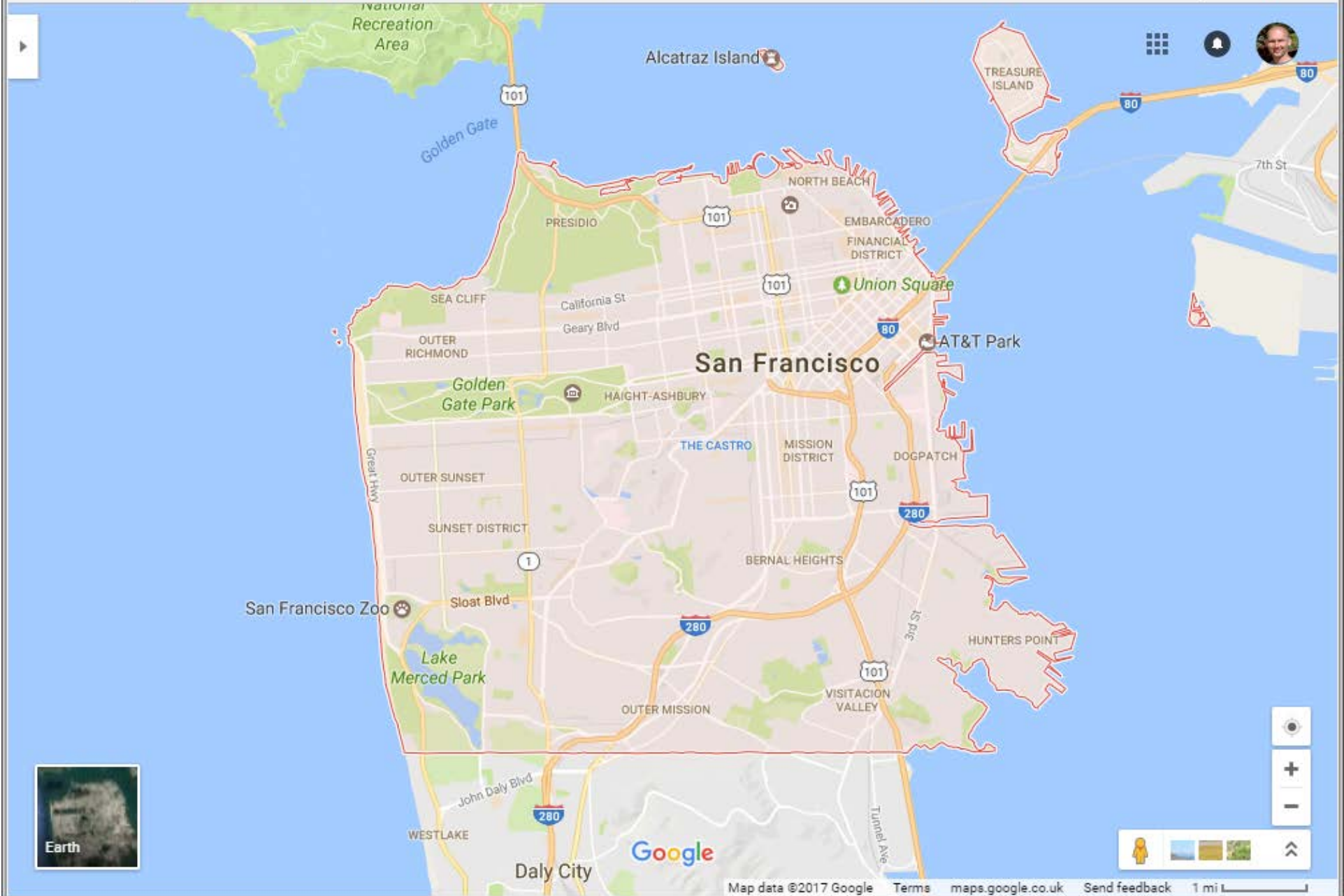
- Multibeam mapping/ scientific echosounders
- SAAB SeaEye Falcon ROV (300m depth rating)
- CTD rosette (24 position)



R/V *Falkor* Onboard Research Infrastructure




- Multibeam mapping/ scientific echosounders
- SAAB SeaEye Falcon ROV (300m depth rating)
- CTD rosette (24 position)
- RC-Controlled 13-foot Blimp with 1000 meter range
- Video Matrix and HD video streaming for real-time scientific interface



Schmidt Ocean Falkor Ship

Secure | <https://www.google.com/maps/place/Schmidt+Ocean+Falkor+Ship/@37.8022526,-122.4009615,16.17z/data=>

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- 4 reviews

Cruise Line Company

Directions

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San Francisco, CA 94111

Permanently closed

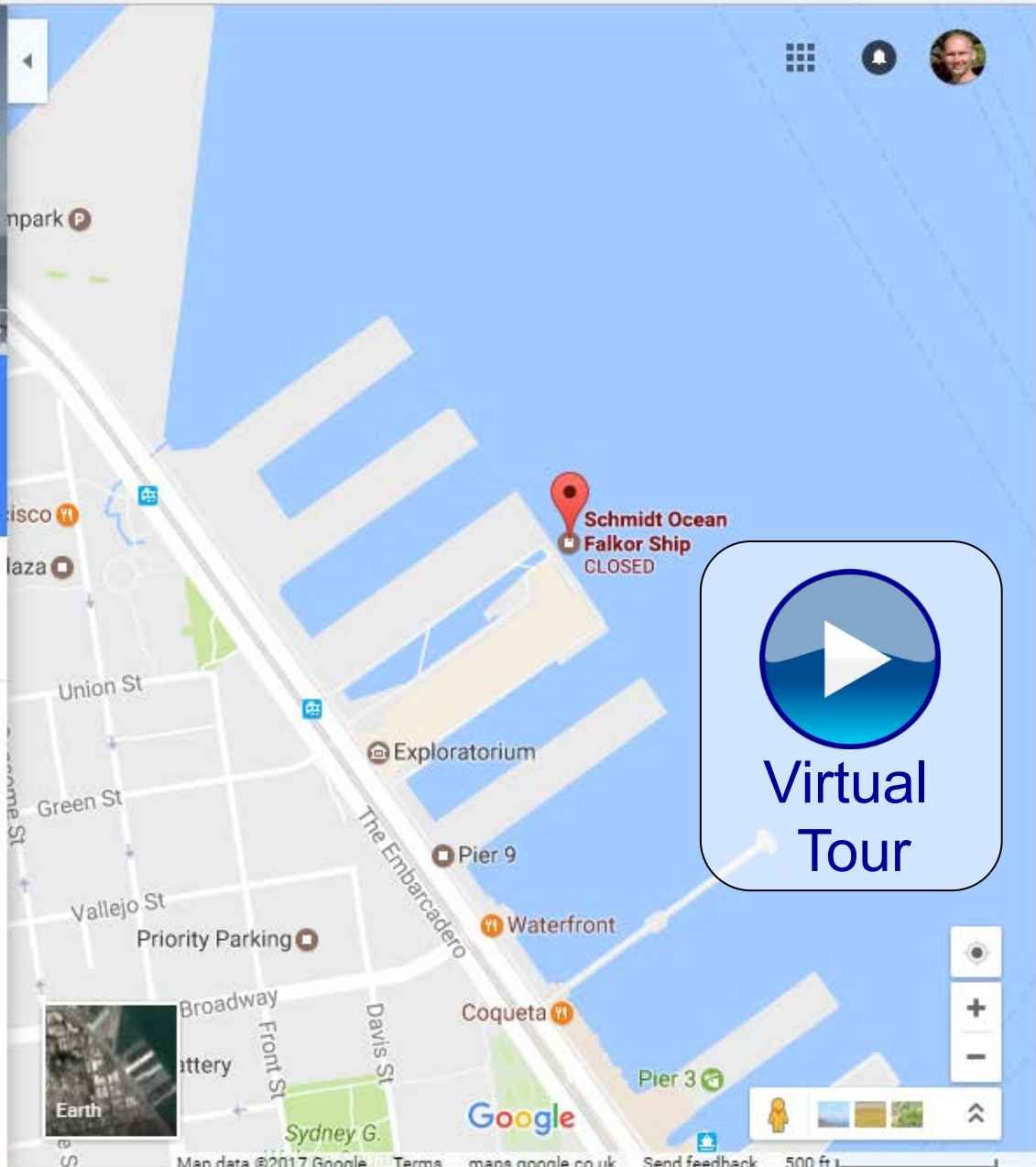
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Suggest an edit

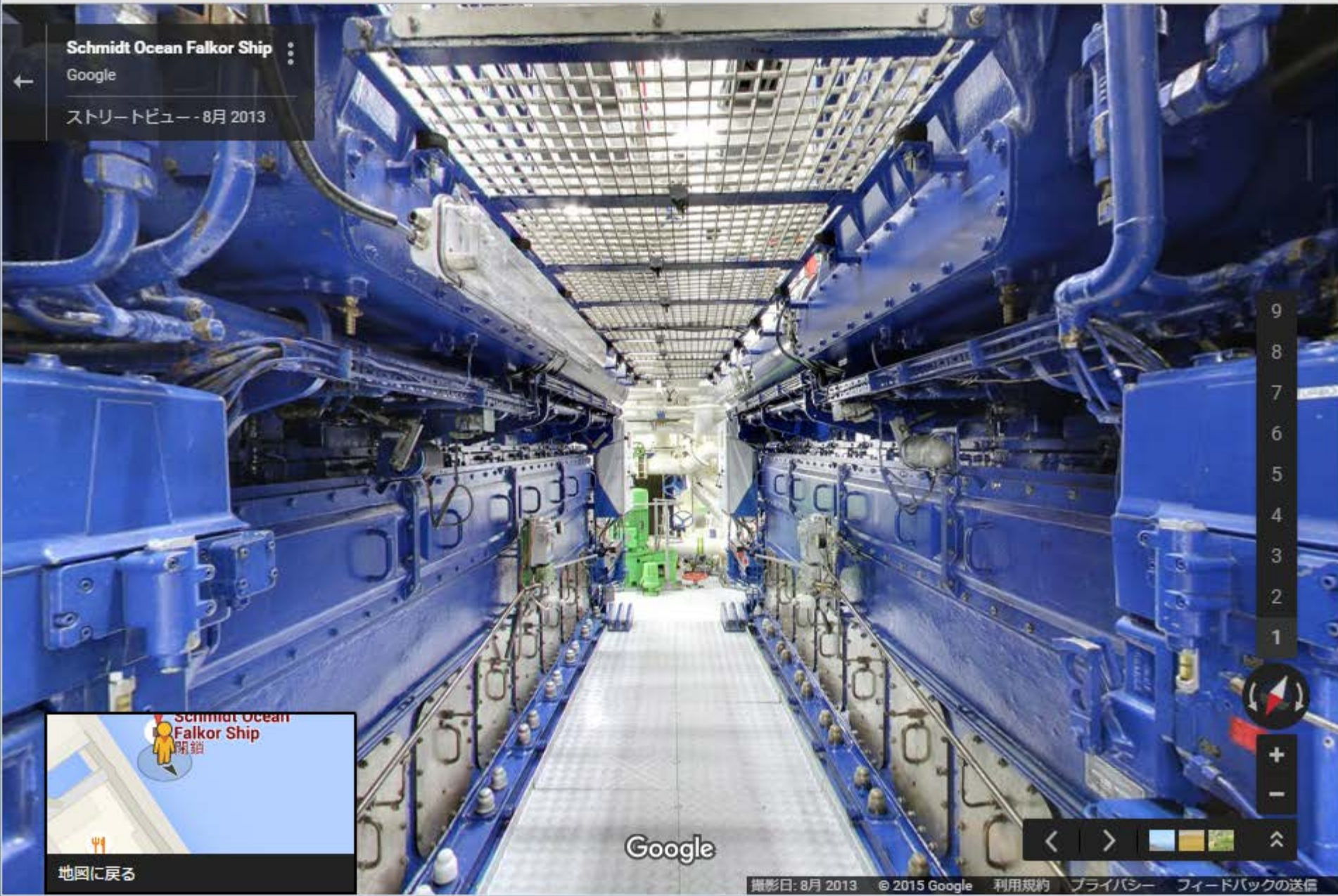
Add a label



Virtual Tour



Map data ©2017 Google Terms maps.google.co.uk Send feedback 500 ft

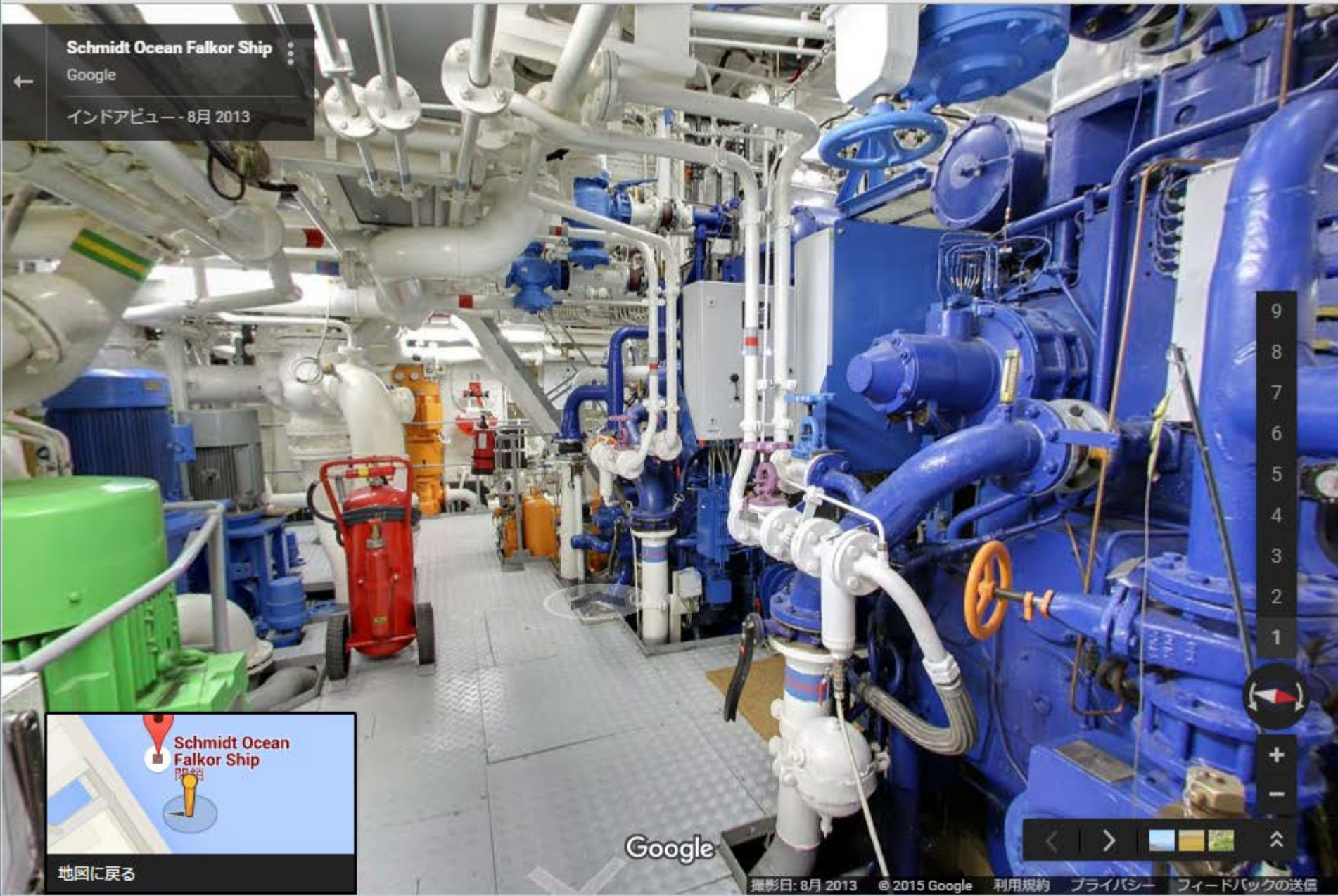


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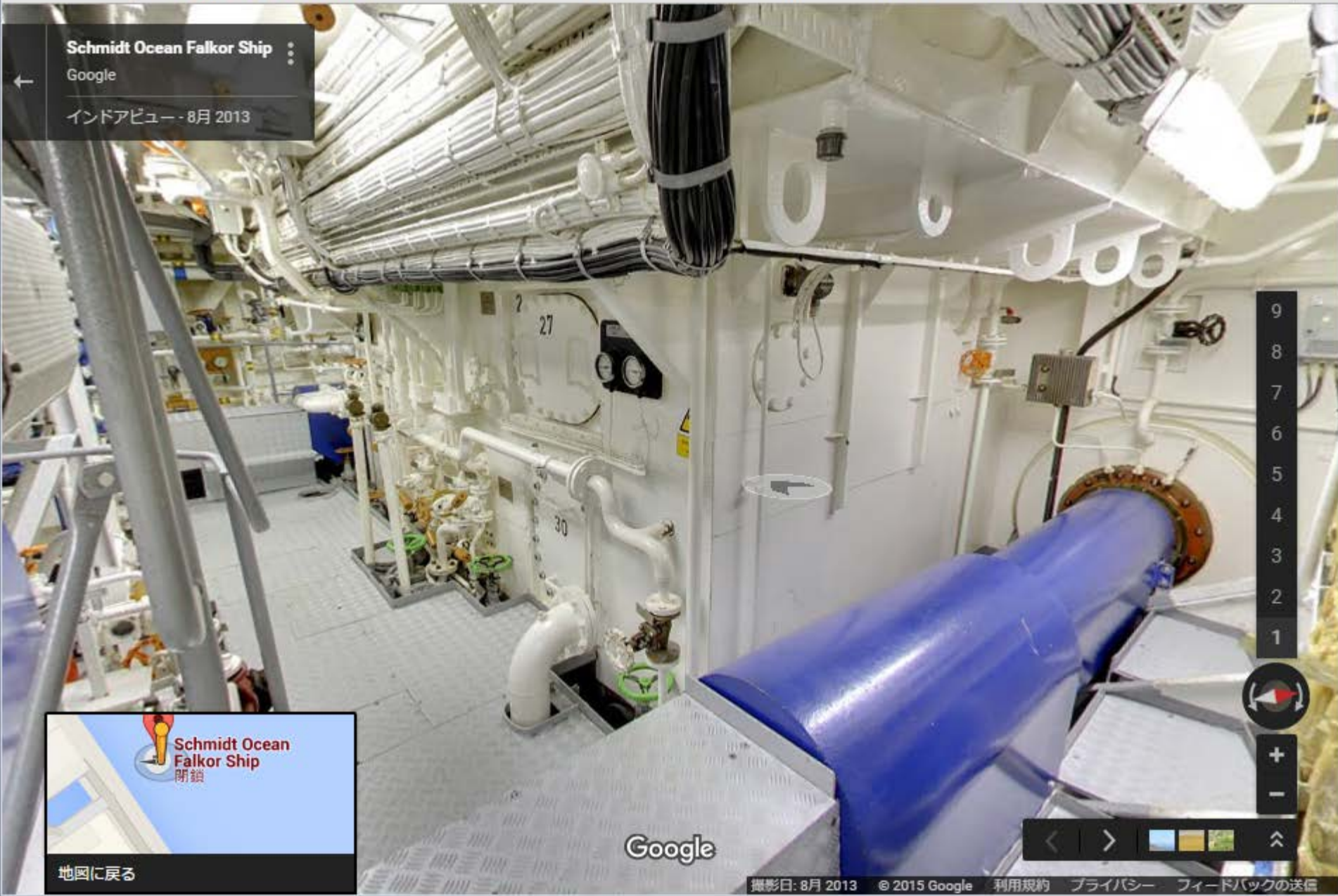


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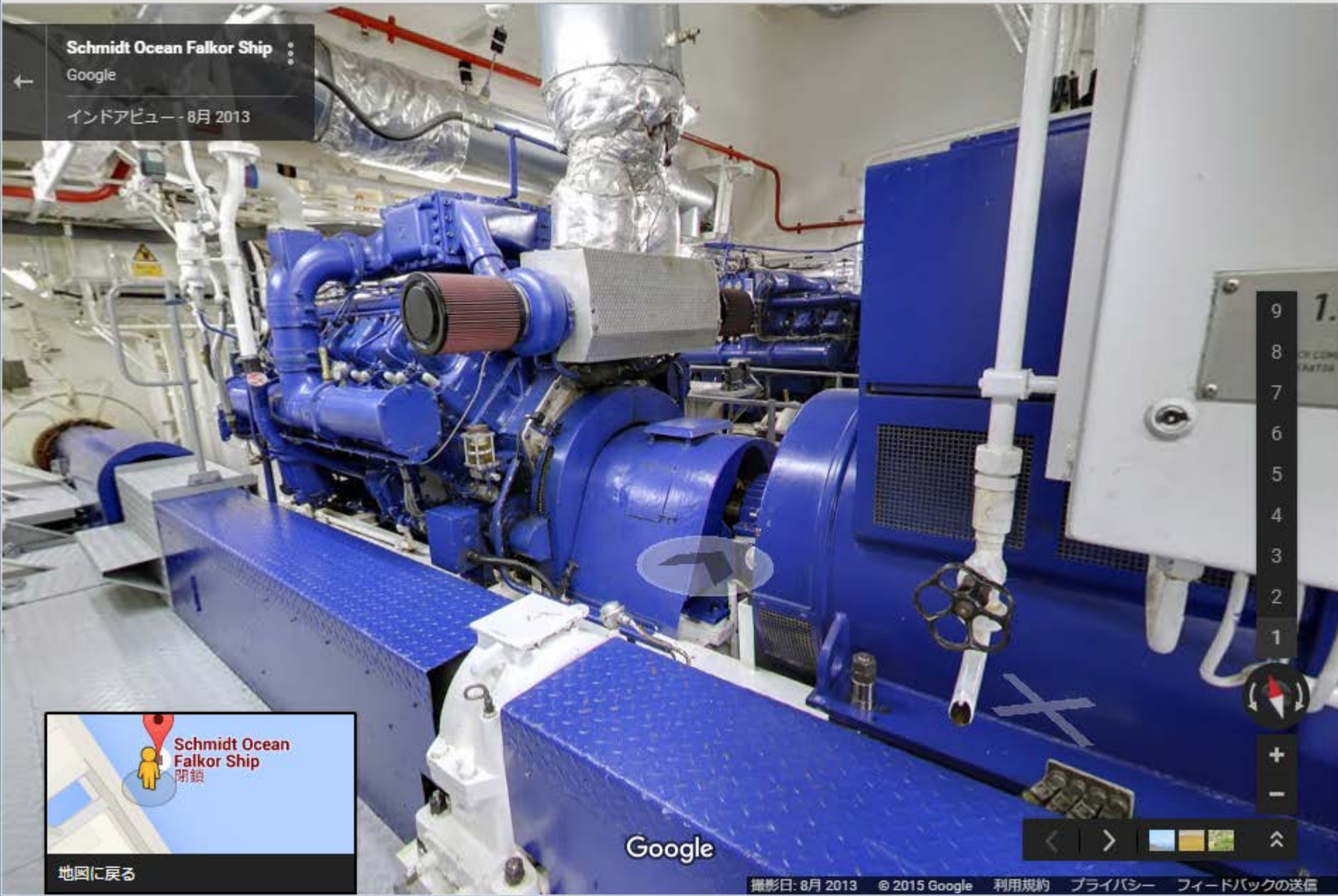


