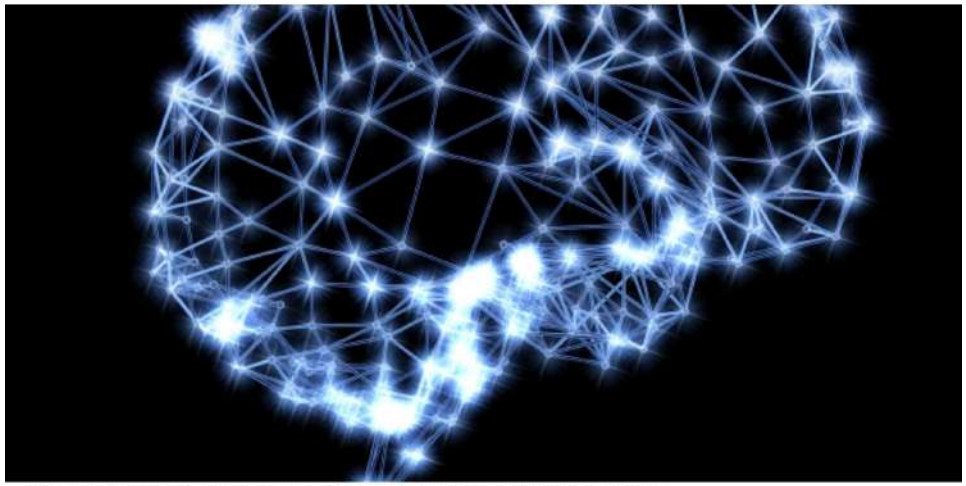
Who am I:

Vincent Pieribone

Director and Fellow, The John B. Pierce Laboratory, Inc.

Professor, Cellular and Molecular Physiology, Yale University School of Medicine

Vice President
Dalio Ocean Initiative



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The goal: Decoding 1 million neurons. Science Photo Library - PASIEKA Getty Images

DIGITAL HEALTH

DARPA Is Spending $65 Million to Fund Brain-Computer Interfaces That Could Cure Diseases

Sy Mukherjee
Jul 10, 2017

The new Dalio Ocean initiative vessel (“new hull”) setting sail in 2018

Challenge

Create the next generation floating research laboratory & media platform

Goal

Create a vessel that will serve the mission of exploration and visualization of the ocean

Travel to the most remote locations and using an array of vehicles reinsert human beings back into ocean exploration using manned submersibles and divers.

Explore locations and depths that have not been visited previously and use state-of-the-art science and media to capture the discoveries.

Dalio Ocean Initiative

Ray Dalio funds all aspects of this operation - purchase of vessels, refit and operations.

This includes a team in Westport, Connecticut with advise and guidance from Rob Munier and his team at Woods Hole Oceanographic Institute

Ray is interested in supporting cutting edge marine science mission onboard M/V Alucia 1 and soon M/V Alucia 2 (Alucia 2 is a place holder, final name under development) and capturing these missions with high quality and widely disseminated media.

We have media project underdevelopment with a wide range of partners:

Dalio Ocean Initiative

Ray believes manned exploration of the ocean is important and therefore supports the operation of our Triton and Deep Rover submersibles - obviously not a trending approach in the general marine/ocean science community!

He has indicated we should investigate the purchase of an ROV for Alucia 2 (Alucia does not have DP making ROV ops challenging). We are considering a number of commercially produced vehicles (potentially 6000m) for purchase this year.

Ray has supported the development of the hybrid tether (PI: Andy Bowen) ROV

He also owns a Remus 6000 that is operated by WHOI. We will use this vehicle on Alucia 2.

We are in discussions with Kjell Inge Rokke around his platform that is under development.

Alucia 2

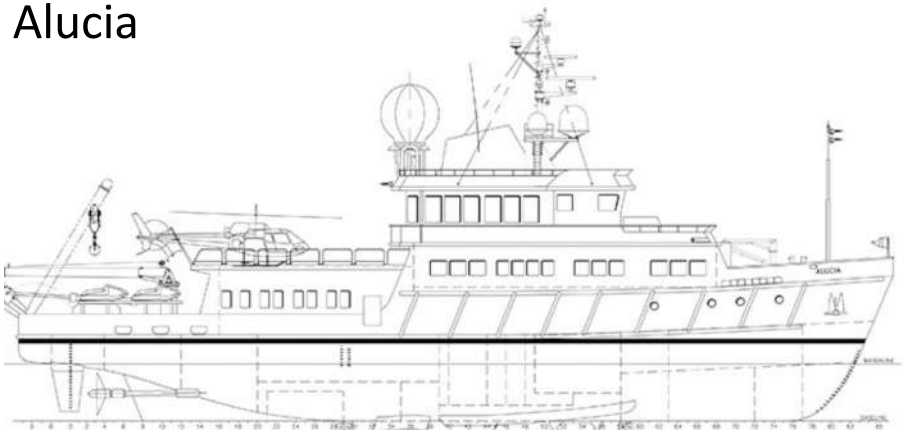
A “new hull” vessel to launch Q4 of 2018

