



SCIENTIFIC OCEAN DRILLING BEYOND 2023



NEXT Meeting

Denver, Colorado

6-7 May, 2019



STEERING COMMITTEE

Instituting U.S. Scientific Ocean Drilling Beyond 2023

Committee Chairs: Anthony Koppers, Jim Wright

Becky Robinson

Beth Christensen

Beth Orcutt

Brandi Reese

Cara Burberry

Carl Brenner (USSSP)

Clive Neal (JRFB)

Dave Mallinson

Dick Norris

Gail Christeson

Jessica Labonté

Ken Miller

Kristen St. John

Patrick Fulton

Ross Parnell-Turner

Sandra Passchier

Sean Gulick



MISSION

It is our mission to put into place a modernized next-generation riserless drilling platform and a new international science program that will augment scientific ocean drilling results in the most challenging geological environments, in US territorial waters and around the globe

 **WE NEED AN INNOVATIVE NEW SINGLE SCIENCE PLAN BY JUNE 2020**

- Remain a leader in scientific ocean drilling
- Remain an international program growing beyond today's 26 countries
- Secure a globally-ranging riserless vessel to support scientific ocean drilling for the next 20+ years
- No break between IODP and future program

MEETING ORGANIZATION

Pre-Meeting Application, Questions and Reading

Participants arrived ready to work ...

Looking beyond 2023, what current IODP science plan challenges need to be modified or expanded? How and why?

What new scientific challenges should be formulated in the next science plan?

What is needed in a new U.S. riserless drilling vessel (from coring to shipboard analysis) to answer these new or updated challenges?

MEETING ORGANIZATION

Bottom Up Progression

Your community ideas → Strawman structures → Proposed new science plan

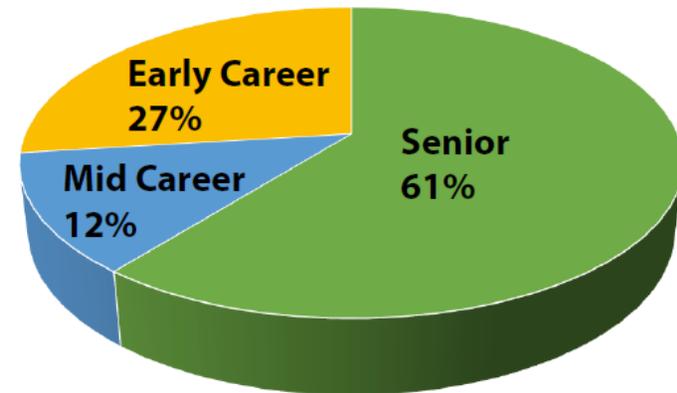
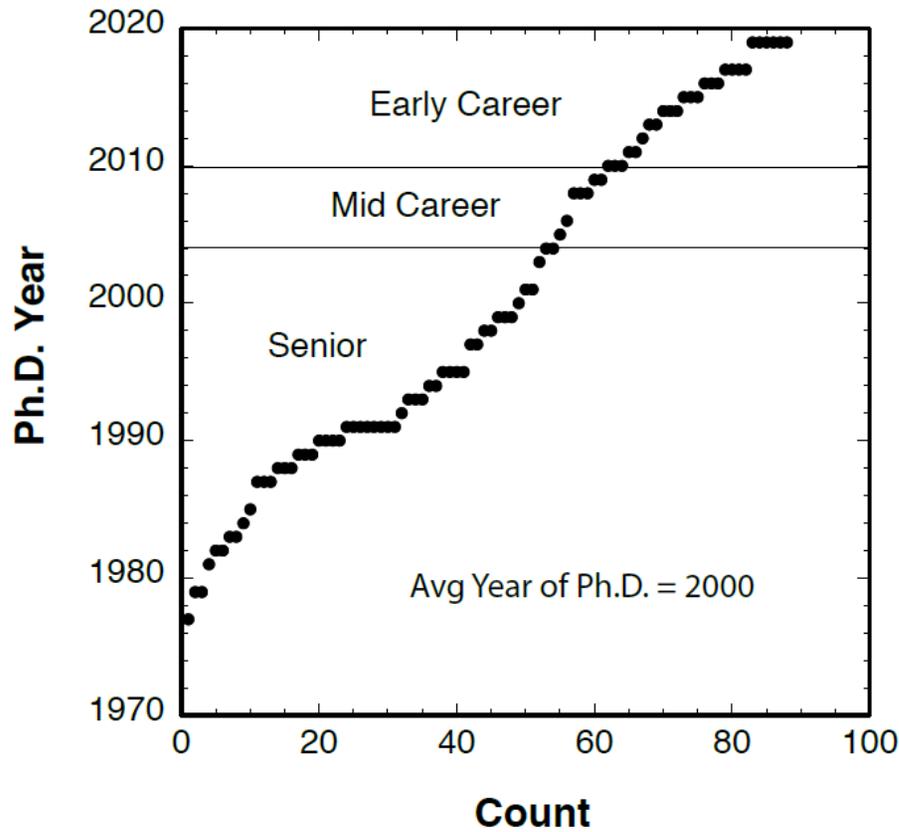
Emphasis on input from early- and mid-career scientists

Why did this work in just two days?