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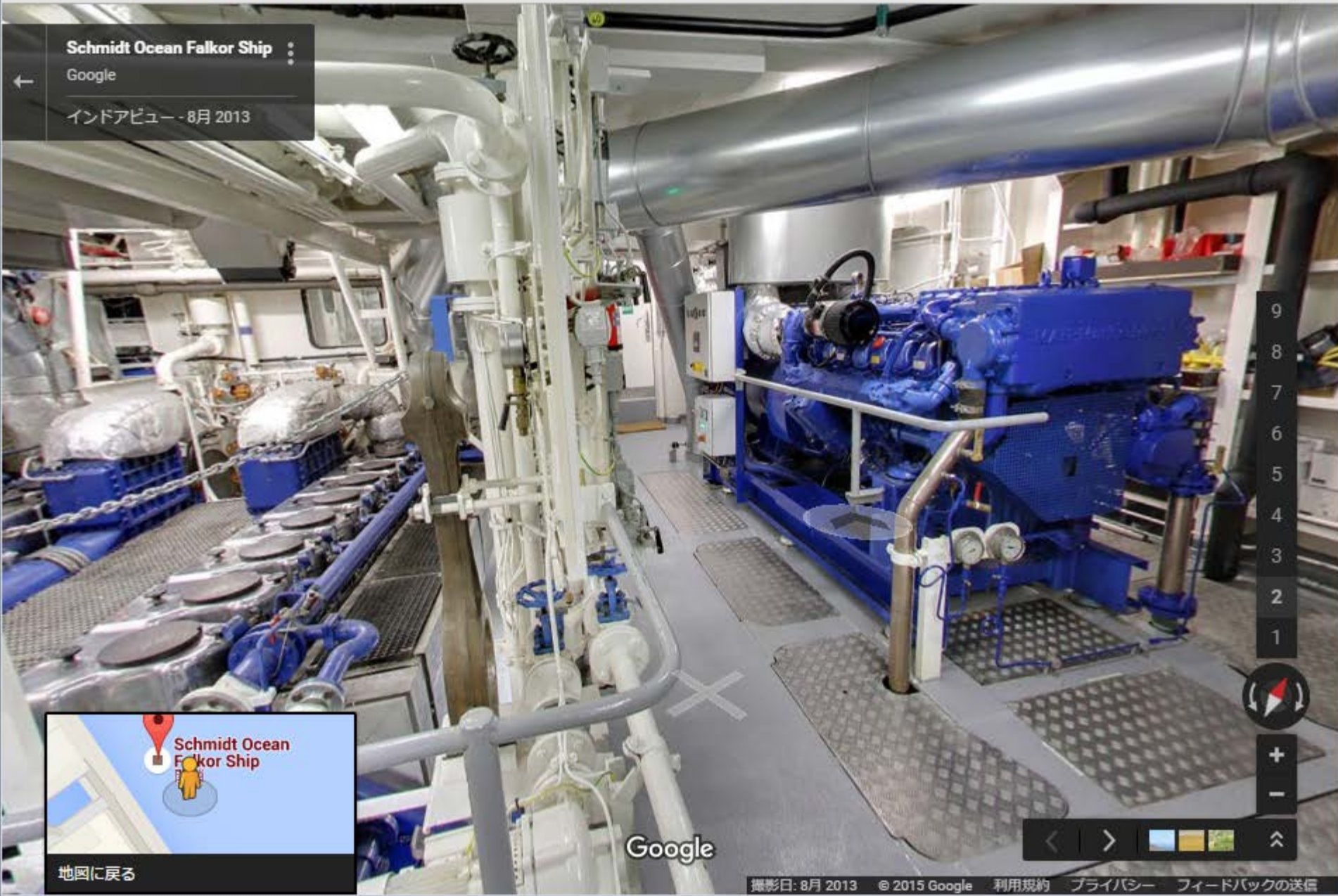
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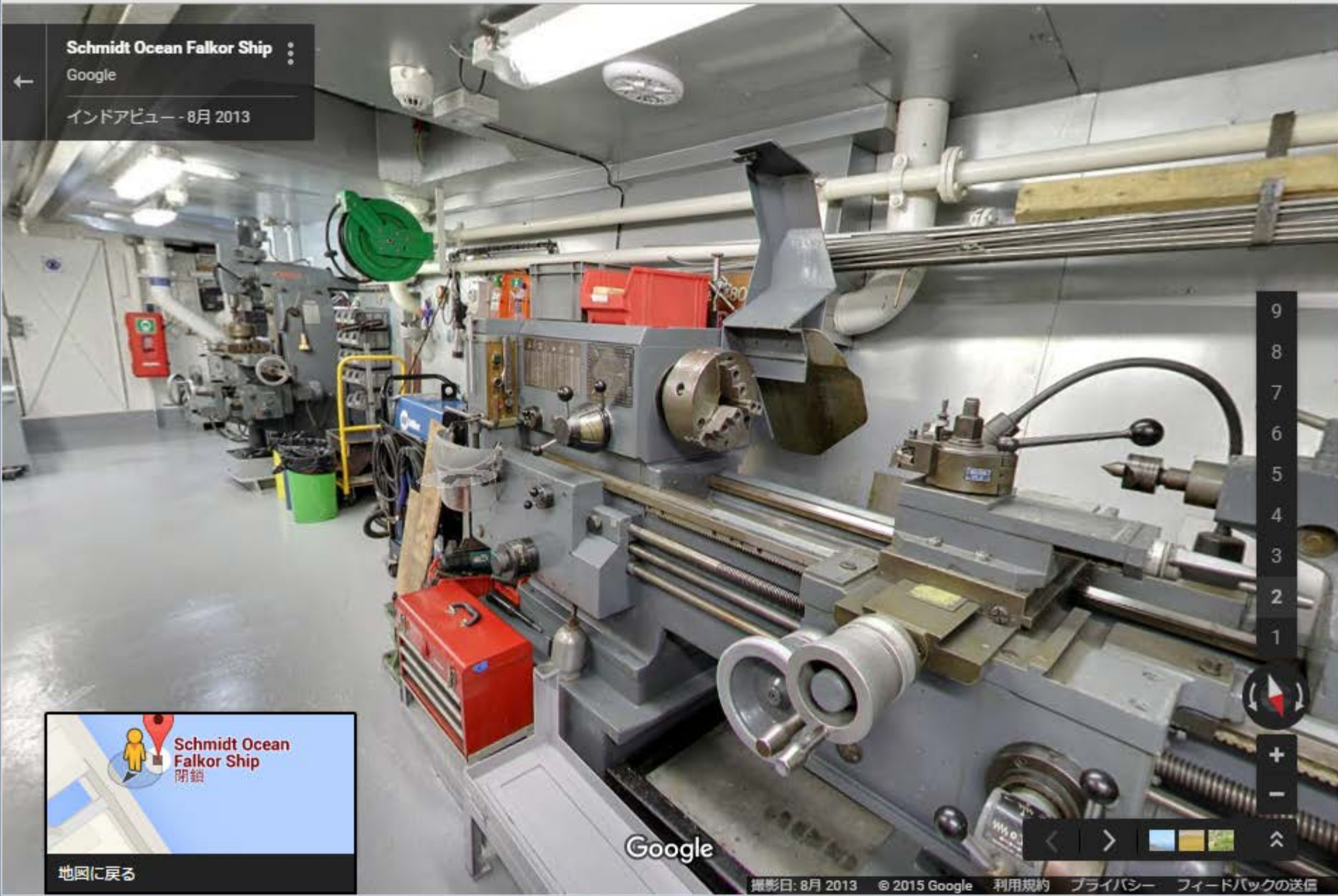
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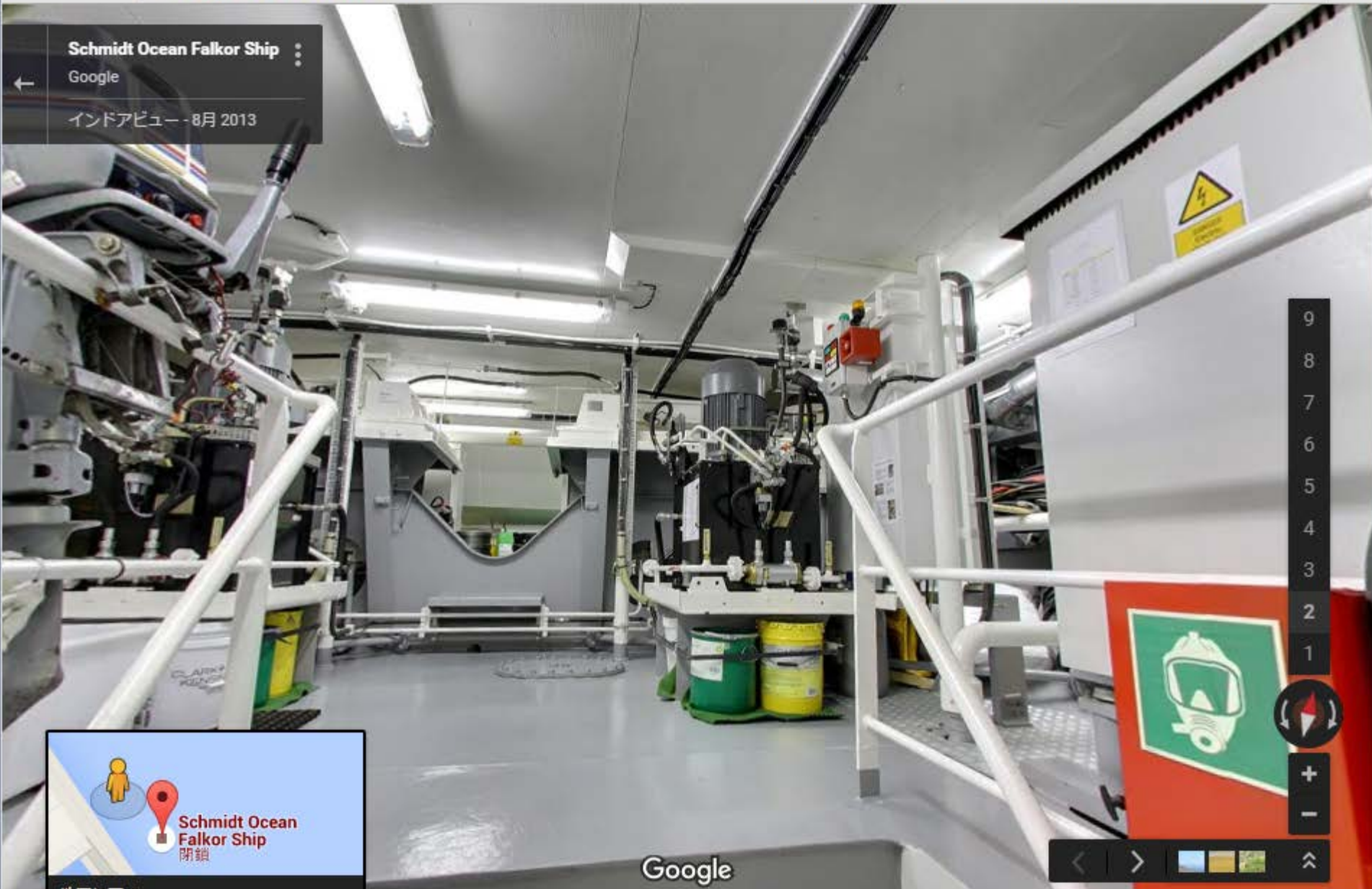
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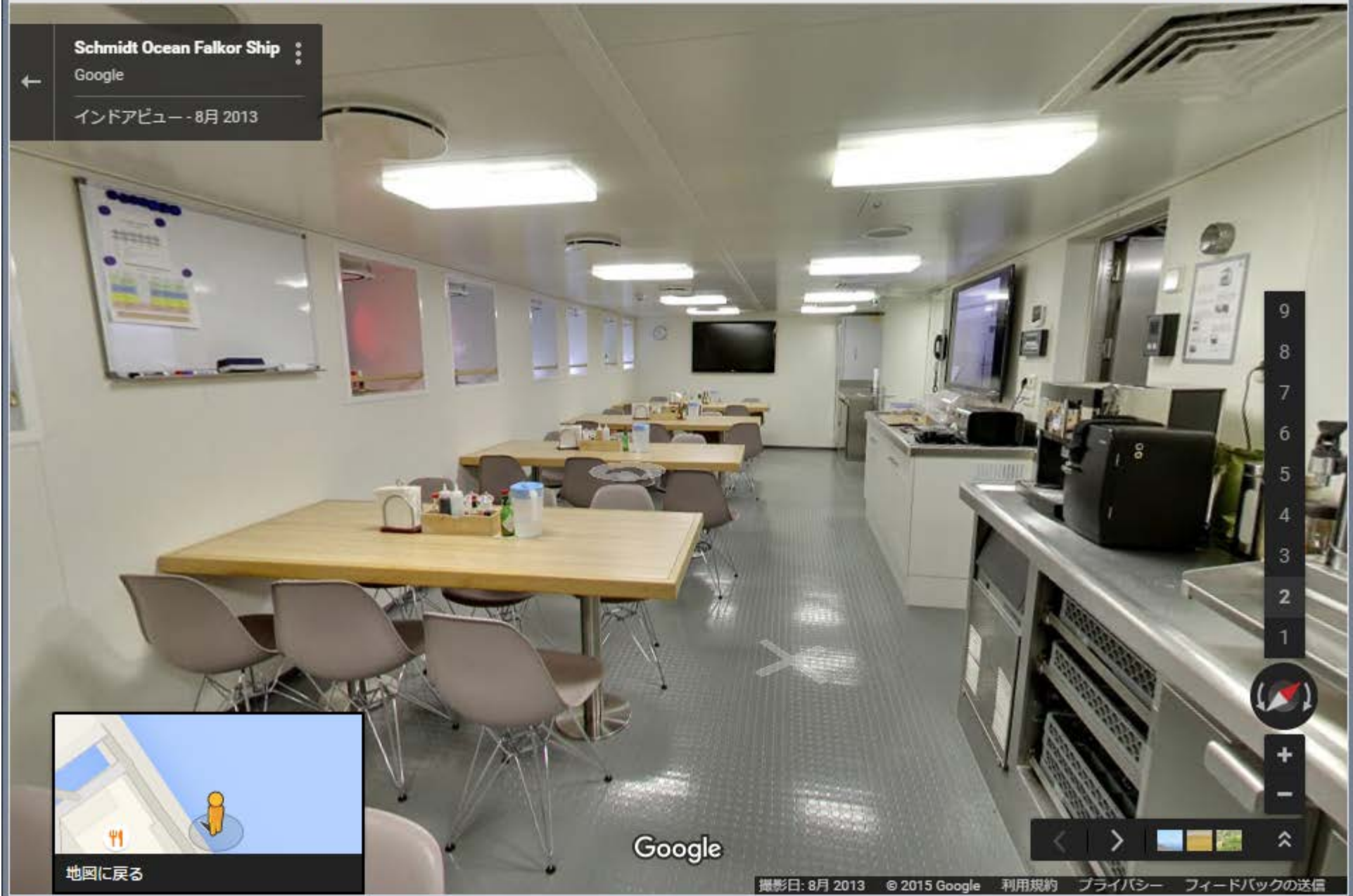
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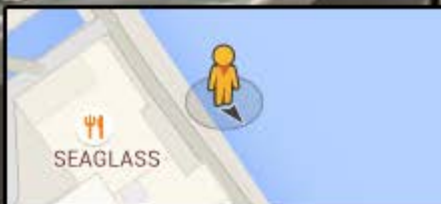
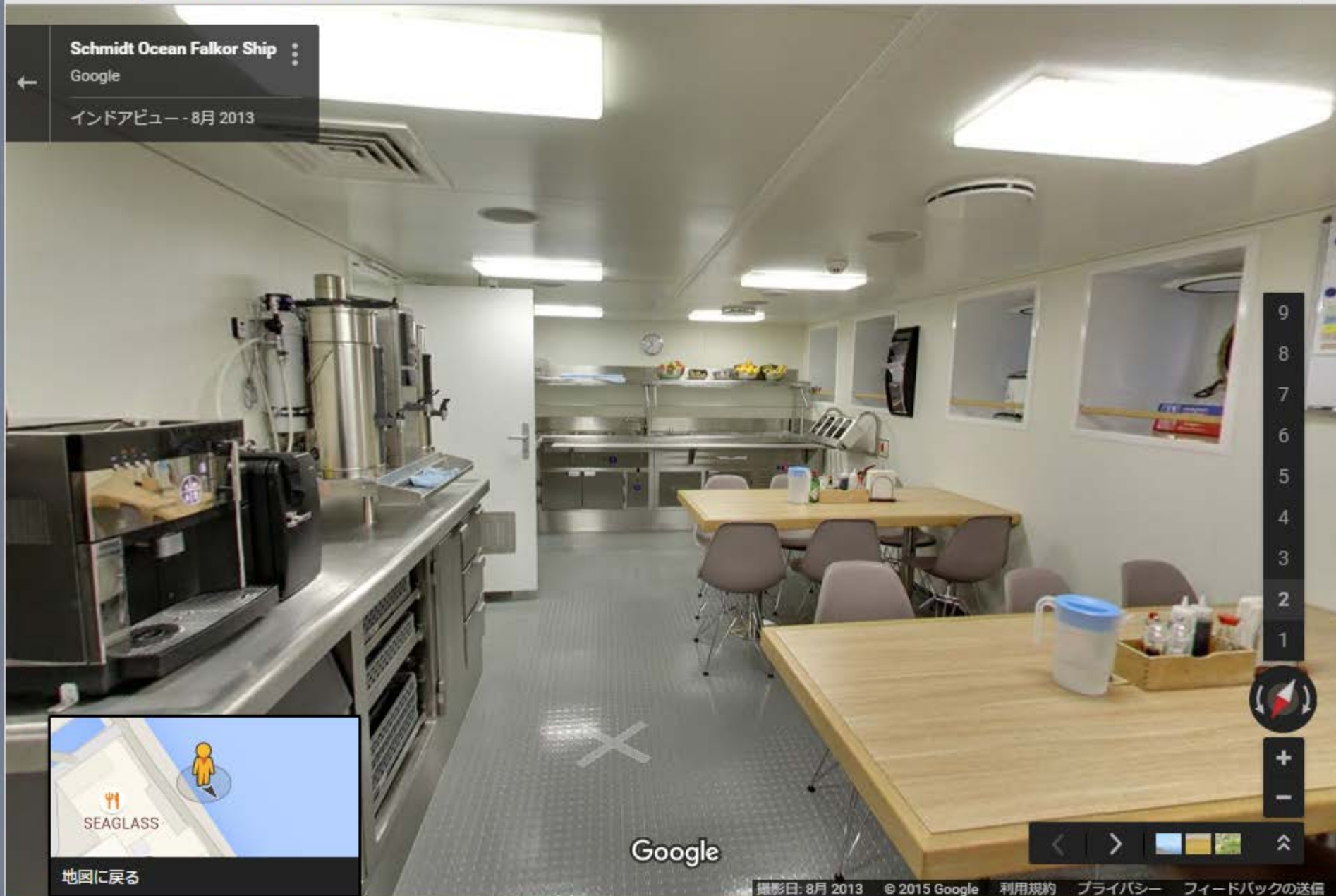
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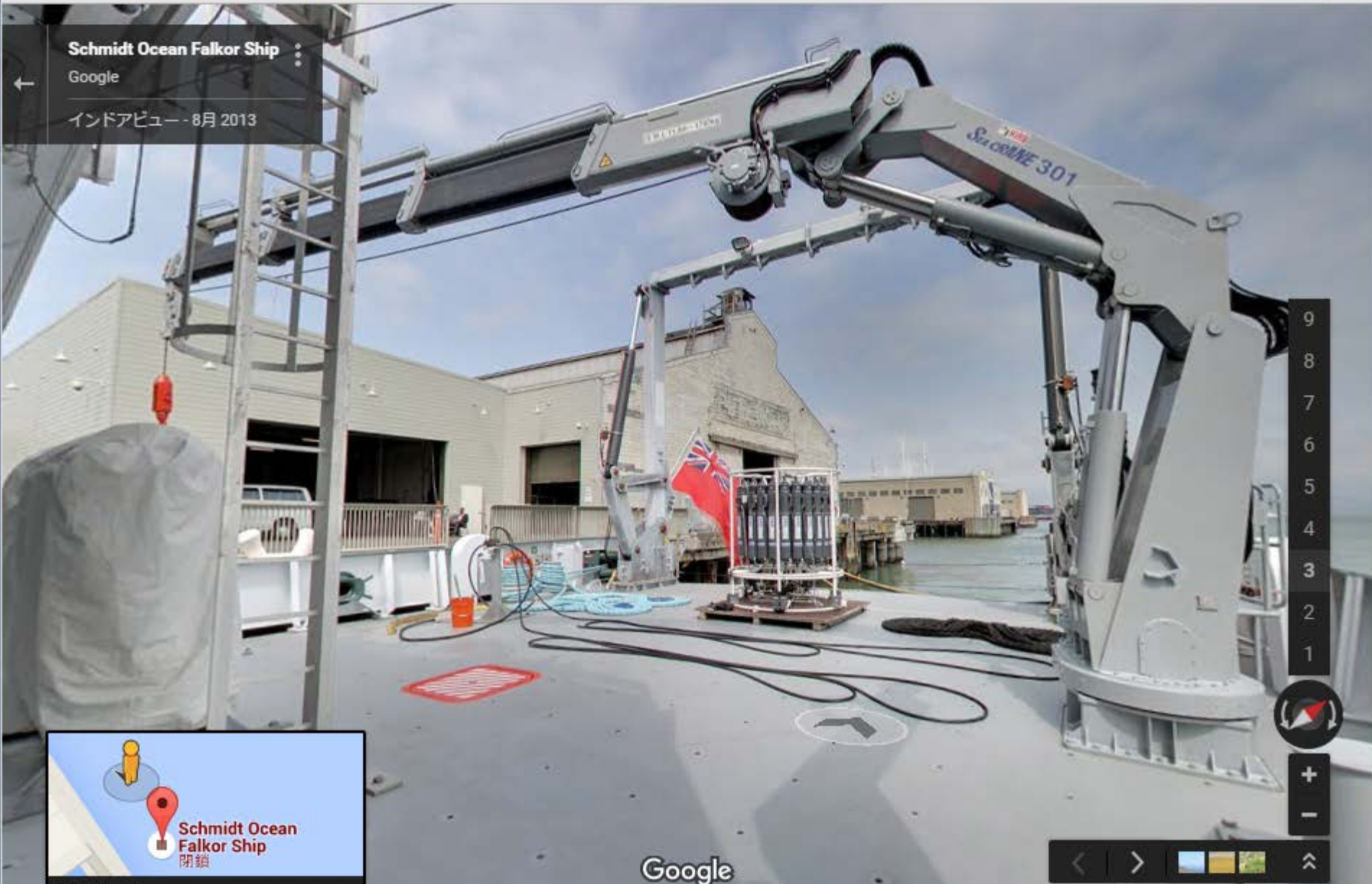
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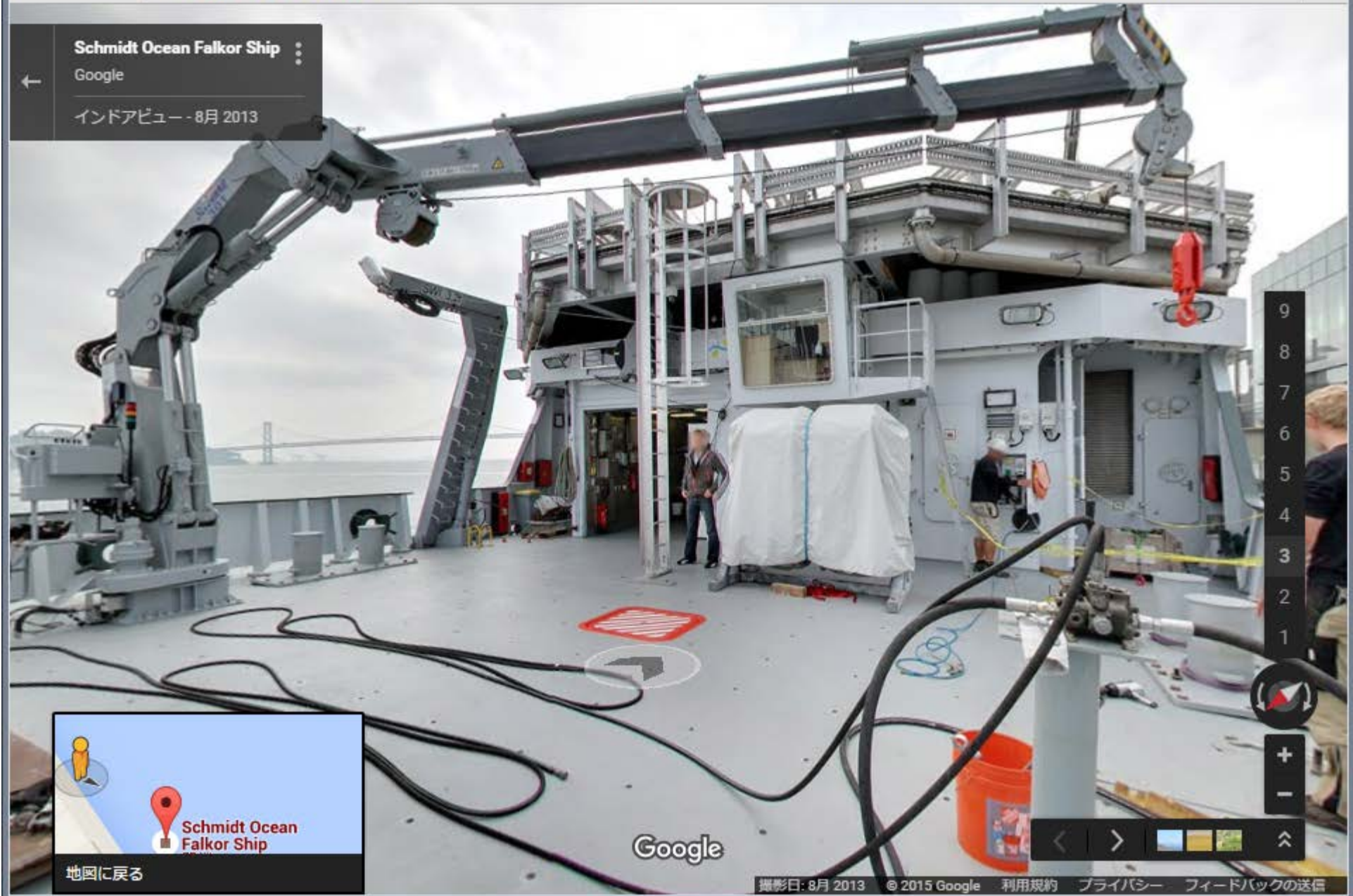
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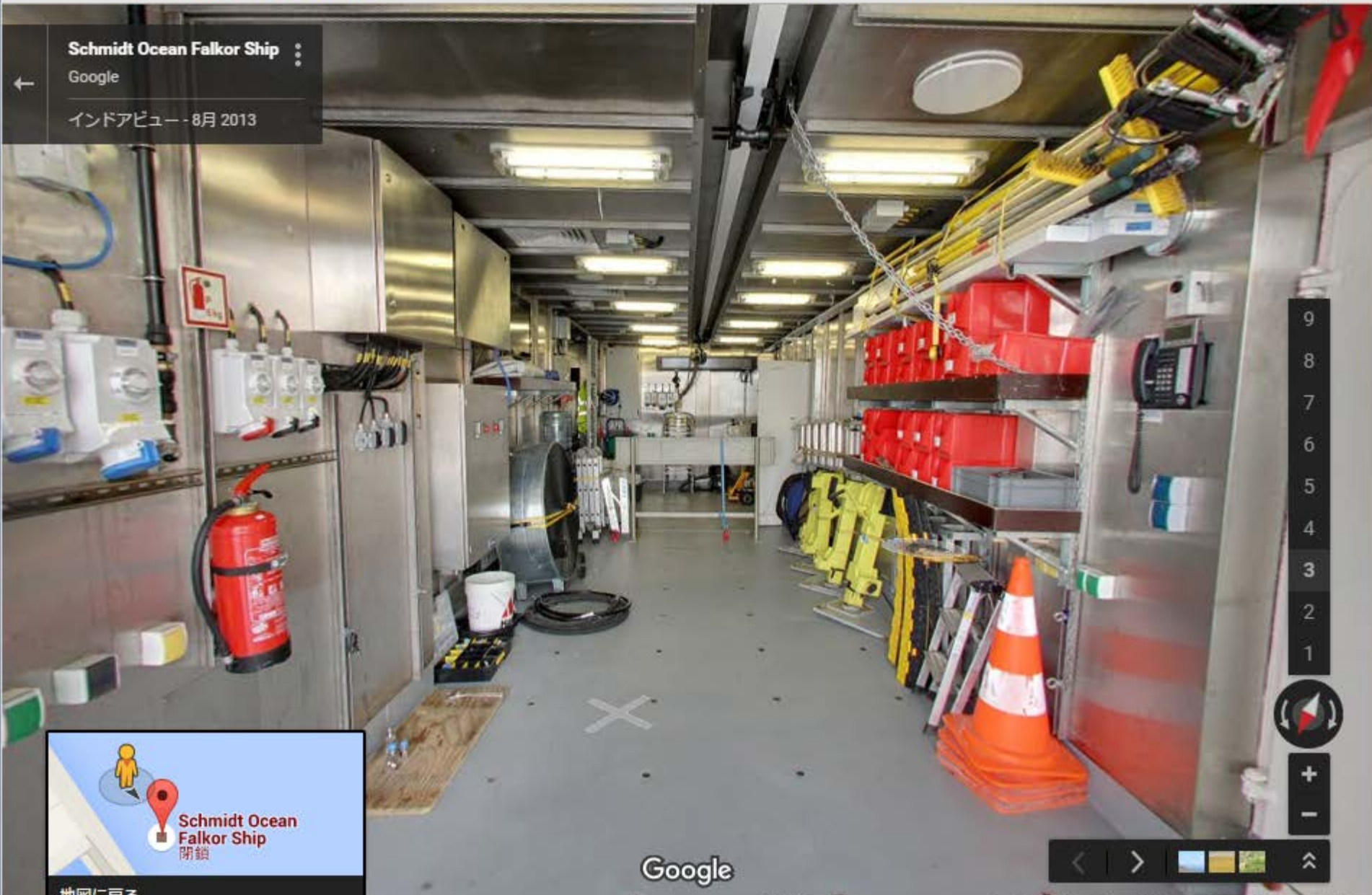