Alucia 2

- Alucia 2 is a conversion of the petroleum support vessel Volstad ST-253.
- Volstad ST-253 was launched in 2010 and was designed to perform petroleum exploration and development in the North Sea
- The vessel was designed in Norway and built in Spain.

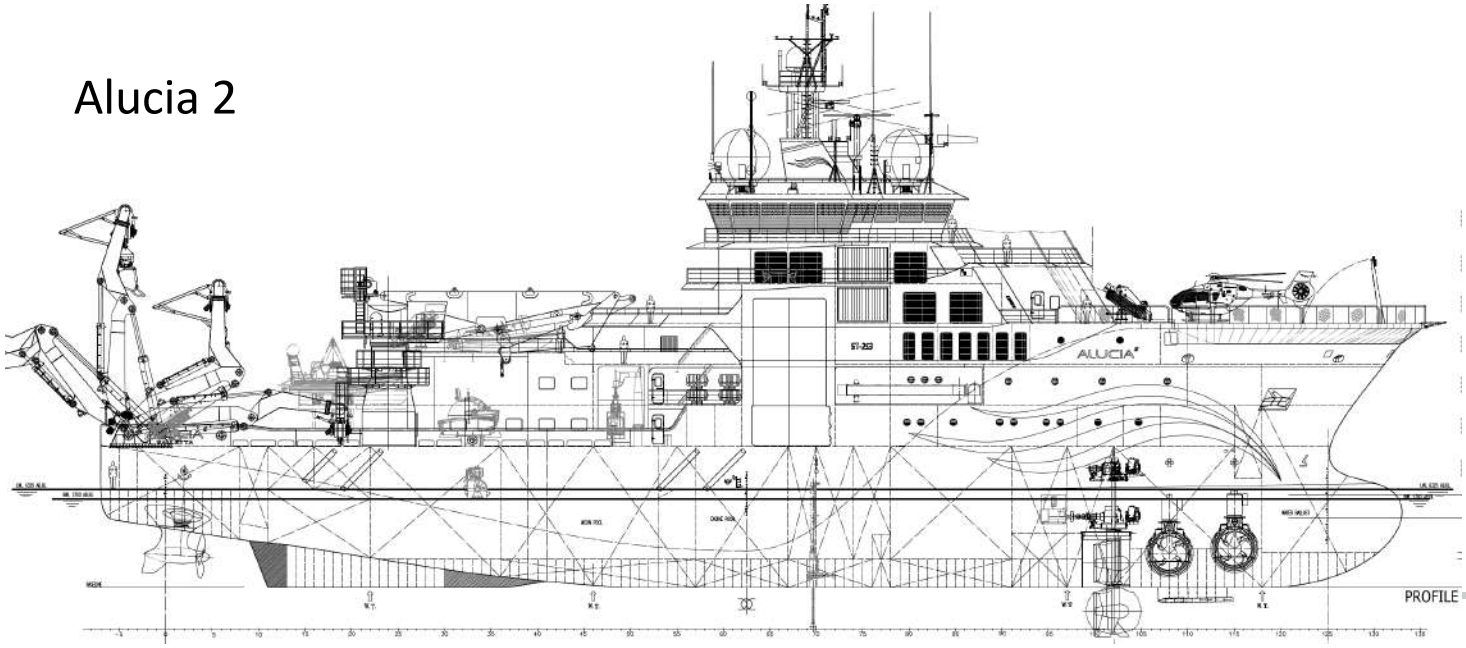
Alucia 2 is a larger and more capable vehicle than the current Alucia.