We had a large database of ideas in response to questions in the application

It simply had to

US Science Participants by Career Level



MEETING APPROACH

Approach

Plenary sessions

- including presentation on JR replacement vessel
- talks by NASA and ICDP

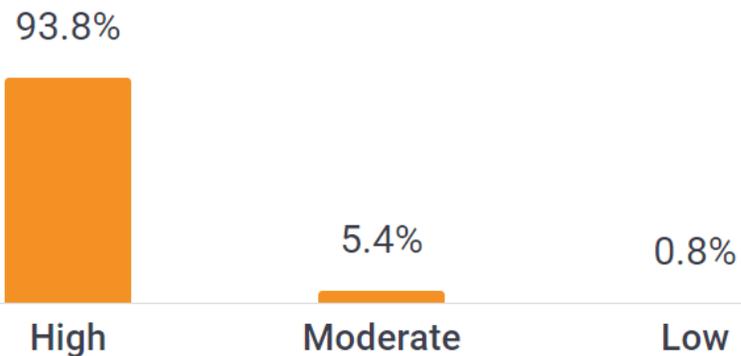
Five **breakout** sessions (focused on science plan structure and science priorities)

Pigeonhole live polling/commenting software

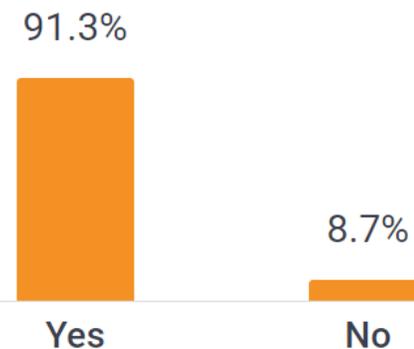
One day for the **steering committee** to digest the two-day workshop results

POLLING OUTCOMES – ON US PLATFORM

How do you perceive the need for a riserless, JR-type vessel in resolving the outstanding or emerging challenges in scientific ocean drilling?

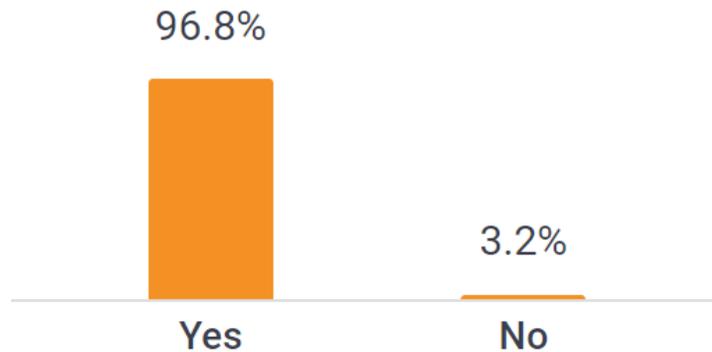


Should the US platform continue to follow a regional track with the goal of circumnavigating the globe at least once in the next decade?

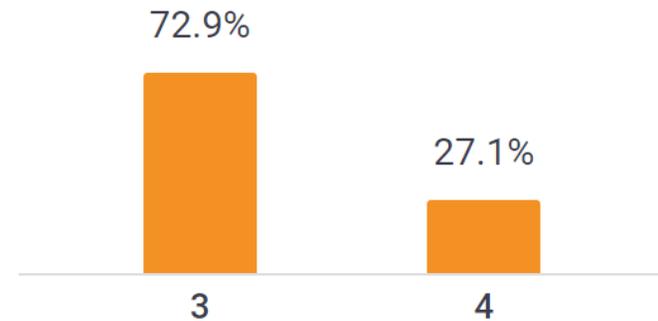


POLLING OUTCOMES – ON SCIENCE PLAN

Do you agree that the new Science Plan needs to highlight connections (threads) between key ideas (themes)?



How many themes do you prefer?



MEETING PRODUCTS

Products

Four structures emerged from the breakouts that showed a remarkable level of overlap in content, structure, and intent → Merged by the Steering Committee into a **single structure with an emphasis on connections/threads/pathways** (not themes)

Approximately 140 science questions provided by the workshop participants → Distilled by Steering Committee into **8 strategic objectives** (with sub-questions)