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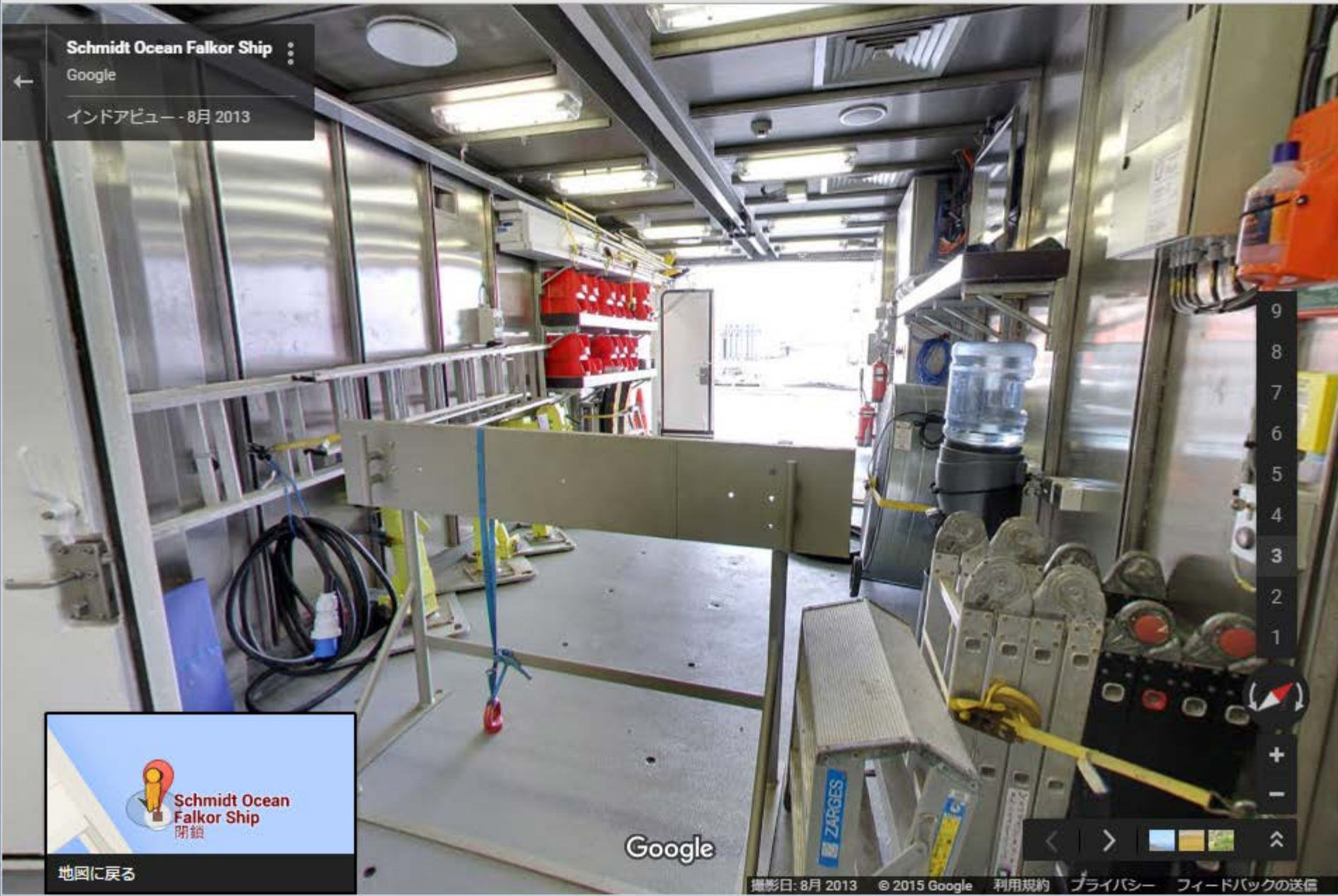
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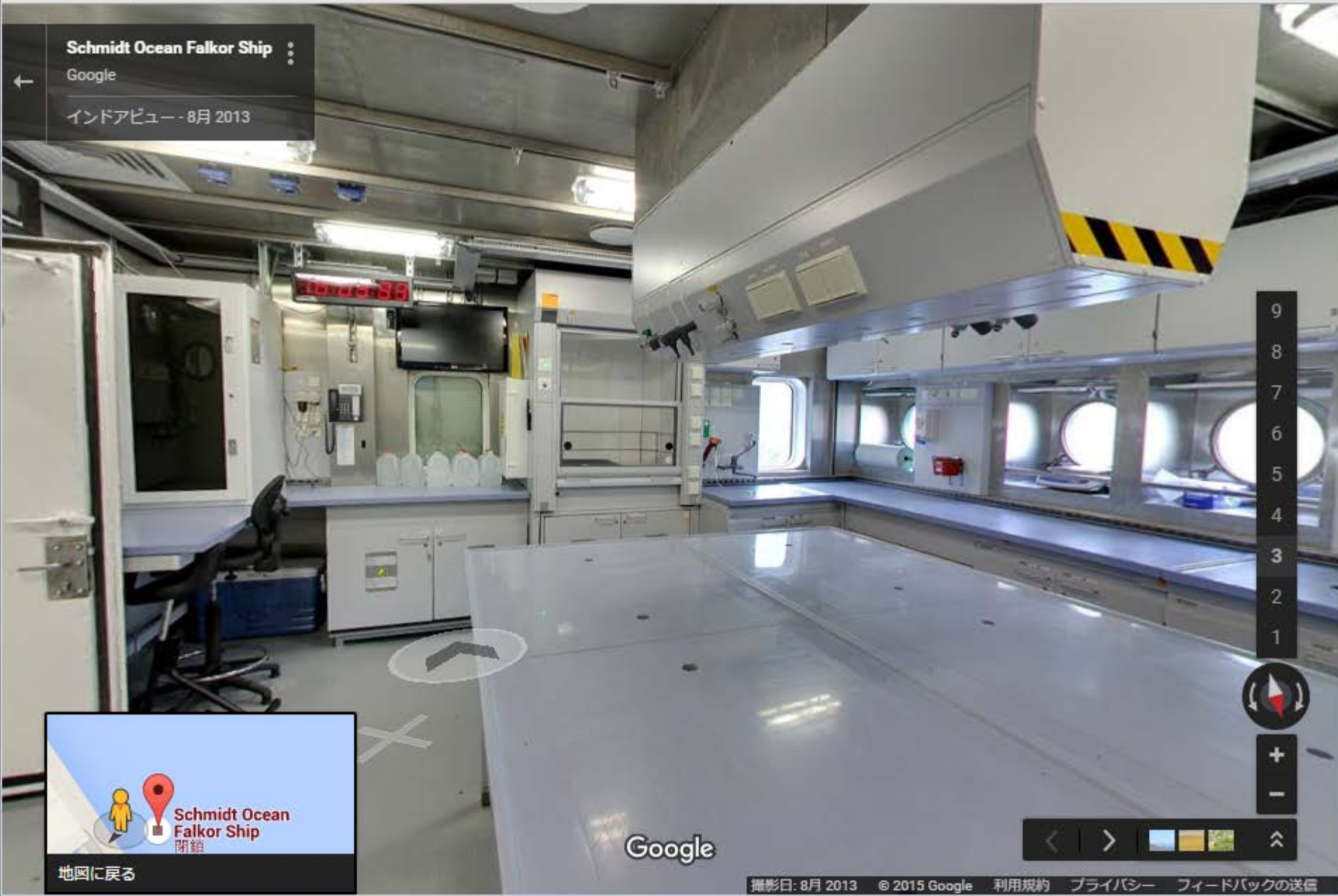
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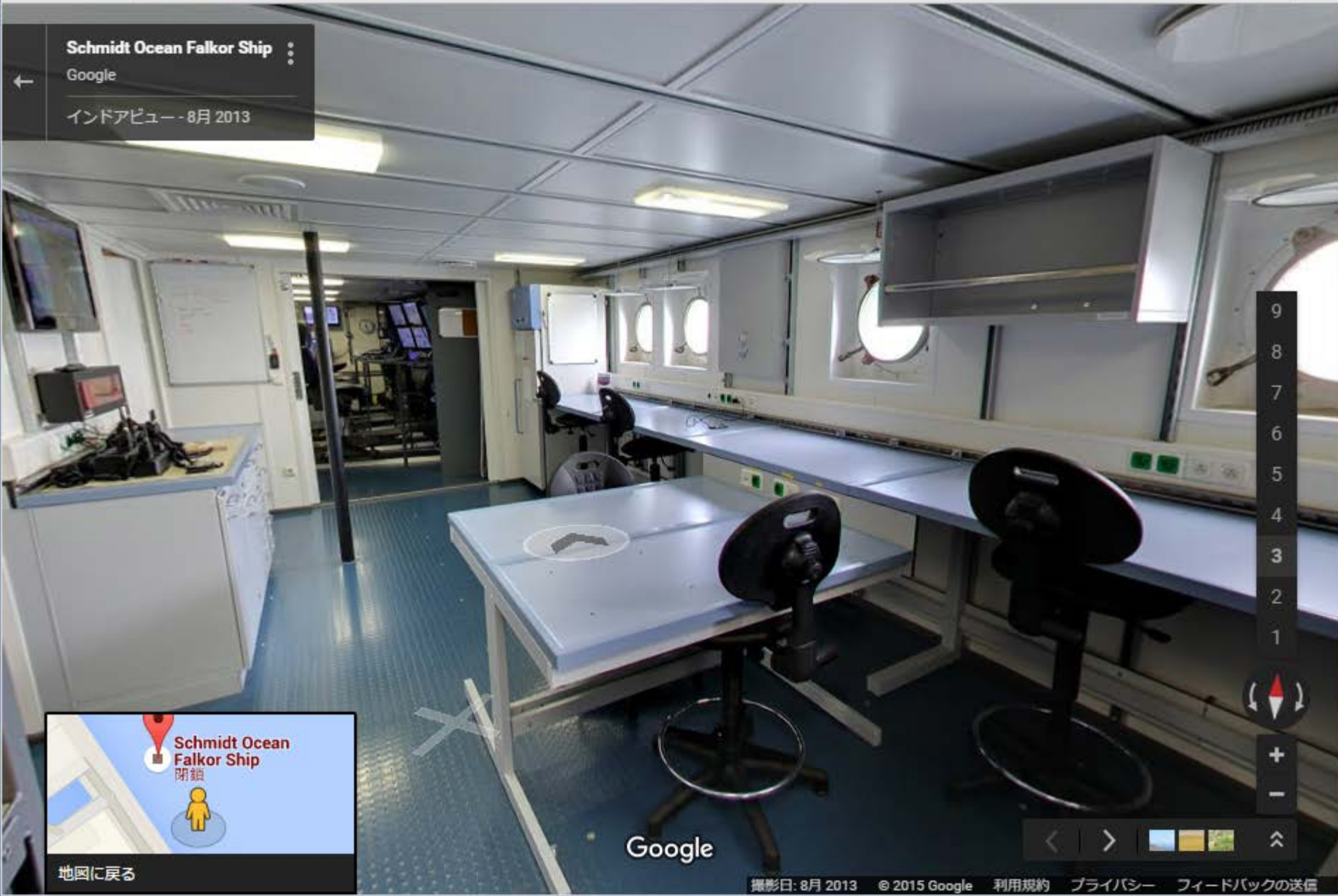
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A small inset map showing the location of the Schmidt Ocean Falkor Ship. A red location pin is placed on the map. Below the map, the text "Schmidt Ocean Falkor Ship" is displayed, followed by "閉鎖" (locked) in red. At the bottom of the inset, there is a button labeled "地図に戻る" (Return to map).