Alucia



Length: 55.78 m (183 ft)
Width: 12 m (39 ft)
Crew: 18-22
Scientists/Filmmakers/Guests: 12
Maximum speed: 11 knots

Alucia 2

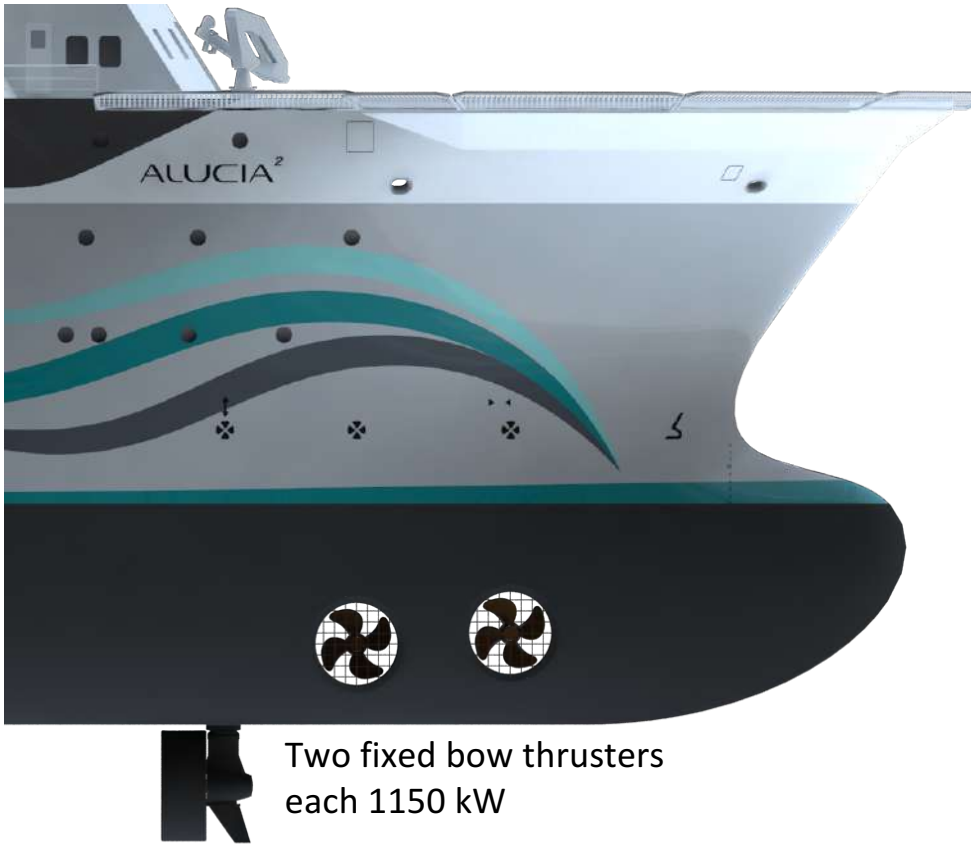


Length: 85 m (275 ft)
Width: 18 m (39 ft)
Crew: 18-22
Scientists/Filmmakers/Guests: 50
Maximum speed: 15.5 knots

Alucia 2

- **Enhanced media facilities**
  - Dedicated areas for assembly of camera & lighting equipment on deck
  - Safe dry storage of equipment
  - Dedicated space for backing up, editing and group viewing of media
- **Improved launch and recovery of manned submersibles**
  - Installation of A-frame crane with improved submersible LARS
  - Goal to rapidly launch and recover Triton and Deep Rover manned submersibles in higher sea states than currently possible
  - Current Alucia can only launch vehicles in sea states up to ~1.5 which severely limits our operational window.
  - Inclusion of i) a multipoint, motion compensated attachment system on A-frame and ii) modification of attachment points on submersibles will produce a more rigid recovery once the vehicle is captured. Allowing safe and routine recovery in sea states of 4-5.

Alucia 2: Propulsion systems



Main thrusters
Two azimuth electric engines, 2,2 MW each

- Rolls-Royce diesel-electric hybrid
- Selective Catalytic Reducers (SCR) installed (NOx reduction)

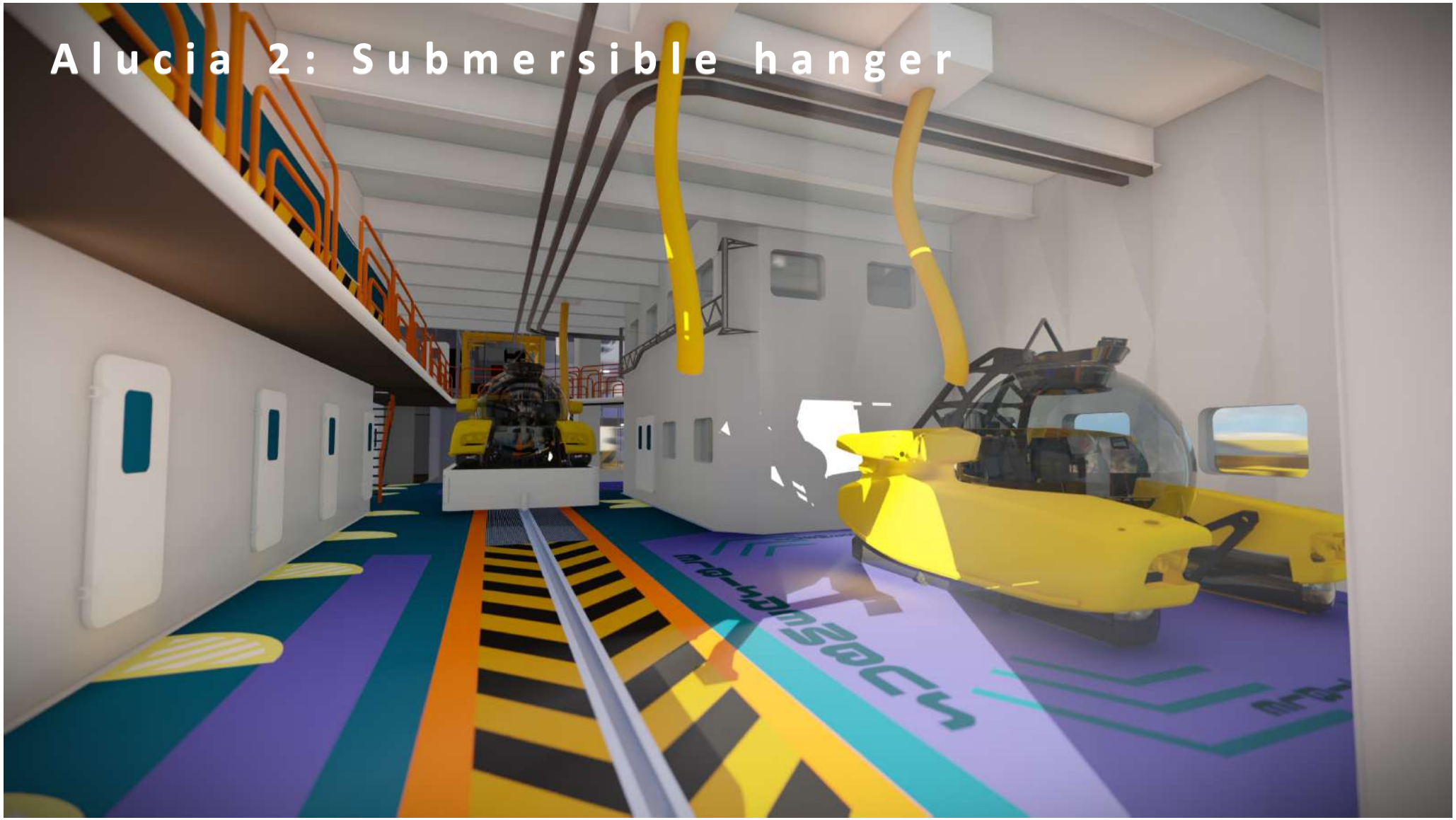
Two fixed bow thrusters each 1150 kW

Full retractable bow azimuth pod thruster, 1400 kW

Alucia 2: Submersible deployment

- Deployment of a range of different submersibles
- Launch and recovery during greater sea states than the current Alucia
- Dynamic positioning of vessel allows better launch and recovery of vehicles

Alucia 2: Submersible hanger




Alucia 2: Submersible hanger


Alucia 2: Submersible hanger


HITACHI

Alucia 2: ROV deployment

- Dynamic positioning allows Alucia 2 to deploy work class ROVs
- Dedicated launch and recovery bay on vessel to allow simultaneous operations with submersibles
- ROVs allow survey of ocean prior to submersible deployment

Alucia 2: Helicopter deployment

- Ability to land medium helicopters
- Larger helo pad than Alucia 1
- Climate controlled helicopter hanger with workshop
- Helicopter will remain on vessel at all times protected from the elements
- Potential to have a second helicopter land on the vessel