Google



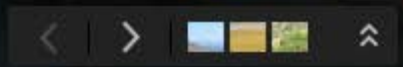
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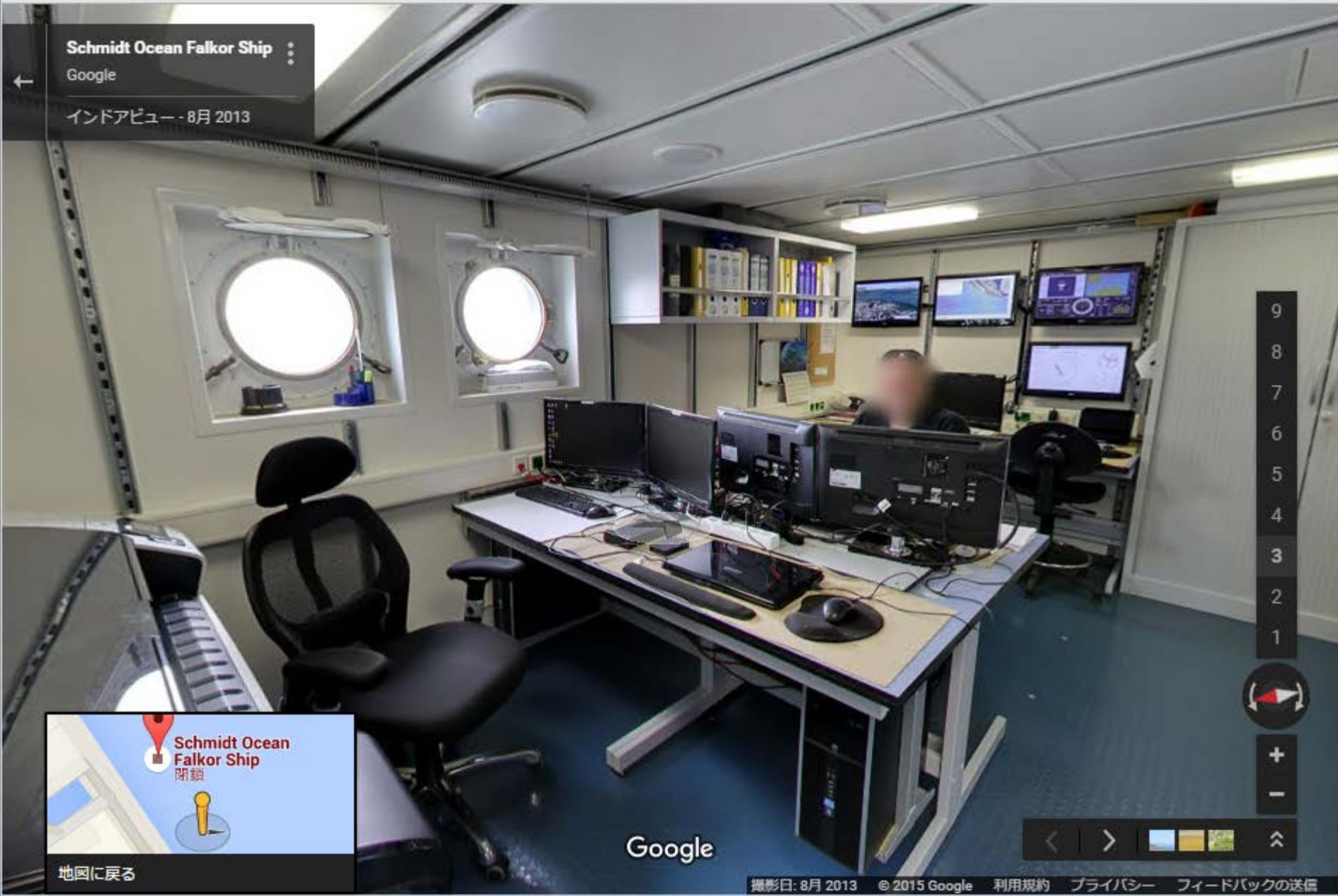
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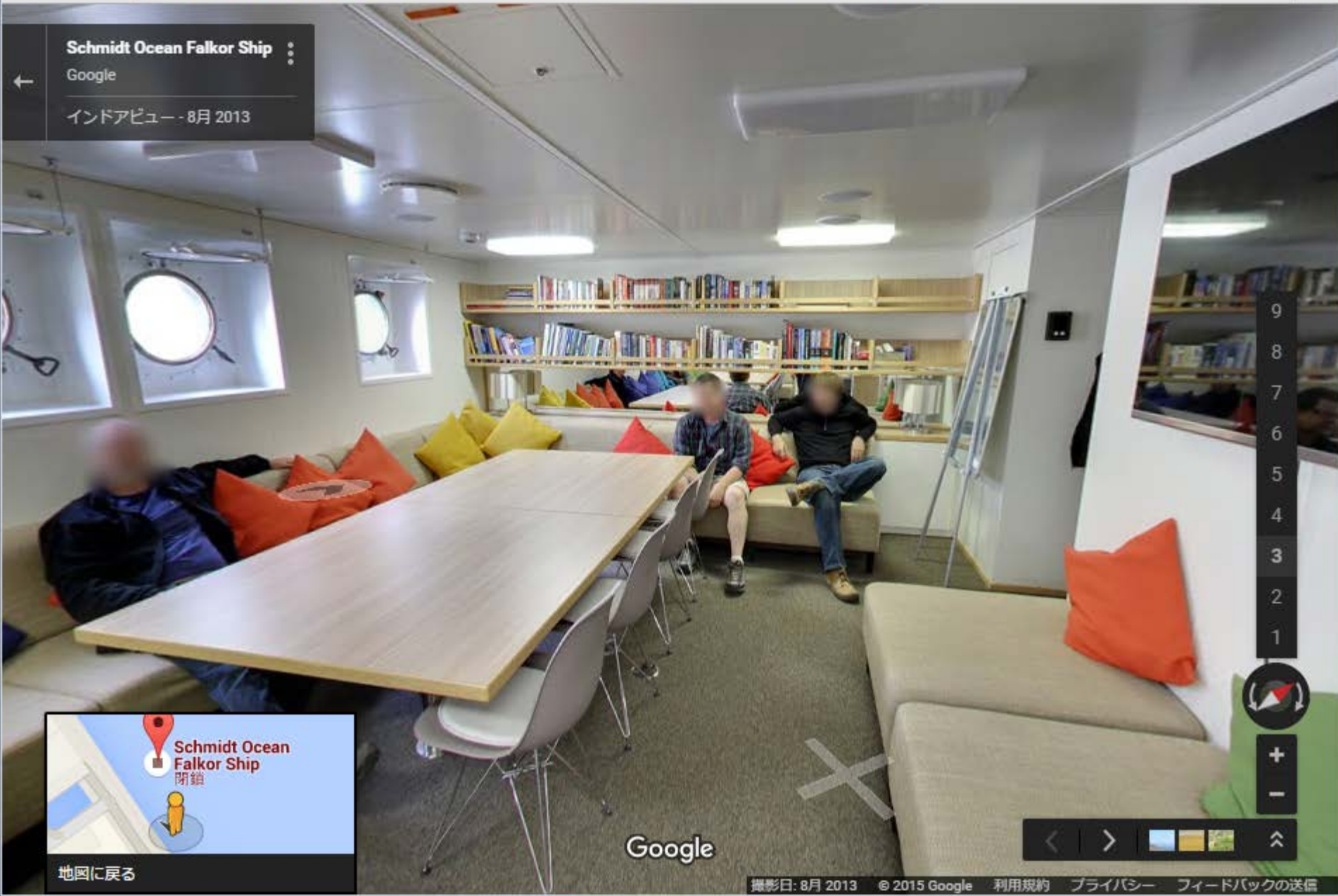
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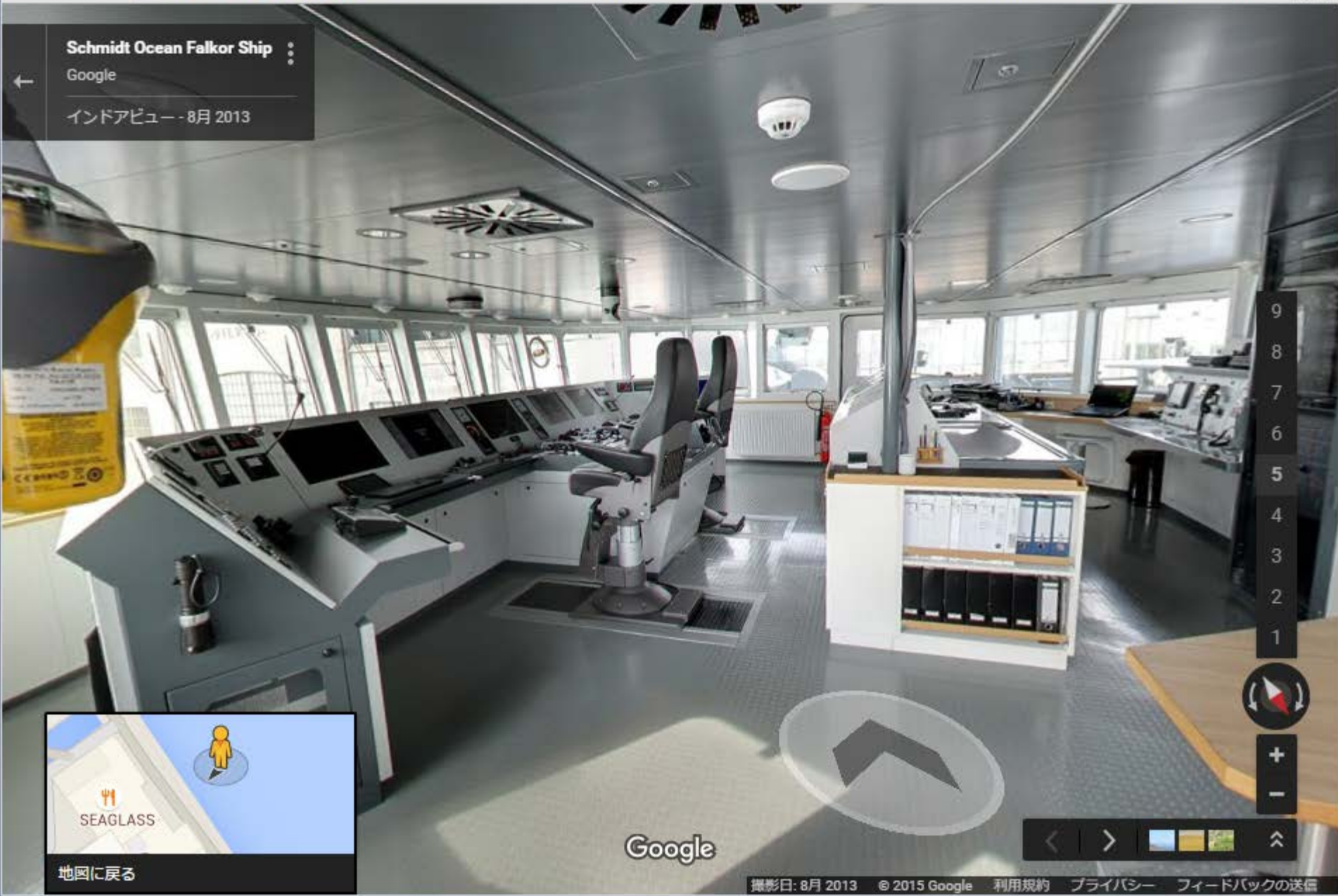


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Navigation controls including a compass, a red arrow icon, and zoom in (+) and zoom out (-) buttons.

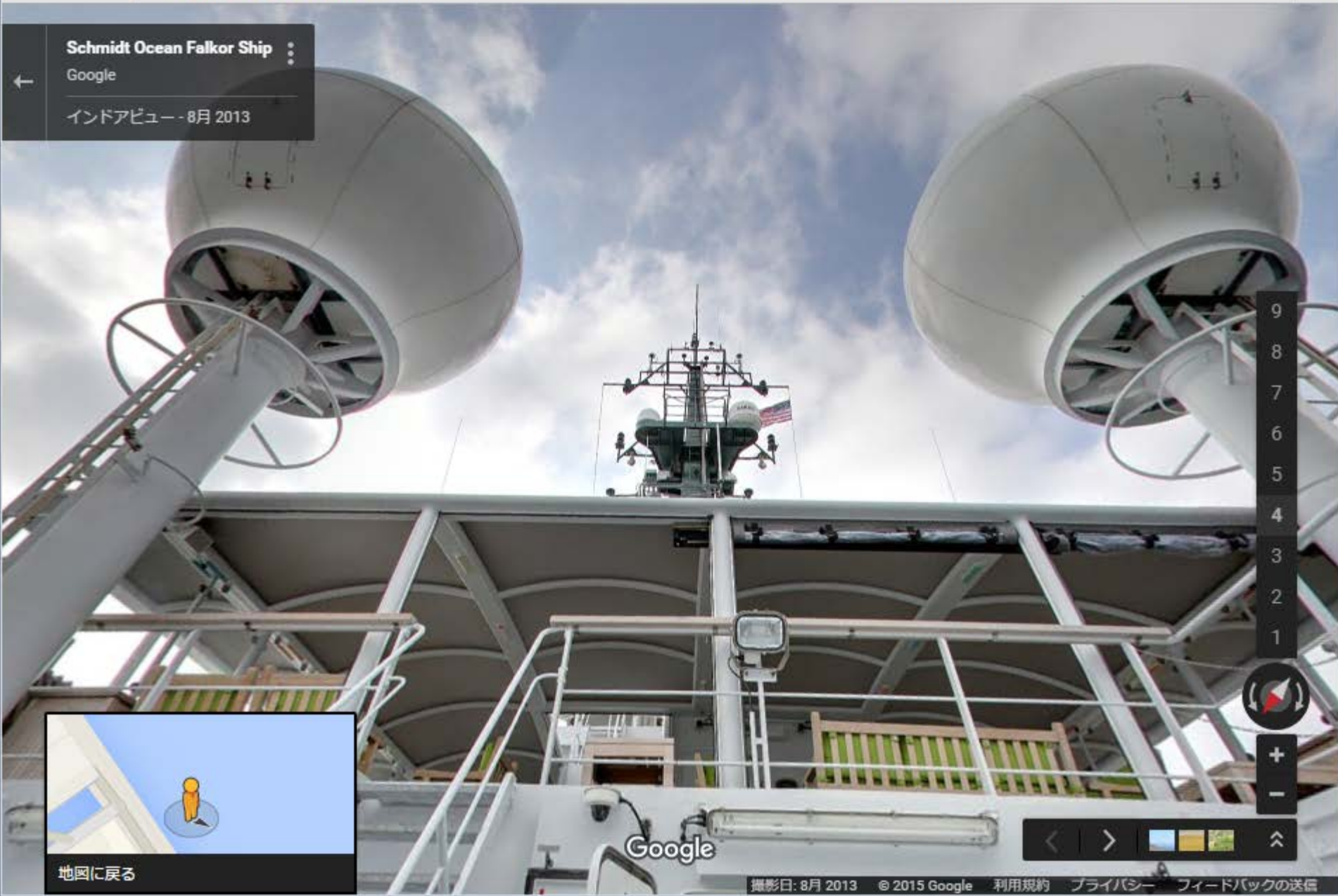


SEAGLASS

地図に戻る

Google

Bottom navigation bar with left and right arrow buttons, a color selection bar (blue, yellow, green), and an expand/collapse arrow button.



Schmidt Ocean Falkor Ship ⋮
← Google
インドアビュー - 8月 2013

- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1



地図に戻る

Schmidt Ocean Falkor Ship ⋮

← Google

インドアビュー - 8月 2013



- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1



地図に戻る

Google

Schmidt Ocean Falkor Ship ⋮
 Google
 インドアビュー - 8月 2013



- 9
- 8
- 7
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- 5
- 4
- 3
- 2
- 1



SEAGLASS

地図に戻る

Google

Schmidt Ocean Falkor Ship

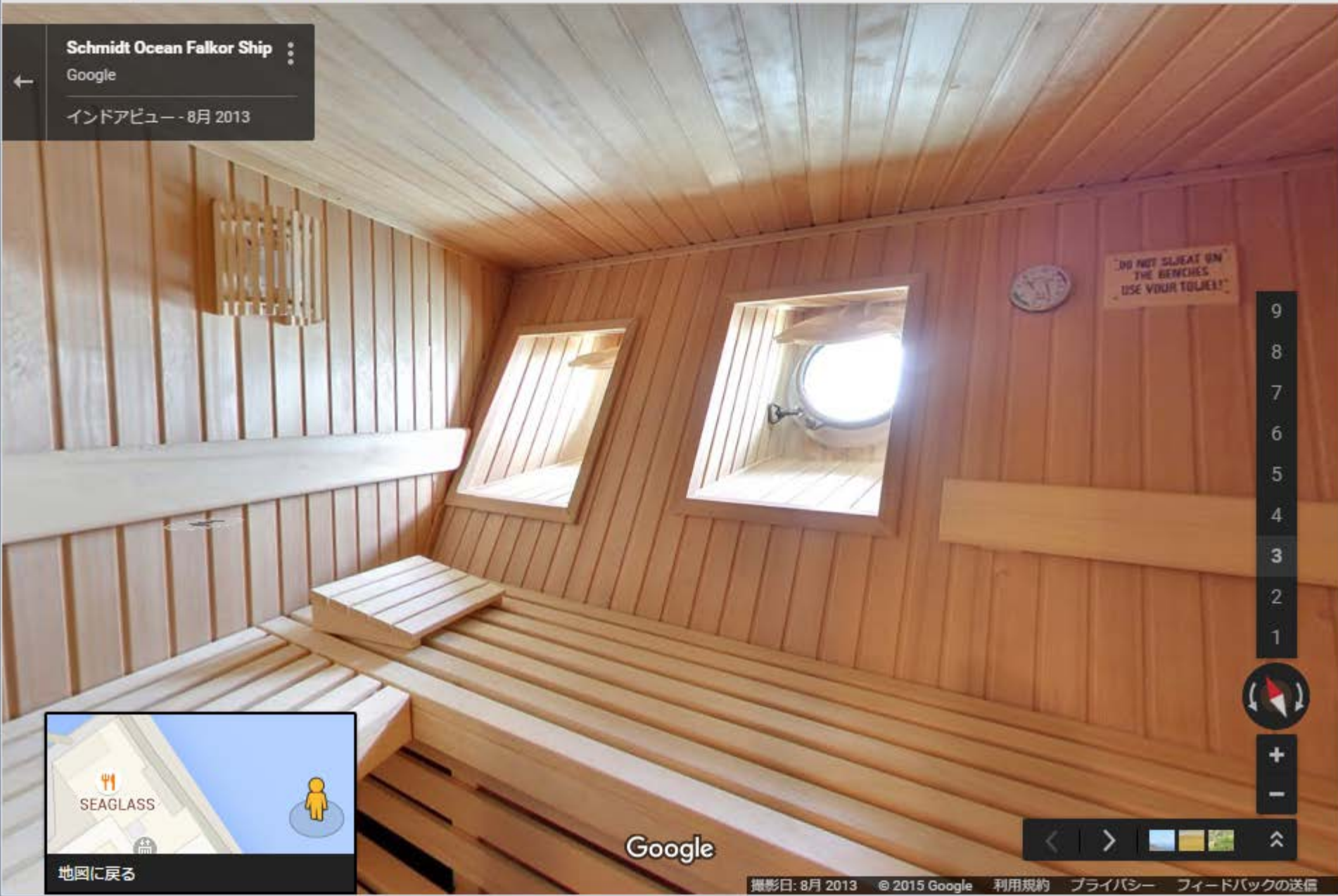
Google

インドアビュー - 8月 2013



地図に戻る

Google



Schmidt Ocean Falkor Ship ⋮
 Google
 インドアビュー - 8月 2013

DO NOT SWEAT ON
 THE BENCHES
 USE YOUR TOWELS!

- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1



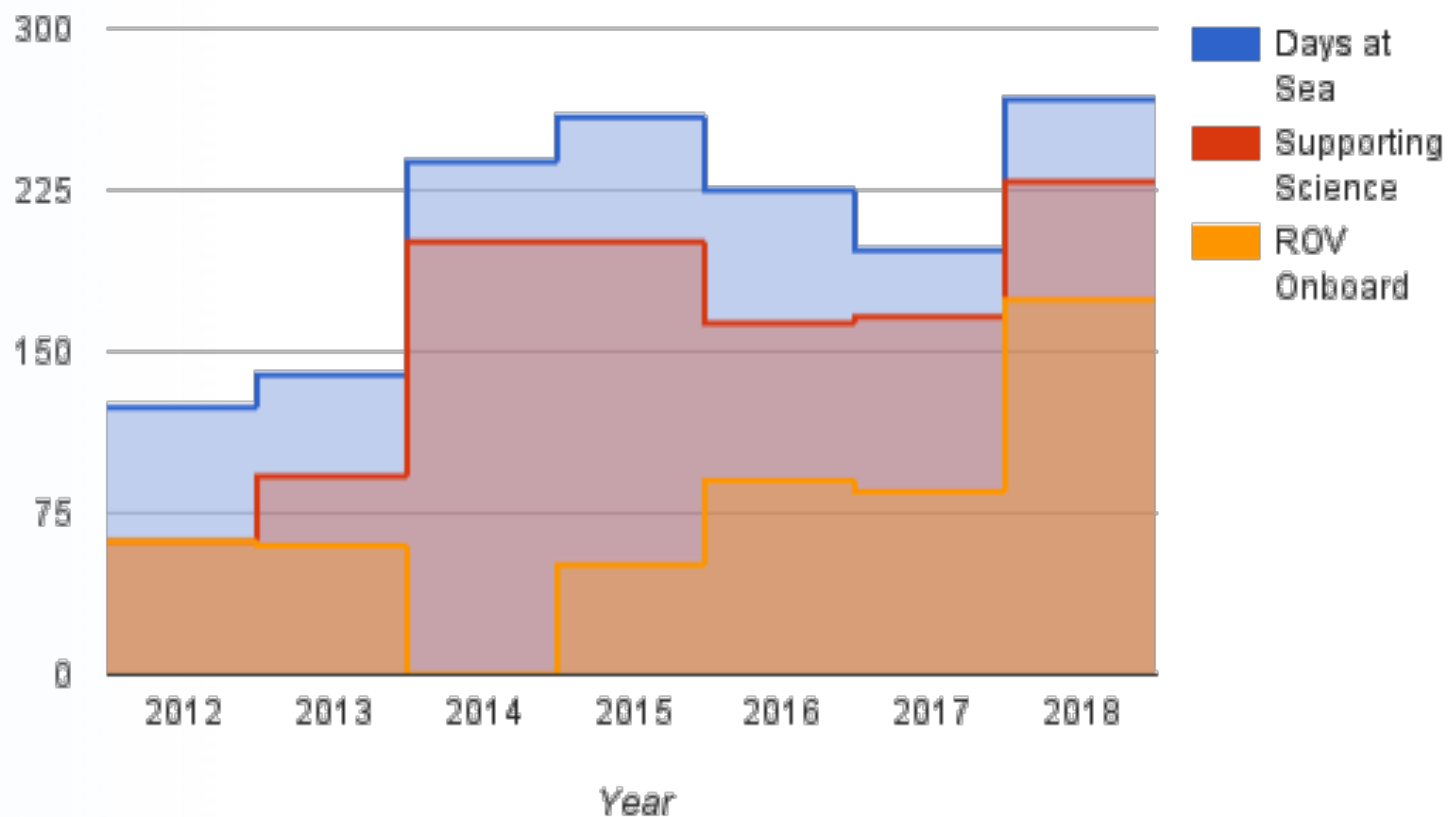
地図に戻る

Google

RV *Falkor* Operational Trends



Days at Sea, Supporting Science and ROV Onboard



“Technology first: new technology
should drive SOI science program.”