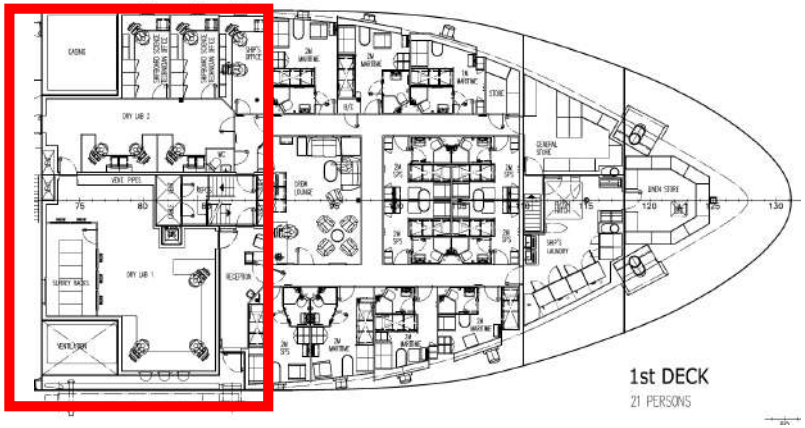
Mission Capabilities

- Equipment Handling and Deployment
  - Main Crane
  - CTD Winch
  - Deck handling system
  - Deck tie-down points (UNOLS)
  - Gantry Crane inside sub hangar
  - Trawl Winch
- Diving
  - Full diving suite (mixed gas)
  - Decompression Chamber
- Helicopter deck and hangar, including refueling
- Imaging
  - Benthic camera system
- Laboratories
  - Wet Lab; seawater sensors, intake and distribution system
  - Dry Lab
  - Aquarium
  - Media Production / Editing
- Mission Control, including ROV control room
- Sensor Systems & Instrumentation
  - CTD
  - Knudsen 3260 sub-bottom profiling sonar
  - MET instruments incl: 4- Vaisala WXT520 MET sensors & PAR
  - Kongsberg EM712 Multibeam Sonar
  - Kongsberg EK80 sonar with 18, 38, 70, 150 and 300 MHz
  - Ocean Surveyor ADCP SONAR 38 kHz / 300 kHz
  - Surface Sound Velocity Profiler
  - Sonardyne USBL System / Kongsberg High Precision Acoustic Positioning
  - XBT & Launching system
- Sub-surface vehicles & related systems
  - Triton Manned Submersible
  - Deep Rover Submersible
  - Remus 6000 AUV
  - ROV
  - Video Plankton Recorder
- Vehicle Launch and Recovery
  - 40-ton man-rated A-Frame
  - 40-ton man-rated Main Crane
  - Dedicated ROV LARS

Alucia 2: State-of-the-art research laboratories

Dry laboratory

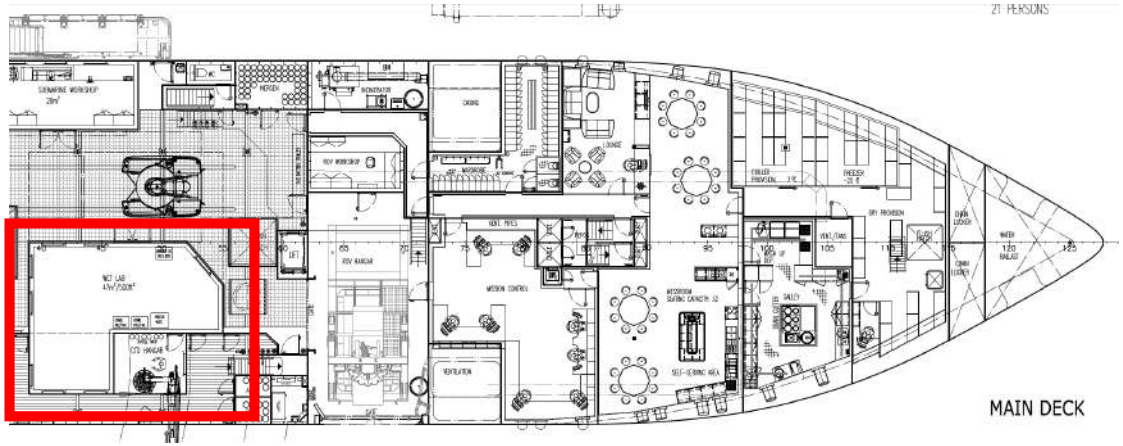
- To perform molecular biology, microscopic imaging and biochemical studies
- Designed to be function and be photogenic for media