– Eric Schmidt, July 29, 2014



Infrastructure, Platform, and Technology R&D for Ocean Science



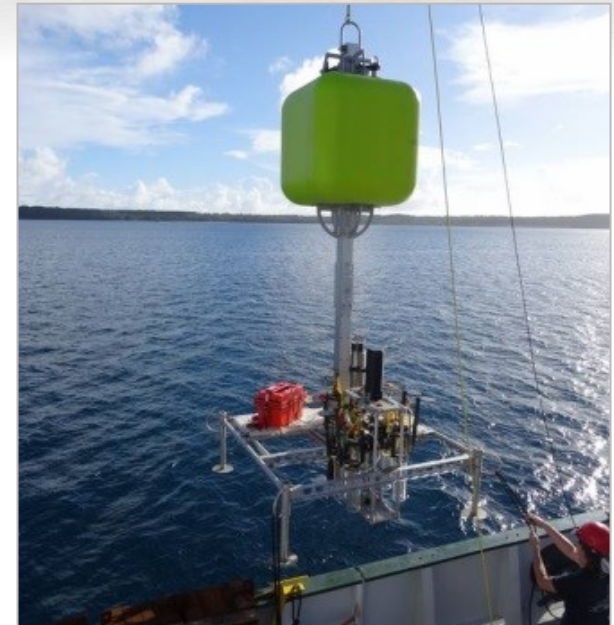
- Robotic research vehicles (HROV, ROV, AUV, ASV, UAV, gliders, etc.)
- Deployable scientific platforms and analytical instruments (sensors, observatories, etc.)
- At-sea R&D of new technologies and computational algorithms on SOI vessels and vehicles
- Technology focused R&D projects as part of *Falkor* cruise program



Development of Landers / Elevators



- Full ocean depth landers / elevators for use on RV *Falkor*
- Can operate independently or support
- Assists other vehicles at depth to bring instruments up and down the water column
- Syntactic foam reduces size/weight
- Modular structure allows for a variety of scientific instruments such as sensors, HD cameras, lights, baited traps, corers, and respirometers, etc.



4500 m ROV core instruments

- Core System Sensors

- CTD Sensor - Seabird FastCAT SBE49
- Pressure Depth Sensor - Paroscientific DigiQuartz
- Oxygen Sensor - Aandera O2 optode 4831

- Core Imaging Suite

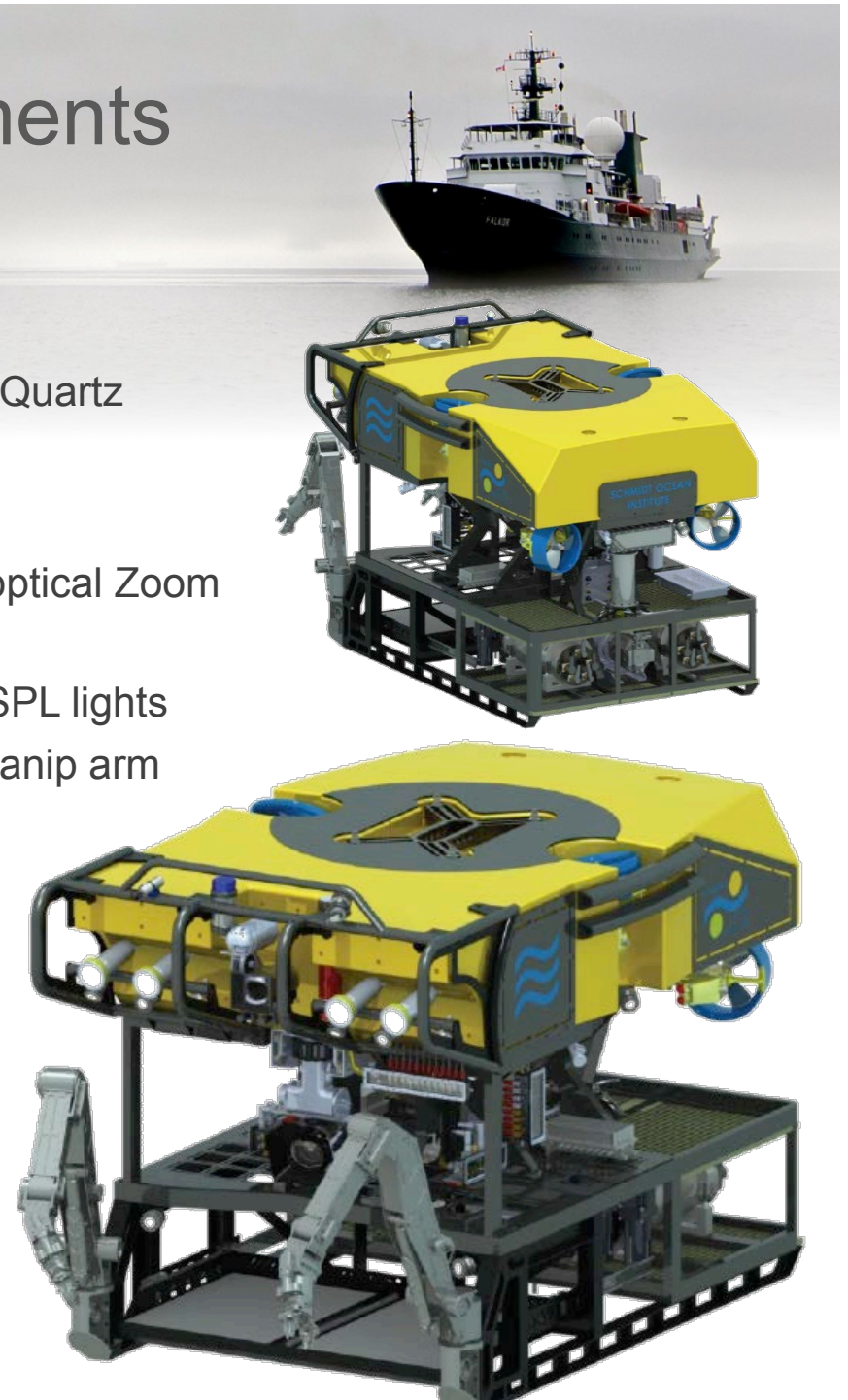
- Main: 4k 2160p, 20 MP stills, Pan/Tilt, 12x optical Zoom
- Situational: 4k 2160p, 12 MP stills, Tilt only
- Scaling lasers w 10 cm spacing, CathX / DSPL lights
- 5 HD cameras: port, stbd, rear, umbilical, manip arm
- 3 SD cameras: configurable tool cams

- Core Sampling System

- Niskin bottles
- Suction sampler
- Core tubes
- Insulated and sealed bio-box

- Core Sonar Systems

- Imaging: Teledyne BlueView M900
- Scanning: Tritech Super SeaKing DST



High Performance Computer at Sea for Numeric Modeling & Analysis

2TB RAM, 240 TB HDD, 60 Xeon cores, 10 Gbps



Collaborative Oceanographic Research



Scott Reef, Timor Sea, Australia – April, 2015

Collaborative Scientific Research aboard *Falkor*



- Environmentally focused and societally relevant ocean research
- Projects with high intrinsic scientific value and meaningful impact potential
- Research effectively leveraging innovative technologies
- Oceanographic research encouraging student participation



29 Research Cruises in 3 Oceans 530+ Science Days at Sea



2012 – Northern Atlantic and Gulf of Mexico

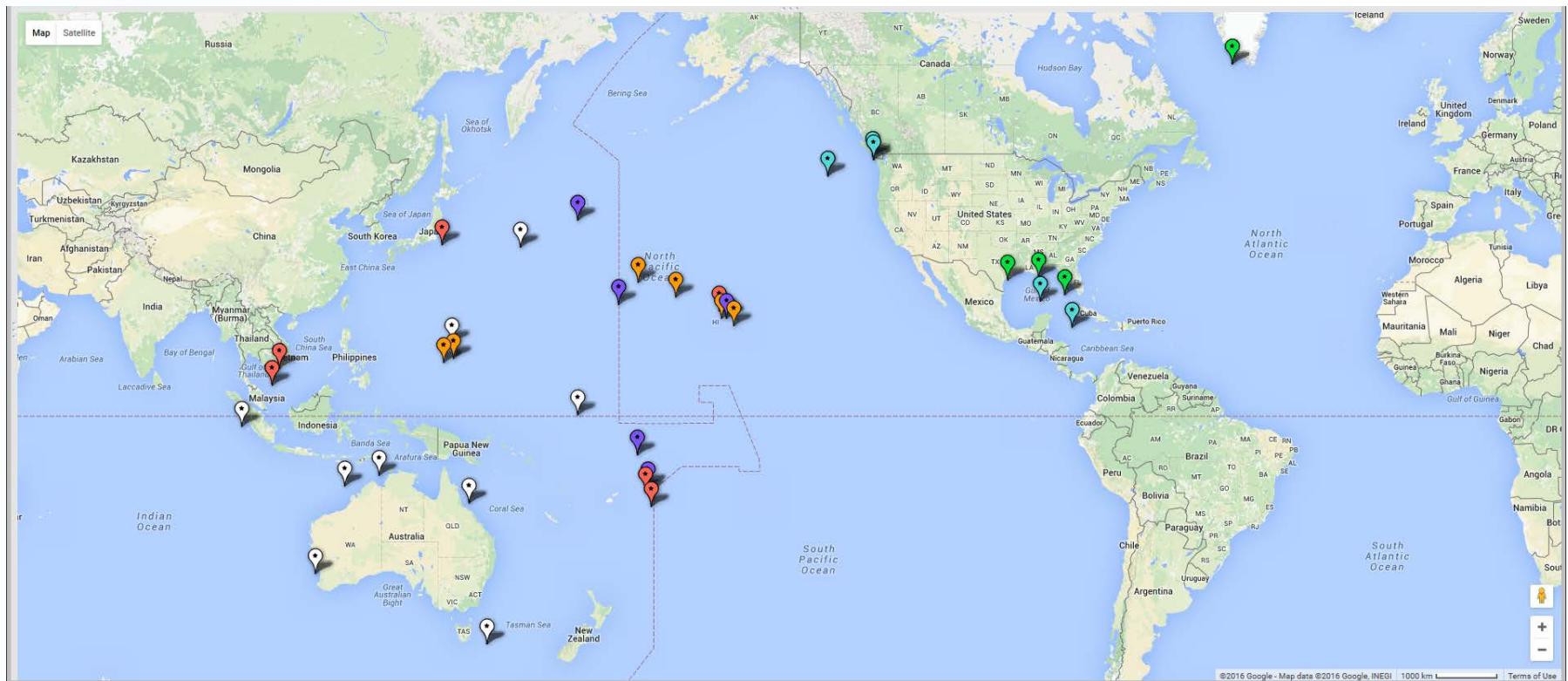
2013 – Caribbean and Northeastern Pacific

2014 – Subtropical Northern & Central Pacific

2015 – Western Pacific and Indian Oceans

2016 – Central and Western Pacific

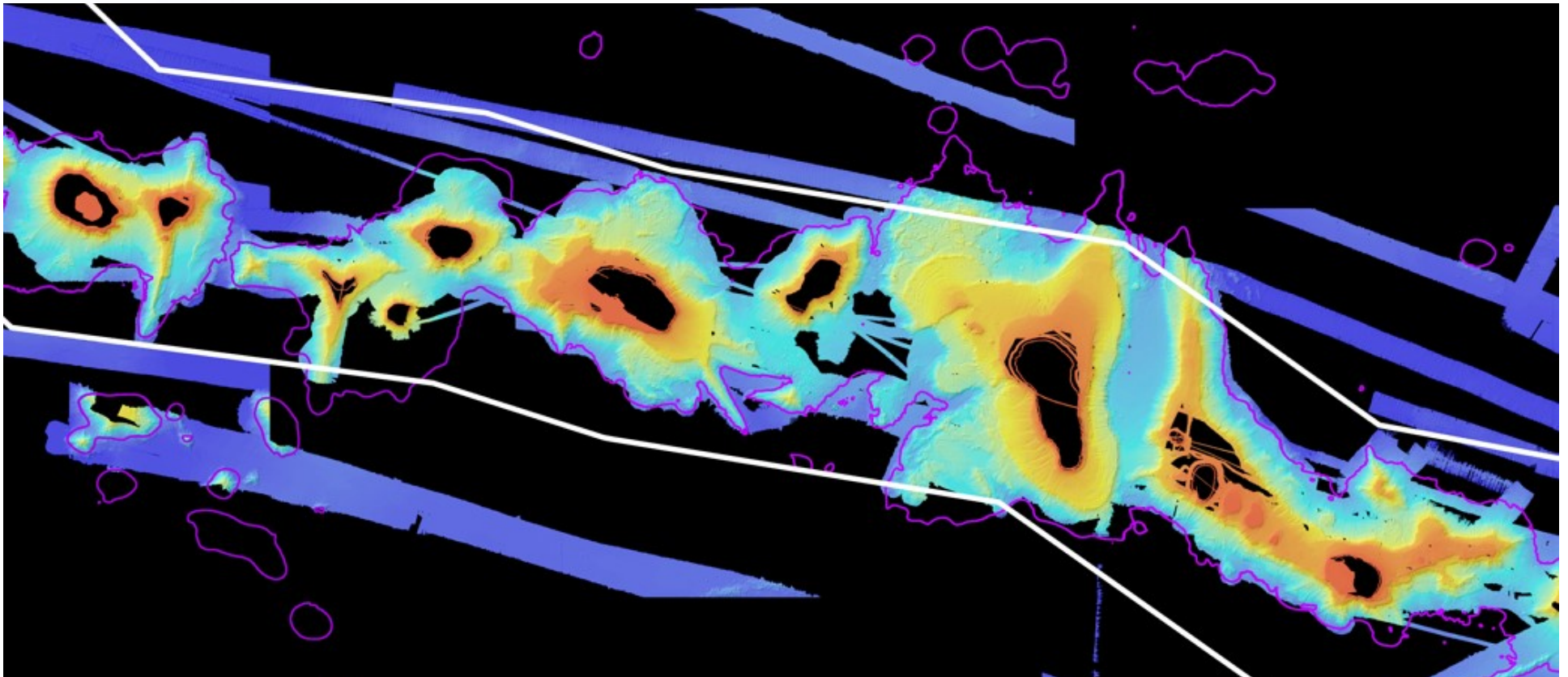
2017 – Central Pacific



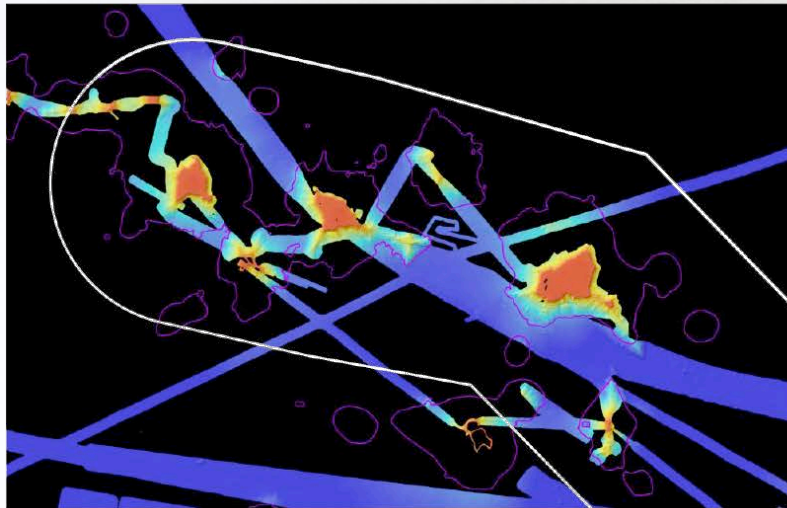
Revealing the hidden Papahānaumokuākea



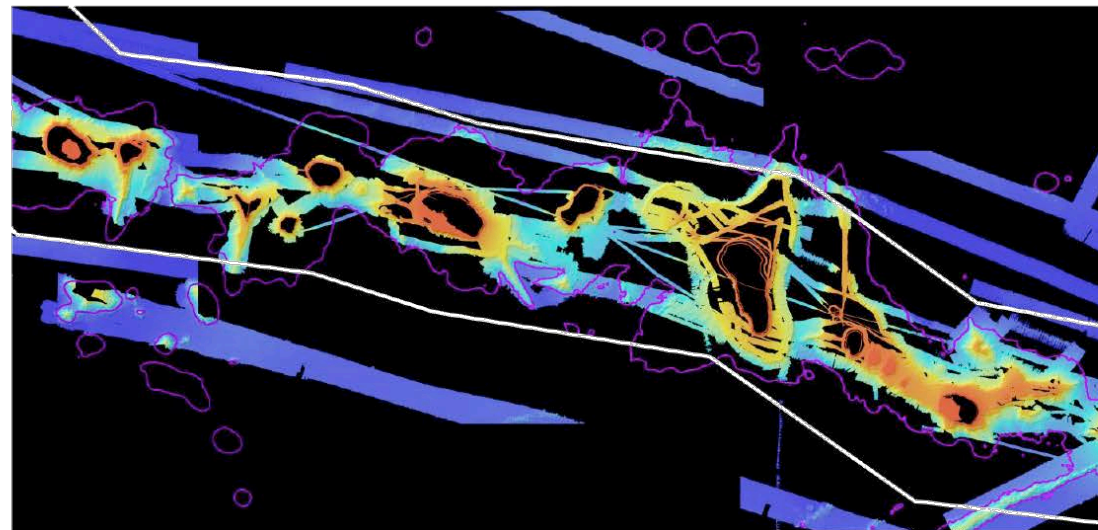
- Two mapping cruises of the Papahānaumokuākea National Marine Monument
- The data collected represents 35% of the Monument area or 127,000 km²



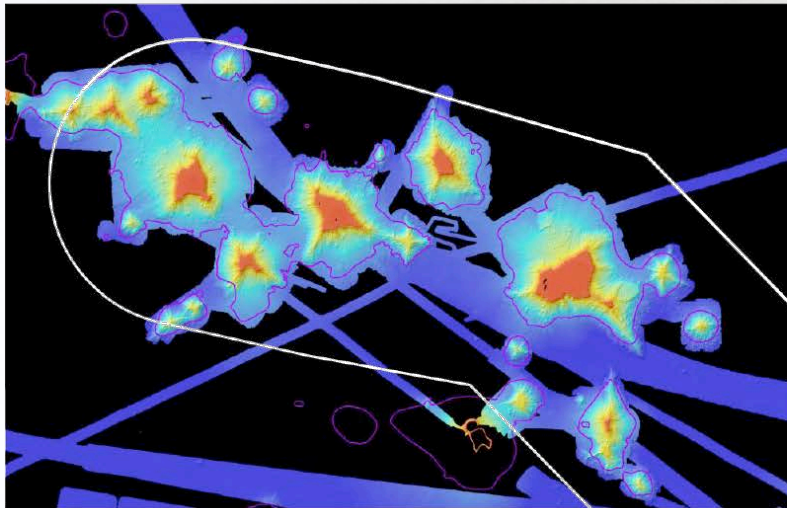
Revealing the hidden Papahānaumokuākea



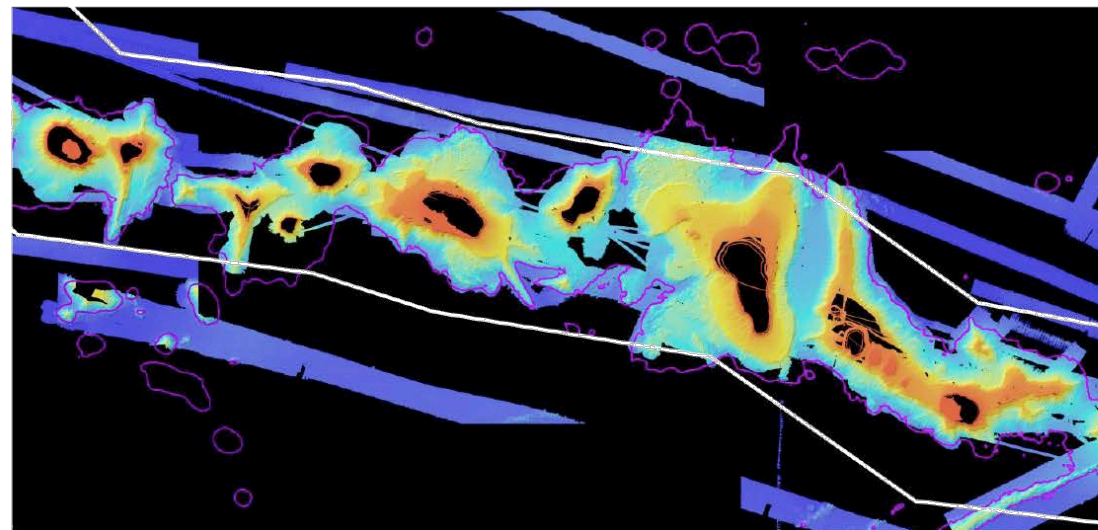
Before



Revealing the hidden Papahānaumokuākea



After



Exploring Mariana Trench – the deepest place on Earth



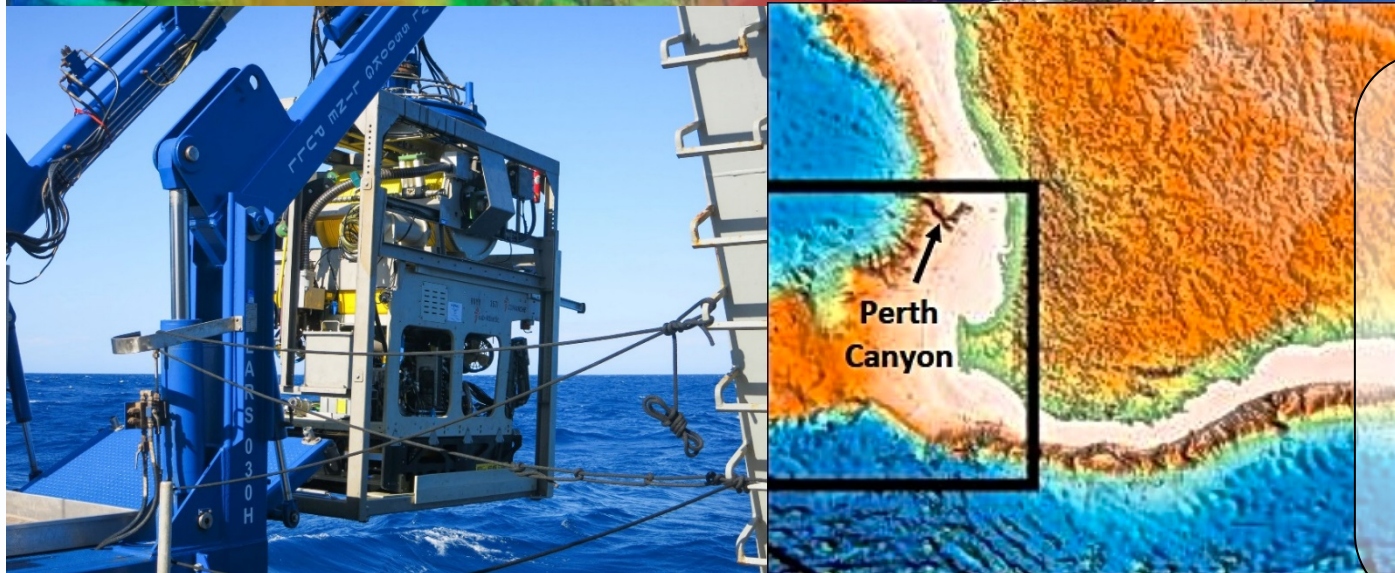
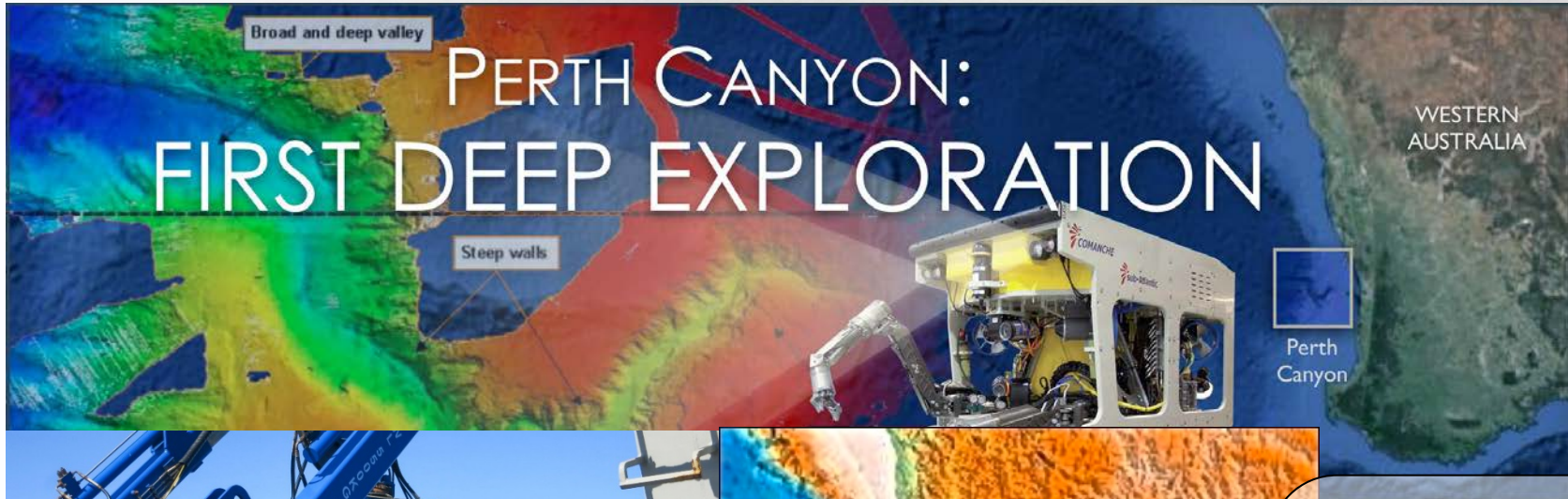
EXPLORING THE MARIANA TRENCH
NOVEMBER 2014

LITTORAL ZONE 0m
SUBLITTORAL ZONE 1,000m
BATHYAL ZONE 3,000m
CONTINENTAL SLOPE
ABYSSAL PLAIN
ABYSSAL ZONE 6,000m
TRENCHES

Trench Video Highlights

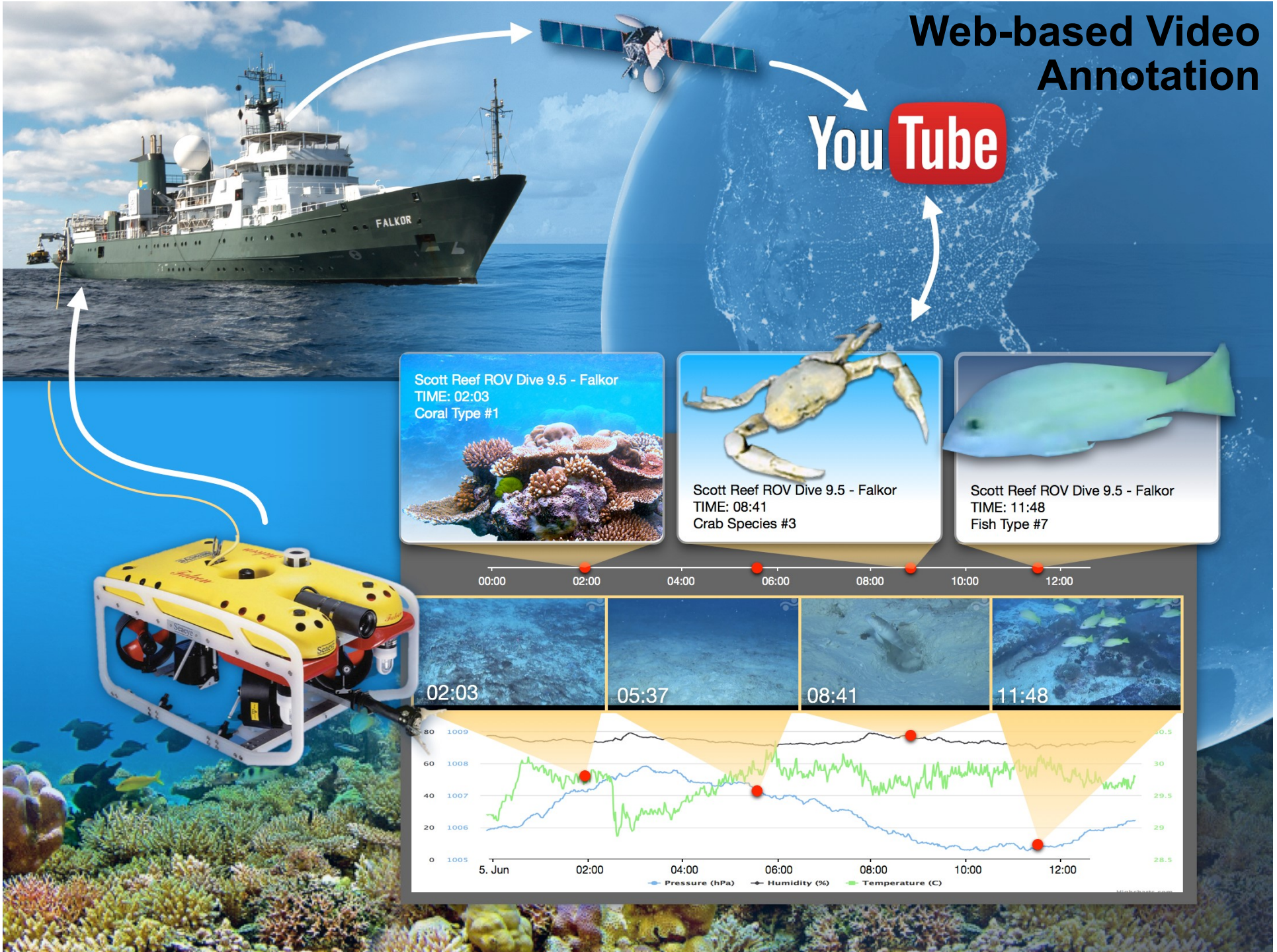
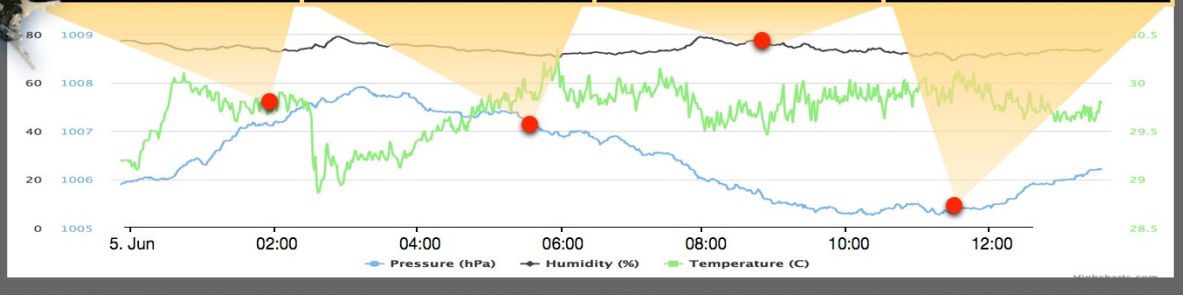
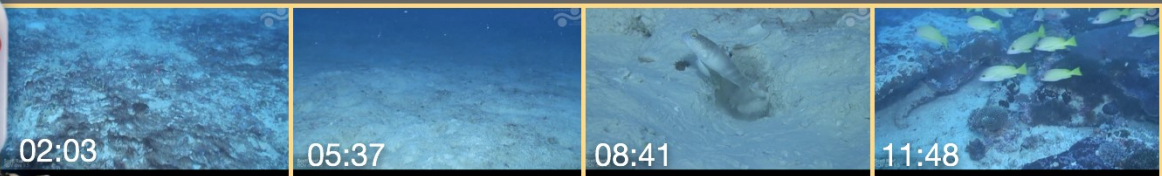
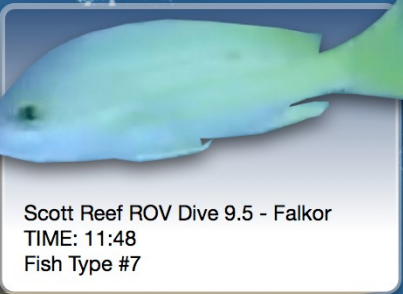
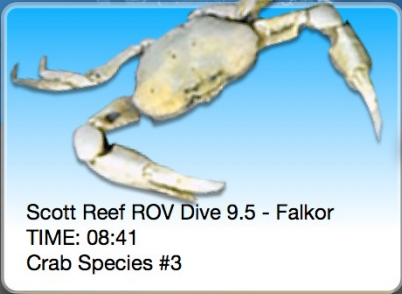
The composite image features a bathythermograph (BT) chart of the Mariana Trench in the background, showing temperature profiles in different depths. Overlaid on the chart are several deep-sea organisms: a purple fish at the top left, a white amphipod in the middle left, a yellow spider crab on the right, and a purple fish and a shark-like creature at the bottom. A white arrow points from the amphipod towards a circular inset showing a cluster of white, worm-like organisms. In the bottom right corner, there is a blue play button icon inside a rounded rectangle, with the text "Trench Video Highlights" below it.

Perth Canyon: First Deep Exploration



Web-based Video Annotation

YouTube




Web-Based Video Annotation (for Volunteers, Citizen Scientists..)



OceanVideoLab

- Browse
- Site Map
- Contribute
- About
- Home
- Sign in

2015-04-26 20:20:33




YouTube

38:03 / 1:19:38

Scott Reef ROV Dive 9.5 - Falkor

Sign in to Annotate

Position: 14.044897° S 121.935787° W

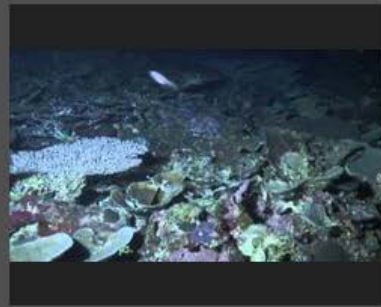


live demo

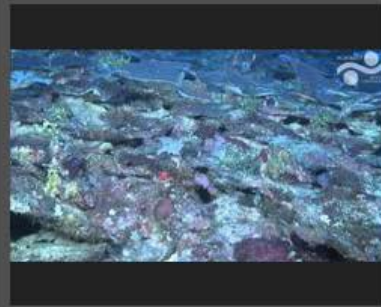
Time	Elapsed Time	Position	Annotation
2015-04-26 19:45:21	02:51	--	Beginning of dive
2015-04-26 19:51:31	09:01	--	Bottom sighted
2015-04-26 19:54:03	11:33	--	A fish
2015-04-26 19:57:52	15:22	--	Anemone spotted
2015-04-26 20:20:09	37:39	--	Fish hiding in a burrow
2015-04-26 20:20:32	38:03	--	A lobster arrives



Scott Reef - coral spawning
ROV Dive 1
3 annotations



Scott Reef - coral spawning
ROV Dive 1.5
0 annotations



Scott Reef - coral spawning
ROV Dive 1.7
0 annotations



Scott Reef - coral spawning
ROV Dive 2
0 annotations



Scott Reef ROV Dive 9
0 annotations



Scott Reef ROV Dive 9.5 -
Falkor ROV Dive 9.5
9 annotations



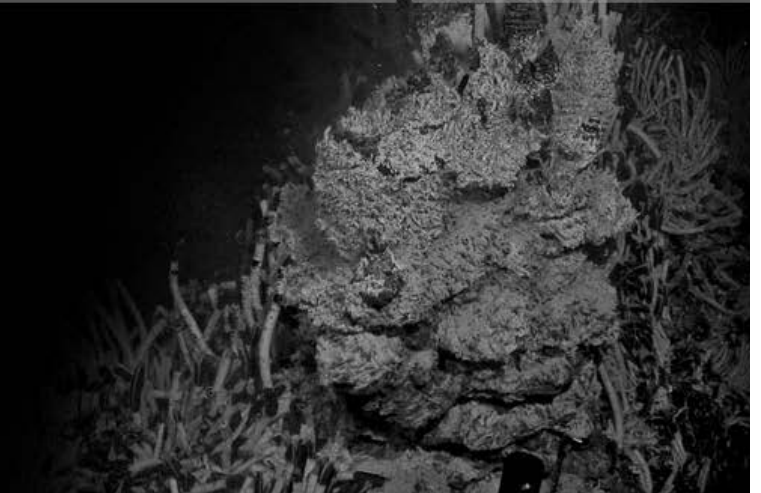
Scott Reef Test Dive
2 annotations



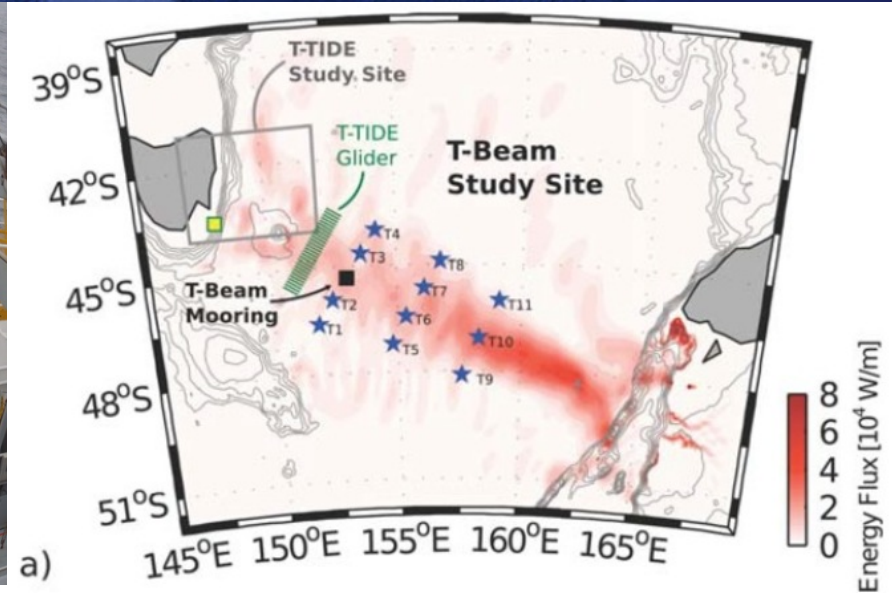
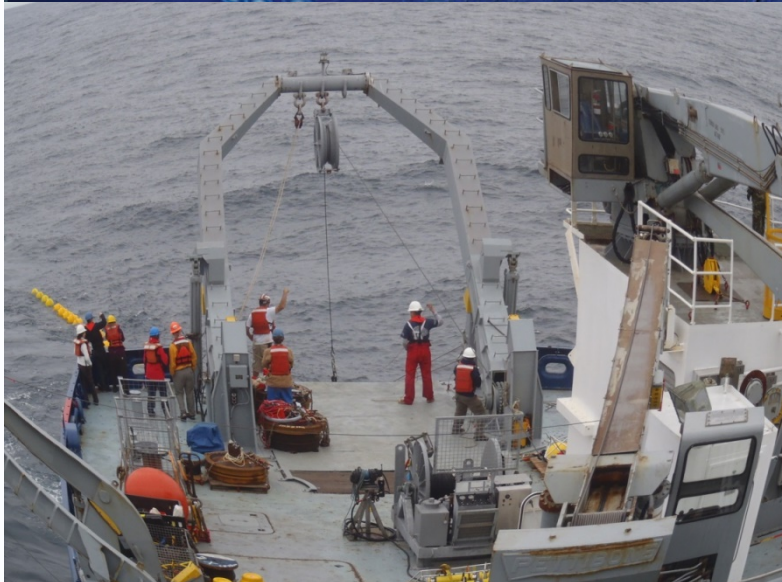
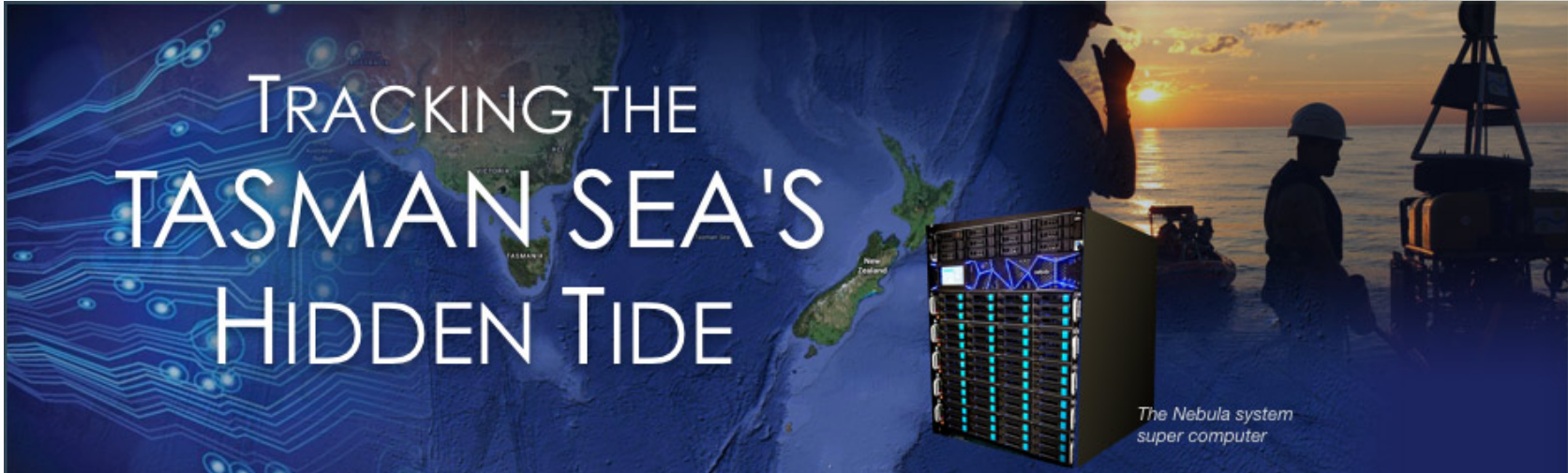
Scott Reef Test Dive 2
0 annotations



Scott Reef Test Dive 3
0 annotations



Tracking the Tasman Sea's Hidden Tide



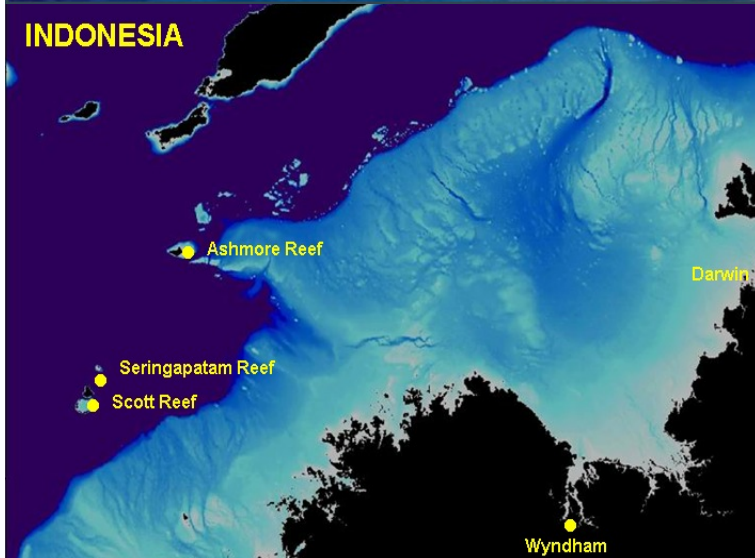
Modeling of Tidal Dynamics at Scott Reef in Timor Sea



“Being able to run a high resolution ocean circulation model on the ship’s supercomputer to forecast currents and temperature fluctuations proved invaluable in planning our daily schedules and in interpreting the data.”