Alucia 2: State-of-the-art research laboratories

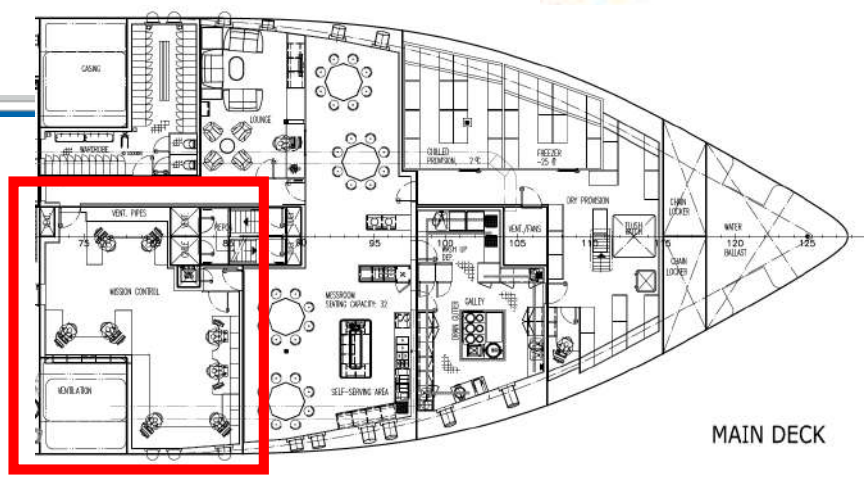
Wet laboratory

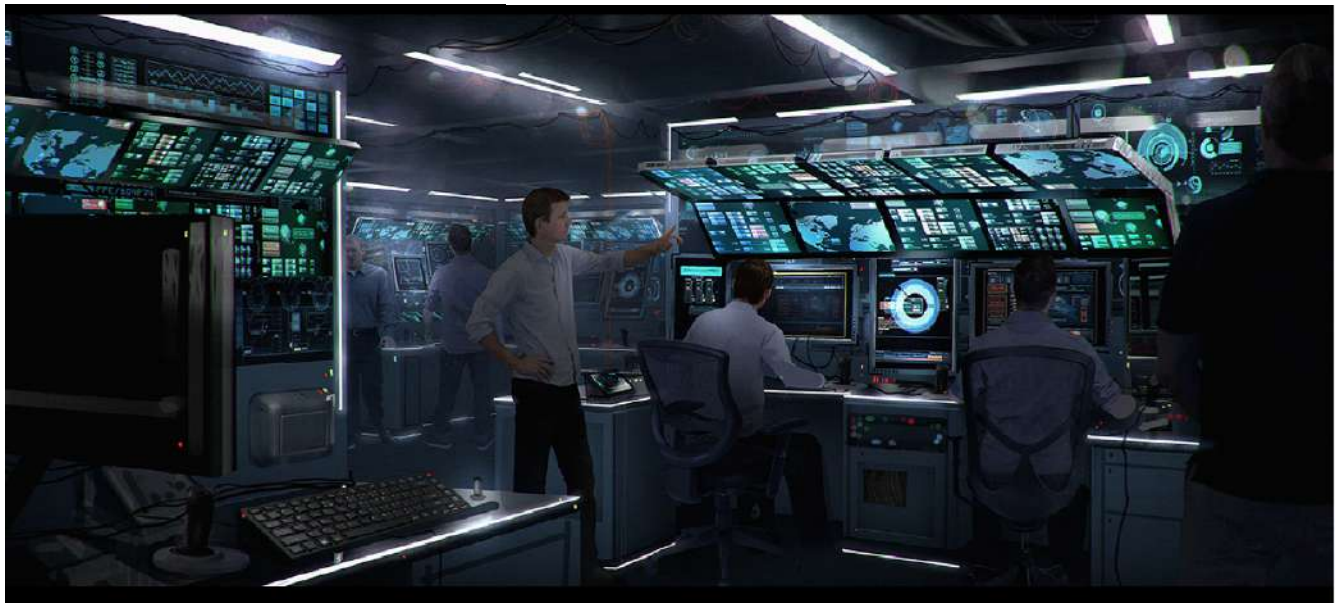
- To house collected organisms and image for media and science
- Designed to be function and be photogenic for media



Alucia 2: Mission control

- Central brain of the ship's research operations
- Control and monitor submersible operations, ROV operations, AUV operations as well as sonar mapping.
- Also aesthetically designed to be featured in media projects.





Alucia 2: State-of-the-art media production facilities

- Facilities to view, archive, edit and produce UHD media
- Live broadcast studio and production facilities for ”Teleprescence” event hosting
- Fully integrated with all ship systems and data streams.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Pathway to Mission Development

Generate Mission Idea

- Identify and select operating region
- Identify and match mission ideas
- Develop preliminary annual mission schedule

Develop Mission

- Build out mission details and budget
- Review and approve mission details and budget
- Publish final annual mission schedule

Plan Mission

- Secure required Legal agreements
- Complete travel and logistics planning
- Complete asset configuration and schedule planning