- Prof. Gregory Ivey,
May 3, 2015

Coordinated Robotics



Real Time Robot Tracking Seafloor 3D / 2D Modeling



Welcome to the Realtime Robot Tracker!
This page allows you to check out underwater robots in action collecting seafloor images! We are currently at Scott Reef in the Timor Sea. We will be here up until 6 APRIL. Click [here](#) to help label the images that are collected! Click [here](#) to find out more about the current expedition.

Java Ridge
Trench
Sahul Banks
Timor Sea
Sahul Shelf

WaveGlider WGM Offline (4)
PFloat USBL LASTUPD: 799451 S
Lat: -16.25628018
Lon: 121.32764876
Slocum Offline (4)
Sirius USBL LASTUPD: 799452 S
Lat: -16.25628018
Lon: 121.32764876
Sirius LASTUPD: 799451 S
Falkor (ship) LASTUPD: 799452 S
Heading: 180.36
Lat: -16.25628018
Lon: 121.32764876
Pitch: 0.4
Roll: -1.51
Speed: 1

3D terrain reconstruction

real time robot tracking

WaveGlider WGMS
Battery: 0%

The interface displays a 3D bathymetric map of the seafloor in the Timor Sea. A large green research vessel, the Falkor, is shown on the left. Several yellow WaveGlider robots are positioned on the seafloor. A detailed view of a seafloor image shows a coral reef structure. A 3D terrain reconstruction of the seafloor is shown in the bottom right. A list of robots and their status is on the left, including WaveGlider WGM (Offline), PFloat USBL, Slocum (Offline), Sirius USBL, Sirius, and Falkor (ship). A battery status bar for WaveGlider WGMS is at the bottom right.

Web-based Near Real Time Image Annotation System

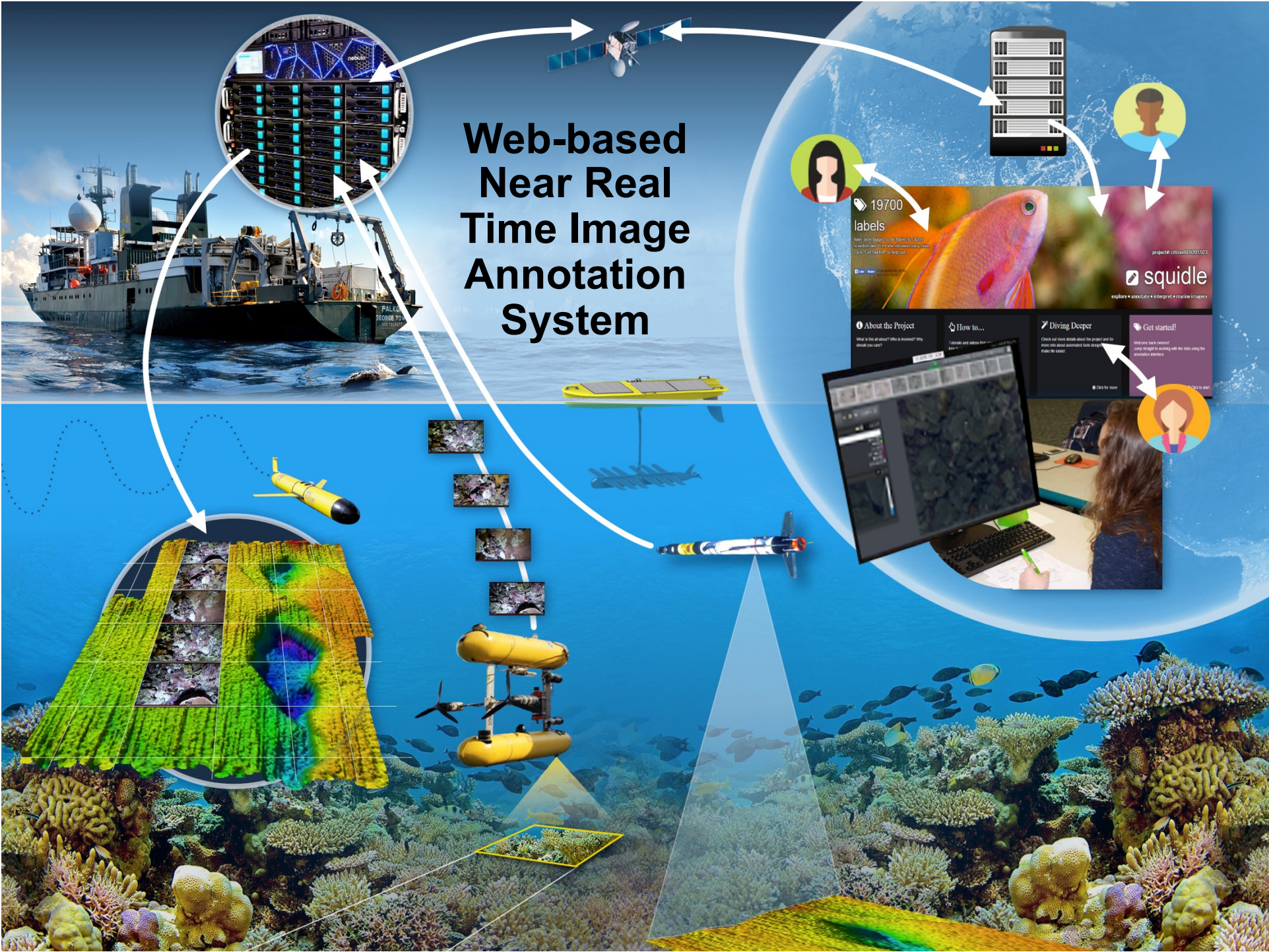


Image Tagging by Citizen Scientists



 **8821 labels**

have been tagged so far thanks to citizen scientists like YOU! We still need many more. Click "Get Started!" to help out...

project#: citizenSOI201503

 **squidle**

explore • annotate • interpret • marine imagery

About the Project

What is this all about? Who is involved? Why should you care?

[Click for more](#)

How to...

Tutorials and videos that provide useful tips on how to use the system.

[Click for more](#)

Diving Deeper

Check out more details about the project and for more info about automated tools designed to make life easier.

[Click for more](#)

Get started!

Click here to log in or sign up and jump straight into labeling seafloor images!

[Click to start](#)

Image Tagging by Citizen Scientists



SOI201503-SCOTTREEFDENSE25 | RAND50-2101-3100 | CITIZENSOI201503.VICTOR.20150415003634 ▾ ★42
THE INTERN

MAP IMAGES

INFO ? VICTOR

A grid of 112 small image thumbnails, arranged in 8 rows and 14 columns. The thumbnails show various underwater reef and coral samples. The top-left thumbnail is highlighted with a green border. The images vary in color and texture, representing different types of coral and reef structures.

Image Tagging by Citizen Scientists



SOI201503-SCOTTREEFDENSE25 | RAND50-2101-3100 | CITIZENSOI201503.VICTOR.20150415003634

★42
THE INTERN

MAP IMAGES

INFO ? VICTOR

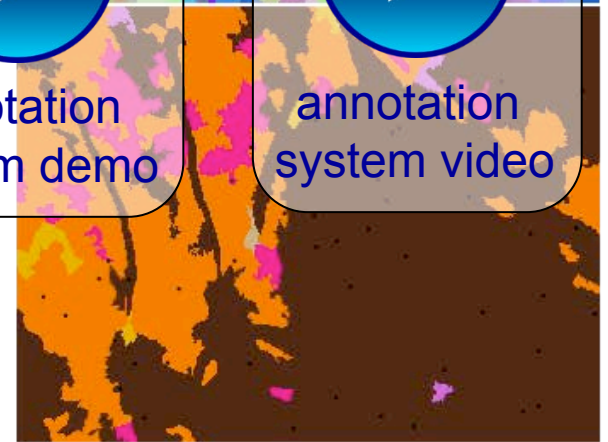
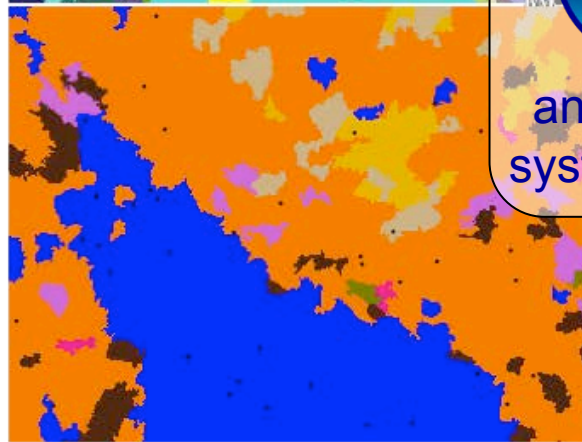
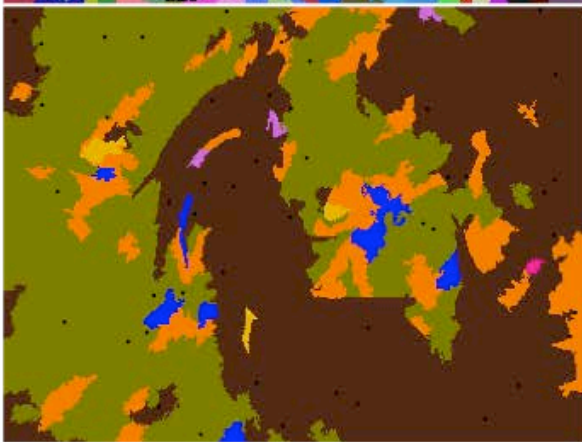
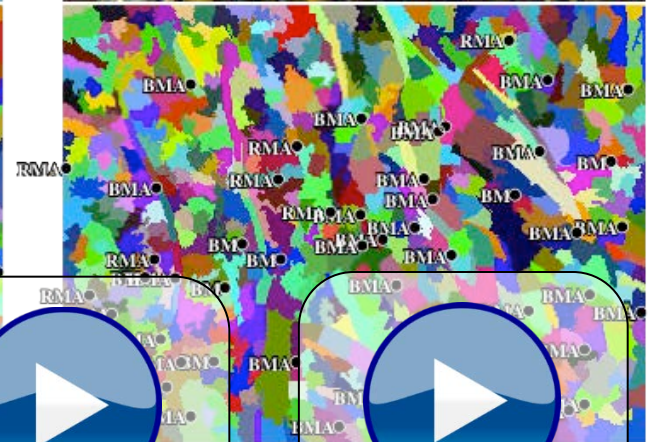
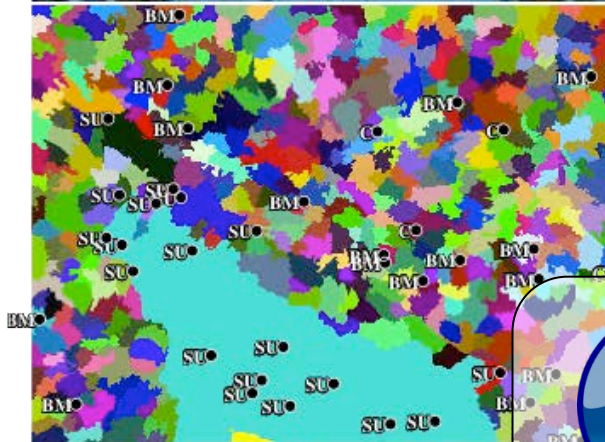
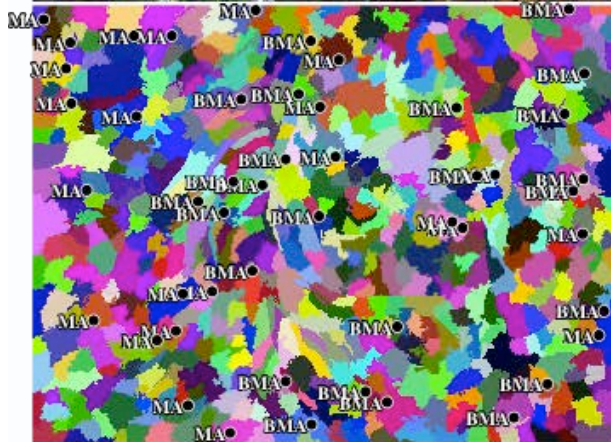
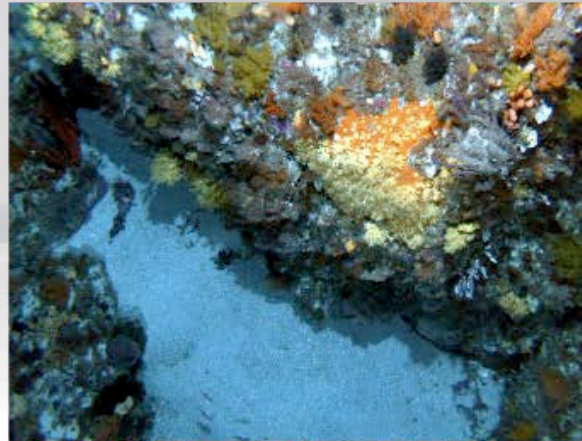
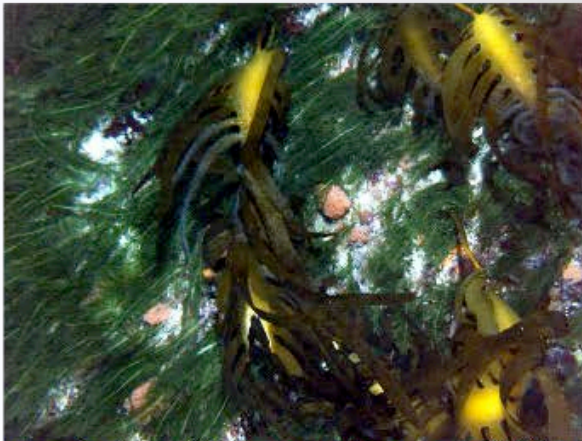
ID: 1075984

Annotate

Search all available labels

- Sand / rubble
- Seaweed
- Plate Coral
- Branching Coral
- Other Coral
- Unknown / Other

Tools



Periodicals



MIT Technology Review:

[MIT engineers hand “cognitive” control to underwater robots](#)

Popular Science:

[MIT Tests Thinking Seabots](#)

Popular Mechanics:

[On This Sea Cruise, Drones Train to Be the Underwater Explorers of the Future](#)

Machine Design:

[Diving Robots Coordinate to Explore Ocean Depths](#)

Marine Technology News:

[A New Age for Underwater Autonomy](#)





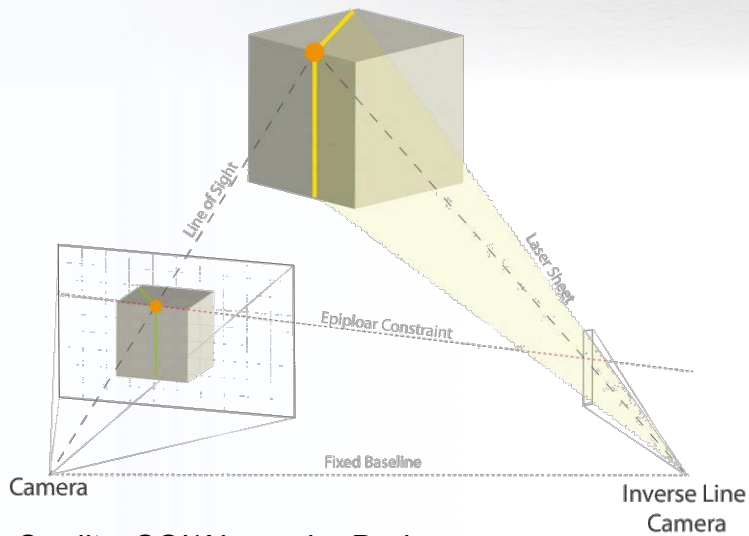
APPLY DATA PUBLICATIONS EDUCATION GALLERY
ABOUT CRUISES TECHNOLOGY R/V FALKOR NEWS

VIRTUAL VENTS: THE CHANGING FACE OF HYDROTHERMALISM REVEALED

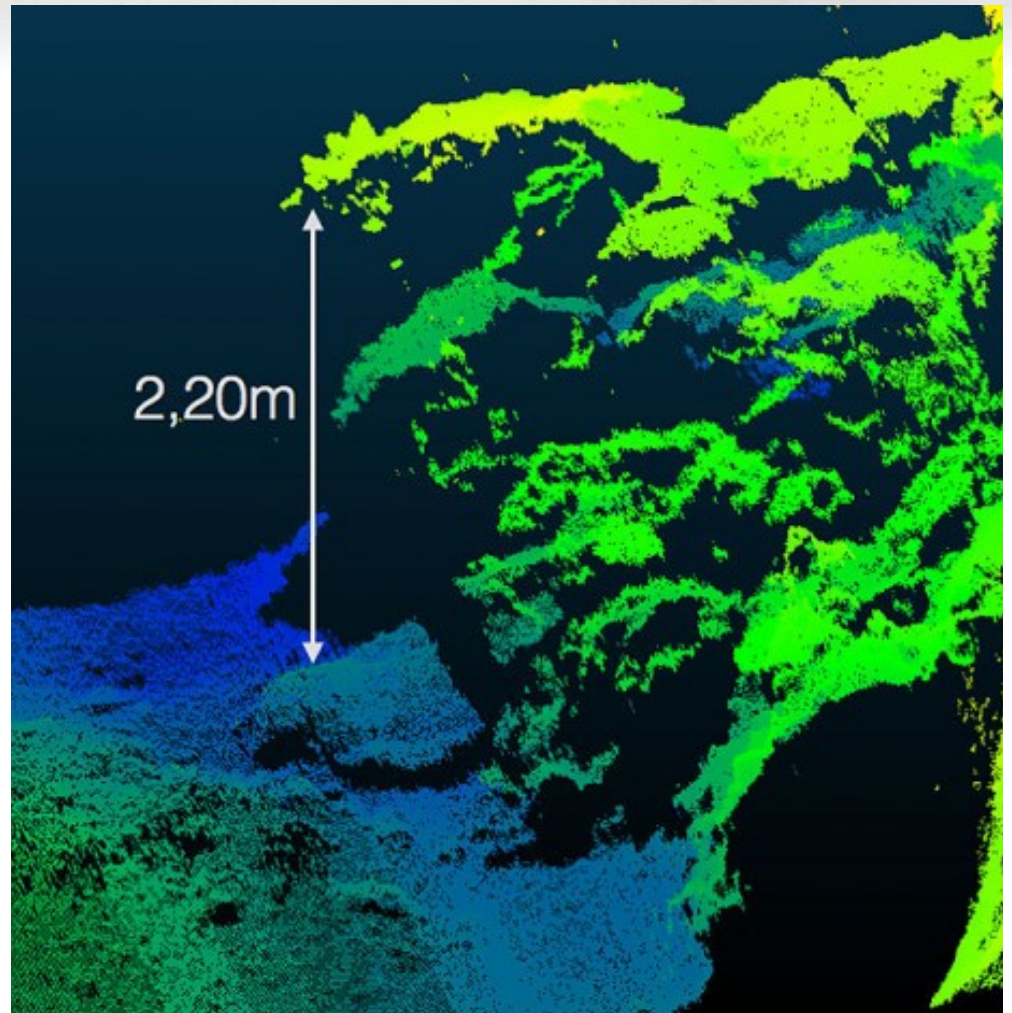
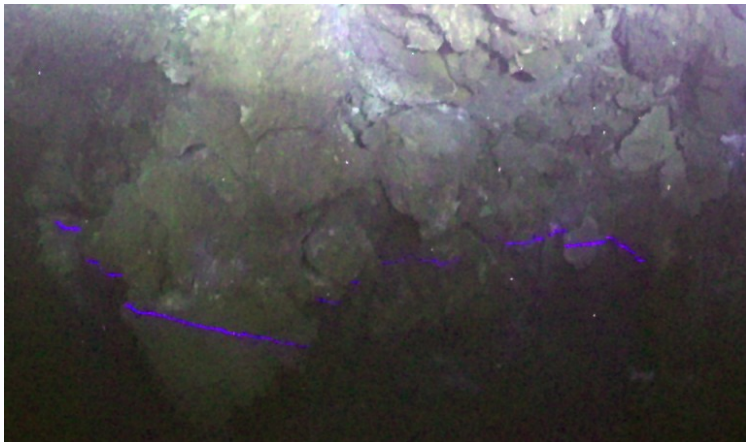
CRUISES