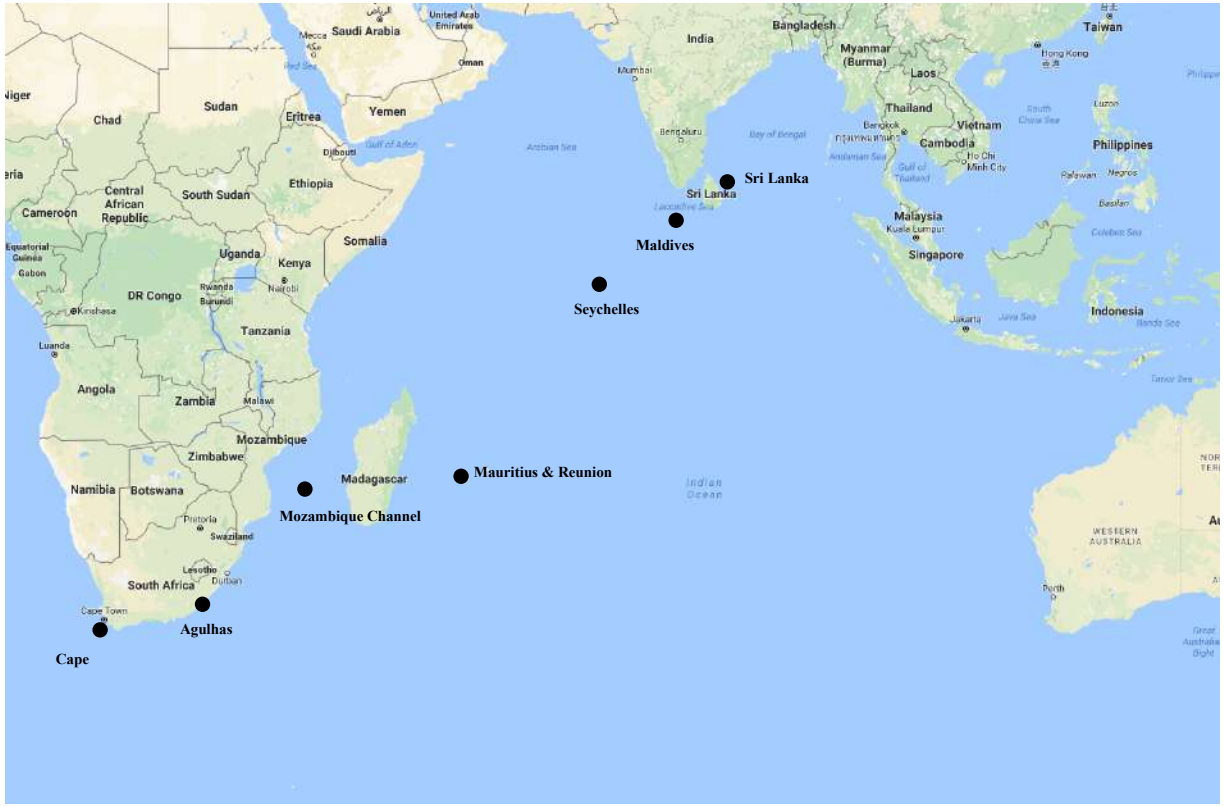
Execute Mission

- Conduct onsite planning and safety meetings
- Conduct vessel introduction
- Ensure mission stays on schedule

Conclude Mission

- Conduct post-mission survey
- Reconcile financials
- Track and communicate mission reporting

Planned Region (Q4 2018 – 2019) – Indian Ocean



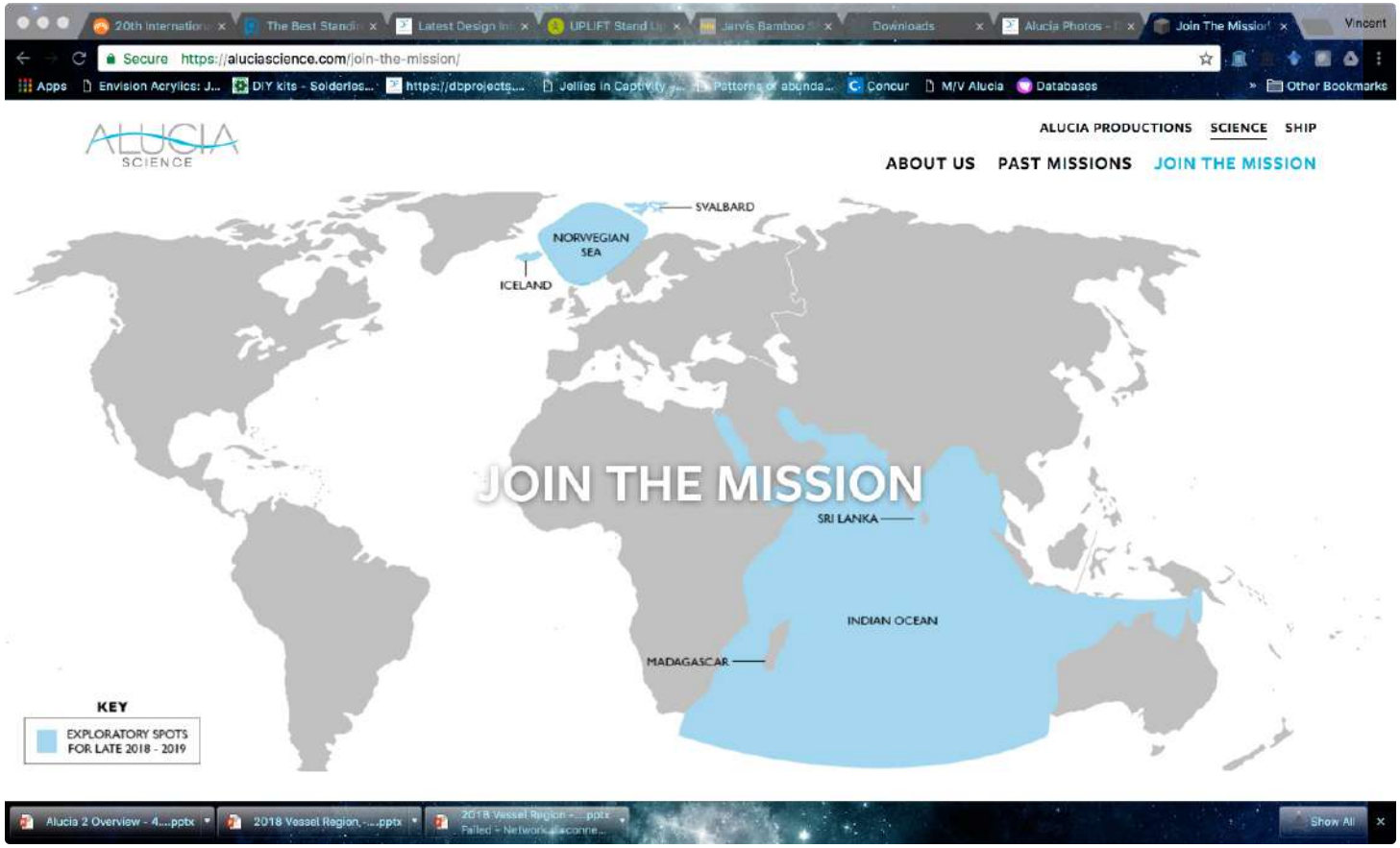
Alucia^2 achieving the mission

- **Proposal: An ongoing science mission for Alucia^2**
  - What scientific experiments can be conducted in parallel to dominant science/media objectives of a particular cruise which can contribute to an understanding of ocean chemistry/biology?
  - What outstanding questions in ocean science can studied using the resources of Alucia^2 while transversing the world's oceans?
  - Proposals:
    - High resolution sonar mapping of ocean bottom (<3000 msw)
    - eDNA sampling via CTD device
    - Drop cameras
    - 3D visual mapping of bottom using AUVs
  - Issues
    - Collaborators to help direct the type of data to be collected, assist with the analysis and publication of data
    - Data repositories to share data
    - Standards for data quality, annotation, meta data and data format
    - Interference with primary ship operations

Alucia scientific mission capacities and goals

- **Proposal: Enhance the potential Alucia[2] to achieve its <u>exploratory</u> mission**
- Once the vessel is deployed to a remote location and a particular set of planned activities are being conducted, how can we maximize the potential of discovering new features of the ocean in parallel?
  - Maximize the observational potential of the vessel while on station:
    - *Drop cameras* - cameras that are relatively inexpensive that could be deployed to visualize organisms that pass by at depth
      - Baited and un Baited - to attract shy species
      - Low light imaging cameras with minimal illumination - allow unobtrusive observation of benthic organism
      - 3D - maximum potential to observe marine organisms
    - *Near continuous ROV operations*
      - Deploy ROVs to enhance the possibility of witnessing an unknown benthic phenomenon that can be further explored using the submersibles.
    - *eDNA sampling with realtime feed back*
      - Perform water column and substrate profiles of eDNA make up in efforts to identify unusual patterns of organismal distribution at a particular site - need HiSeq on vessel.
    - *CTD and sonar surveys*

We are interested in proposals from scientist to run missions on board the vessel in 2018-19



https://aluciascience.com/join-the-mission/