3D Vent Model

3D Seafloor Mapping with Structured Light










Credits: SOI/Alexander Duda




Study of the Sea-Surface M x


Secure | <https://schmidtocean.org/cruise/study-of-the-sea-surface-microlayer/>



APPLY DATA PUBLICATIONS EDUCATION GALLERY      

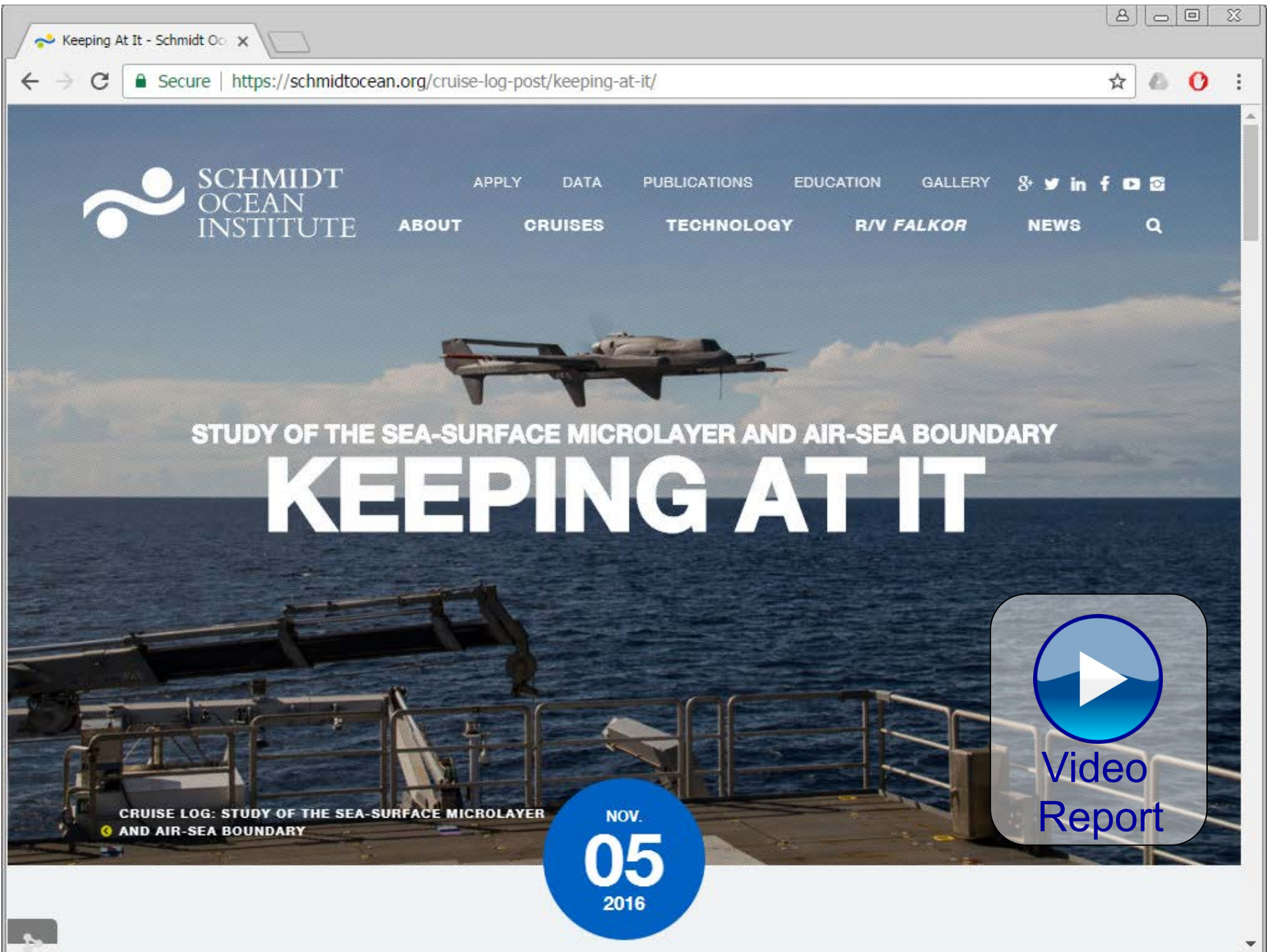
ABOUT CRUISES TECHNOLOGY R/V FALKOR NEWS 

STUDY OF THE SEA-SURFACE MICROLAYER AND AIR-SEA BOUNDARY

 CRUISES

Mark Schrope

ABOUT COLLABORATORS CRUISE LOG DATA PUBLICATIONS IN THE NEWS TEAM



- APPLY
- DATA
- PUBLICATIONS
- EDUCATION
- GALLERY
- ABOUT
- CRUISES
- TECHNOLOGY
- R/V FALKOR
- NEWS



STUDY OF THE SEA-SURFACE MICROLAYER AND AIR-SEA BOUNDARY

KEEPING AT IT

CRUISE LOG: STUDY OF THE SEA-SURFACE MICROLAYER AND AIR-SEA BOUNDARY

NOV.
05
2016



Marine Technology Reporter



MTR 100

Editor's Choice

Five Stand-Outs

MTR's roving correspondent Kira Coley was tasked to identify and deliver five innovative companies worthy of inclusion in the 10th Annual MTR100.

Deep Trekker Inc.

Deep Trekker Inc. was founded in 2010 with a mission to bring a fully capable yet portable and accessible remotely operated vehicle to market. Over the last 5 years, Deep Trekkers ROVs have quickly been adopted around the world as the go to underwater observation tool. Based on clean-sheet, innovative engineering, Deep Trekker offers a new breed of submersibles. Deep Trekker products are used across the world for applications including aquaculture, commercial diving, salvage, military, oil & gas, marine survey, research and recreation.

As the World's first fully Portable Vectored ROV, Deep Trekker's DTX2 patented pitching system is combined with powerful vectored thrusters for unprecedented flexibility and movement in the water. Forward, reverse, up, down, and lateral movements are available in 360 degree vertical and horizontal planes using only 4 thrusters. Vertical movements are

accomplished using the main thrusters instead of relying on standard vertical thrusters, providing unmatched speed & maneuverability. The DTX2 comes with many options for sophisticated add-ons such as single and multi-beam sonar, USBL positioning, Cutter Attachments, Cygnus Thickness Gauge, tether lengths up to 300 M. Intelligent features come as standard with the DTX2 ROV System, allowing users to work in higher currents and maintain stability.

Taking its cues from larger ROVs, the DTX2 brings all of the functionality required for difficult jobs, but without the usual complexity. Building on the proven DTG2 platform, Deep Trekker offers unparalleled ease of use and simplistic sophistication.

Schmidt Ocean Institute

Established in 2009, the Schmidt Ocean Institute strives to advance the frontiers of ocean research and exploration through novel technologies, intelligent observation and analysis. The last year has seen their involvement in many ground-breaking projects, pushing the boundaries of innovation and marine research. Schmidt Ocean Institute approaches oceanographic re-



Deep Trekker

50 MTR

July/August 2015



Schmidt Ocean Institute Research Vessel Falkor

Credit: SOI / Logan Moore Bunting

search from the technological, operational, and informational perspectives. The institute maintains and operates R/V Falkor as a technologically advanced scientific platform suitable to support multidisciplinary oceanographic research and technology development. Collaborators get free access to R/V Falkor with her on-board research facilities and expert technical support in exchange for a commitment to openly share and communicate the outcomes of their research.

In March 2015, the Schmidt Ocean Institute worked with the University of Sydney, MIT, as well as other institutions on the "Coordinated Robotics" project, which was also featured in June 2015 issue. The goal was to expand techniques for efficiently coordinating deployments of multiple exploratory underwater vehicles by advancing algorithms and their autonomous capabilities. The success of the project has brought engineers even closer to leaving groups of vehicles untended for long periods for a variety of underwater observation and data collection missions.

The "Perth Canyon: First Deep Exploration" was another project based in one of Australia's proposed national reserves. Despite being just 50 kilometers or so from Western Australia's capital of Perth, the canyon's deeper reaches remained poorly known and largely unexplored until 2015, when scientists from the University of Western Australia onboard Schmidt Ocean Institute's Research Vessel Falkor explored the region, along with a deep-diving remotely operated vehicle.

Xeos Technologies

With decades of manufacturing experience, Xeos Technologies have successfully designed market leading wireless telemetry products for use in the world's harshest environments. Products range from deep sea alarm beacons to surface oil spill tracking systems to land based perimeter surveillance systems. Xeos is an Iridium Value Added Reseller and provides contract engineering services in addition to its standard product line. All these qualities have brought them success in their four divisions: Communications, Oceanographic Asset Recovery, Remote Monitoring and Security.

The Apollo is an independently powered, self-contained mooring beacon with the power of an ultra-bright LED Flasher combined with satellite communications. Users receive notification of the Apollo's arrival at the surface from anywhere on earth via the Iridium Low Earth Orbit satellite communication system. This beacon provides unparalleled visibility, even in the worst conditions.

Apollo is fully submersible and has been rated to 11,000 m (36,089 ft) below sea level. In addition, the solid state surface sensor provides a measure of reliability unavailable in mechanical methods. The new APOLLO unit combines all the best features of Iridium communication beacons and LED Flashers, along with up to 10 years deployment on alkaline batteries.

With older style VHF beacons, a handheld "direction finder" would need to be used to locate equipment, sometimes in very

Numerically Speaking

A VISUAL YEAR IN REVIEW



Falkor led **NINE EXPEDITIONS**, and spent **171 DAYS AT SEA**,

a 60% increase since last year.

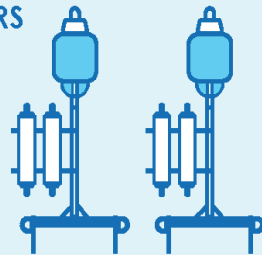
She sailed **40,362 km** and mapped **227,110 km²** of ocean floor.



We hosted **131 SCIENCE COLLABORATORS**, **82 STUDENTS**, and **540 VISITORS** aboard the ship.

TWO NEW FULL-OCEAN DEPTH LANDERS were built this year, and over

95 LANDER DEPLOYMENTS occurred off *Falkor*.



1.4 MILLION+ YOUTUBE VIEWS, the equivalent of **3.5 YRS** spent on our site.



18 SEAMOUNTS, **NINE UNNAMED**, were mapped in the Papahānaumokuākea Marine National Monument

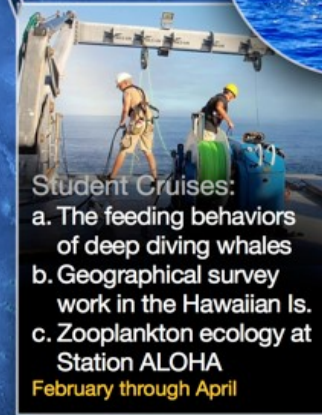
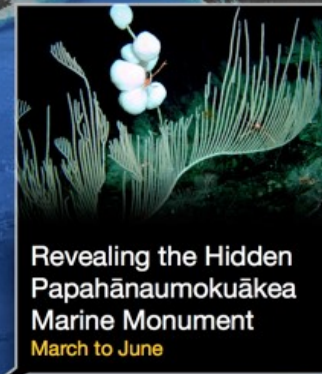
Schmidt Ocean Institute obtained a **CLOUD-BASED SUPER COMPUTER**, for use on *Falkor*



Schmidt Ocean Institute gave **25 PRESENTATIONS** in **14 COUNTRIES**.



2014 - Sub-tropical Northern Pacific & Western Pacific



Web Presence & Media



- SOI website, can select language
- Multimedia gallery
- Cruise & publication search features
- Real-time data via *Falkor* status
- Daily blogs: over 300 blogs viewed in over 200 countries in 2015
- Dedicated multimedia journalist on cruises
- Growing social media, now on Instagram
- Since 2014, we have conducted 8 live radio broadcasts from *Falkor* for the *All Things Marine Radio Show*
- Over 250 articles from 2015 in international and national television, radio, print, and web outlets.



Live Connections with Shore



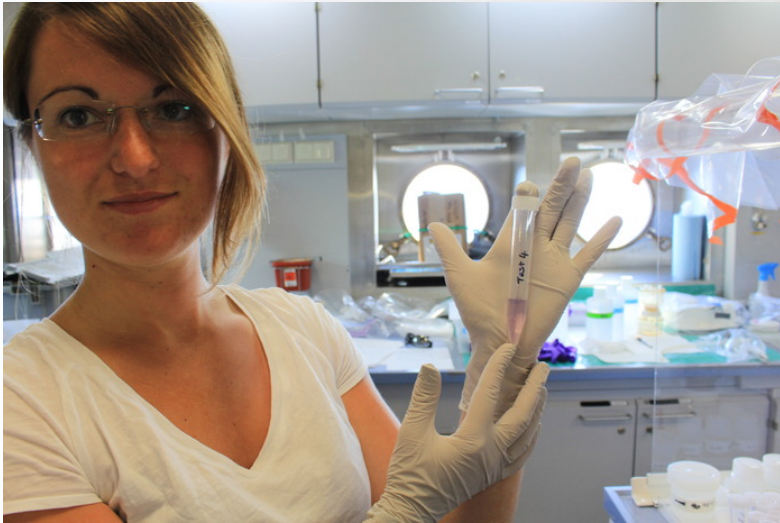
- Over 100 live ship to shore chats in 10 different countries in 2015
- Live connections with middle and high school classrooms, museums, universities, and aquariums

Training the Next Generation



- The goal of student cruises is to inspire a deep passion for ocean sciences by bringing students out to conduct research at sea
- Students gain invaluable skills and at sea experience while working with some of the world's most advanced oceanographic technologies
- Encourage students to continue on toward careers in ocean science
- In 2014 three separate student cruises were conducted including: whale feeding behavior, mapping, and zooplankton ecology

Training the Next Generation: Student Opportunities



- Schmidt Ocean Institute seeks to provide undergraduate and graduate students with a chance to take part in meaningful scientific research in coordination with our organization and the principal investigators leading at-sea research projects.
- Student berthing space may be made available if a science party has unused berthing.

Data Sharing and Publications



- Data Sharing
 - Live through Falkor Dashboard
 - Archived through Rolling Deck to Repository – 257 data sets shared
- Publications
 - Journal Publications: 13 (9 in 2015)
 - Conference Presentations and Publications: 107 (48 in 2015)
- Over 2,000 people reached in 2015 through conference presentations

Rolling Deck to Repository (R2R)

Home About R2R Cruise Catalog QA Dashboard News Contact Us Internal

Catalog Status: (In Service) Vessels: 24 Cruises: 4482 Archived Files: 18294558 May 12, 2015

Home

Cruise Catalog: Falkor

Operator: Schmidt Ocean Institute

Cruise ID	Start Date	Start Port	End Date	End Port
FK141215	2014-12-15	Apra, Guam	2014-12-21	Apra, Guam

Project: Expanding Mariana Trench Perspectives (Info)

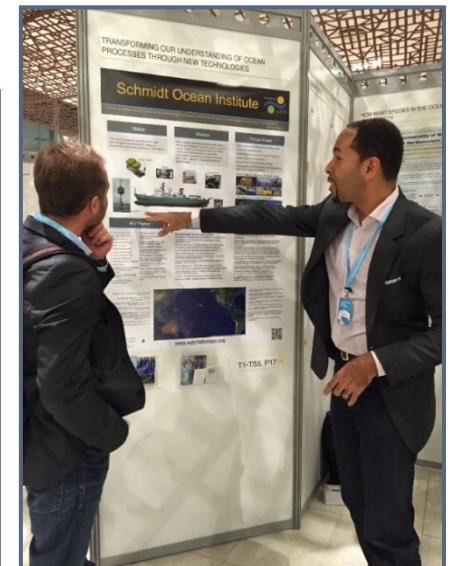
479 labels
have been tagged so far thanks to citizen scientists like YOU! We still need many more. Click 'Get Started!' to help out.

project#: citizenSOI201503

squidle

explore • annotate • interpret • marine imagery

- About the Project**
What is this all about? Who is involved? Why should you care?
[Click for more](#)
- How to...**
Tutorials and videos that provide useful tips on how to use the system.
[Click for more](#)
- Diving Deeper**
Check out more details about the project and for more info about automated tools designed to make life easier.
[Click for more](#)
- Get started!**
Welcome back travelers!
Jump straight to working with the data using the annotation interface.
[Click to start](#)





Status: At Sea

Vessel is currently at sea, status page will be updated every 5 minutes except when there is a communication issue.

Last Updated: 2017-01-16 0:45:01

Longitude: -160.528083333333 (ddeg)

Latitude: 20.1227333333333 (ddeg)

Pressure: 1014.23 (hPa)

Humidity: 100 (%)

Temperature: 22.89 (C)

Current Status



Sensor Locations

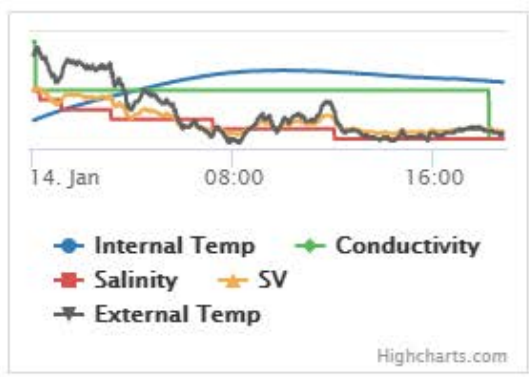
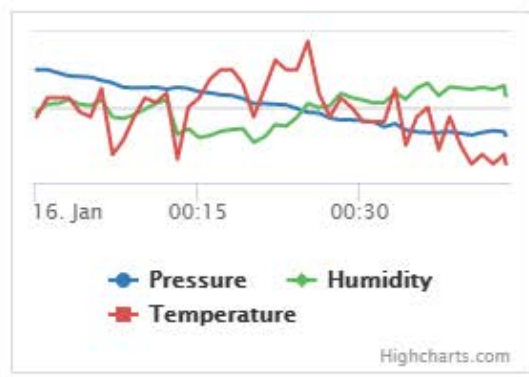
Camera Currently Unavailable

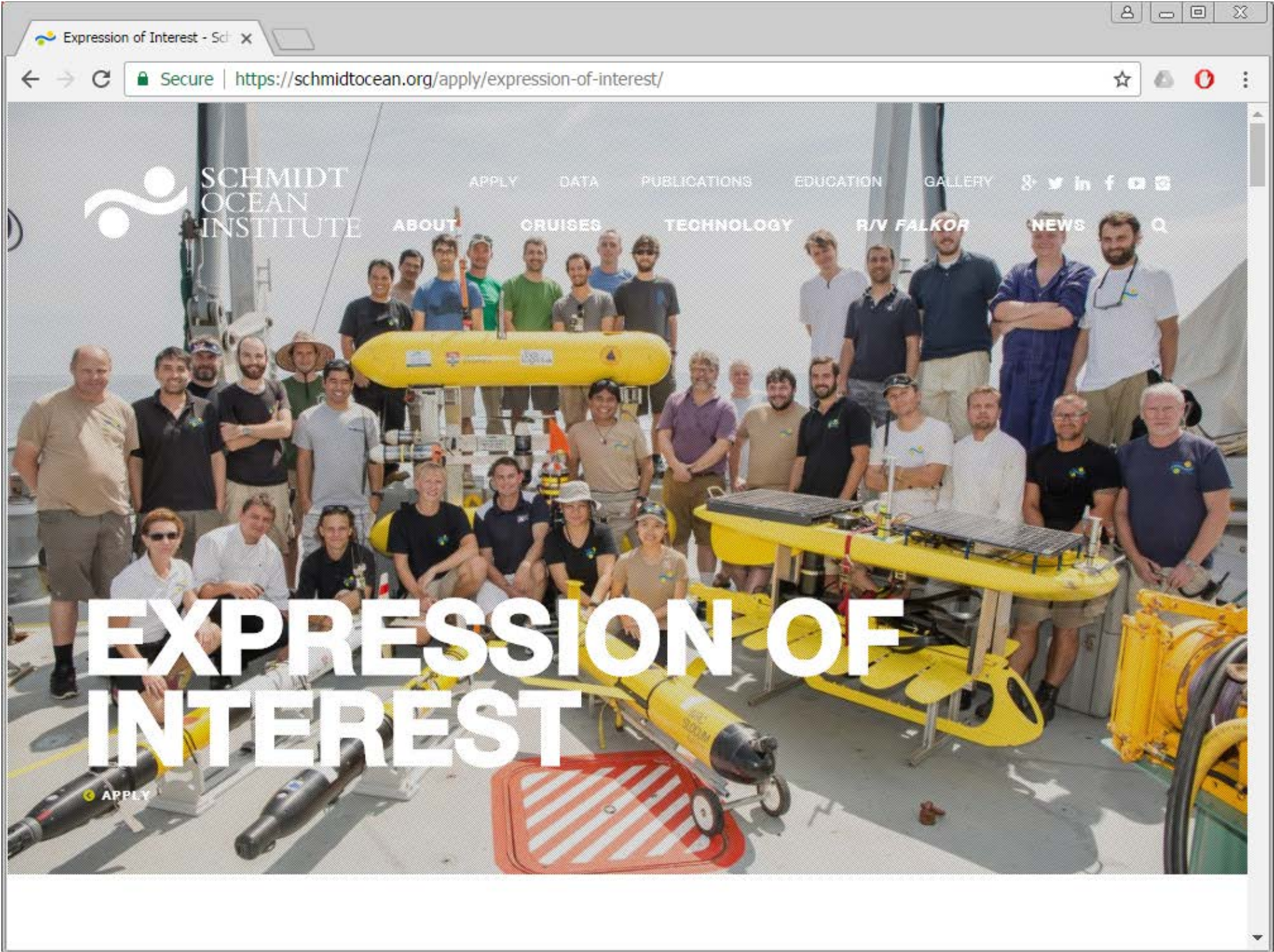
Camera Currently Unavailable

Camera Currently Unavailable

Camera Currently Unavailable

Live Cameras






- APPLY
- DATA
- PUBLICATIONS
- EDUCATION
- GALLERY
- ABOUT
- CRUISES
- TECHNOLOGY
- R/V FALKOR
- NEWS

EXPRESSION OF INTEREST

APPLY

Expression of Interest - Schmidt Ocean Institute

Secure | <https://schmidtocean.org/apply/expression-of-interest/>



APPLY DATA PUBLICATIONS EDUCATION GALLERY [g+](#) [t](#) [in](#) [f](#) [v](#) [i](#)

ABOUT CRUISES TECHNOLOGY R/V *FALKOR* NEWS [Q](#)

“Technology first: new technology should drive SOI science program”

Eric Schmidt • Founder and President

OVERVIEW

Call for Expressions of Interest in Collaborative Research on R/V *Falkor* in 2019

Expression of Interests due annually the first Friday of December

Overview

[View Due Dates & Timeline](#)

[Guidelines & Evaluation Criteria](#)

[SOI-Coordinated Program Activities](#)

Schmidt Ocean Institute is uniquely structured as an oceanographic research facility operator on a mission to transform ocean sciences with innovation in research technologies, marine operational practices, and information sharing. We seek to advance the frontiers of global ocean research by providing state of the art operational, technological, and informational support to pioneering marine science and technology.

Program Review Feedback



- Falkor successfully operationalized
- Enviable flexibility to foster international collaborations
- Transparent review process, extensive outreach
- Data collection system to be improved (metadata)
- Exclusive support of Falkor as a platform limits SOI in achieving its goal of transforming ocean science through technological innovation. SOI would be more effective in achieving its goals if it focused more directly on incubation and demonstration of new technologies that address critical science and societal needs.