A proposed **new science plan title and mission statement**

PROPOSED PROGRAM AND MISSION

Proposed Science Plan Title

Exploring Earth, Life, and Oceans Through Time

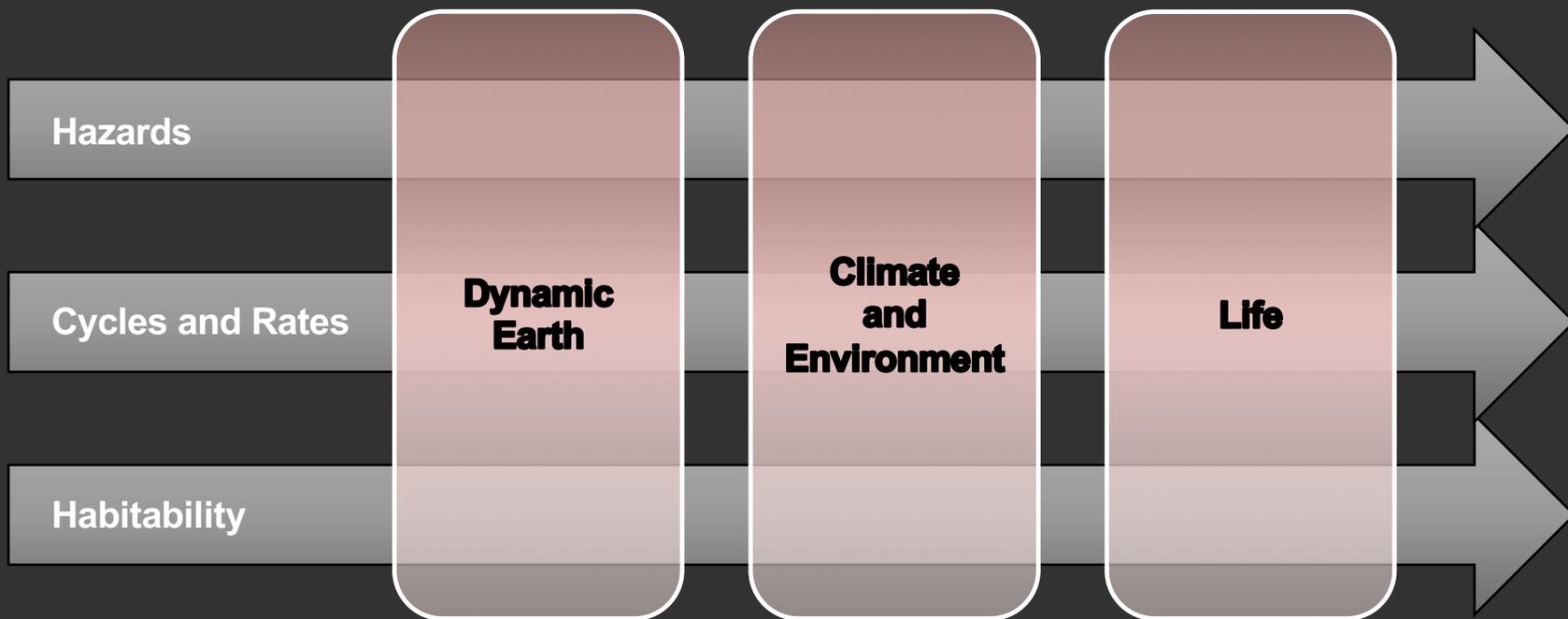
Proposed Mission Statement

We are an international scientific community pioneering large-scale and interdisciplinary research in the world's oceans.

We explore Earth systems and processes that can only be uncovered through scientific ocean drilling.

We sample otherwise inaccessible places that constrain the mechanisms and feedbacks among Earth, oceans, life, climate, and society.

PROPOSED NEW SCIENCE PLAN STRUCTURE



PROPOSED EIGHT STRATEGIC OBJECTIVES

overview

Define the conditions for life and planetary habitability

Constrain the feedbacks among Earth, oceans, life, and climate

Examine the cryosphere and sea level under different climate states

Use the past to inform our understanding of a future Earth

Identify the causes, scales, and consequences of climatic and environmental perturbations

Investigate the life cycle of a lithospheric plate and its impact on the earth system

Characterize the transfer of water, energy and matter in the earth system

Assess the conditions and processes that control the occurrence of natural hazards that affect society

PROPOSED EIGHT STRATEGIC OBJECTIVES

with questions

Define the conditions for life and planetary habitability

- a. How do organisms live, interact, evolve, and die beneath the seafloor?
- b. What are the interactions of microbes, lithology, and fluids?
- c. What are the rules of life?

Constrain the feedbacks among Earth, oceans, life, and climate

- a. What are the feedbacks between life, the rock cycle and crustal properties?
- b. How do active tectonic processes affect ocean and atmosphere circulation and chemistry?
- c. What are the solar, climate, and tectonic factors that govern ocean productivity?
- d. How does subseafloor life shape the cycling of energy and mass?

Examine the cryosphere and sea level under different climate states

- a. What are the mechanisms and rates of sea-level change through time?
- b. When did polar ice sheets begin to grow and what are the feedbacks that lead to deglaciation?

PROPOSED EIGHT STRATEGIC OBJECTIVES

with questions

Use the past to inform our understanding of a future Earth

- a. How productive was the greenhouse world of the past?
- b. What were the climatic, biological and chemical characteristics of an ice-free planet?
- c. What is the record and magnitude of human impacts in Earth systems?

Identify the causes, scales, and consequences of climatic and environmental perturbations

- a. What are the timescales and patterns of ecosystem recovery to major disturbances?
- b. How have catastrophic or major environmental perturbations shaped the history of life?
- c. How do large igneous provinces and hotspots form and evolve, and what are their environmental and biosphere impacts?

PROPOSED EIGHT STRATEGIC OBJECTIVES

with questions

Investigate the life cycle of a lithospheric plate and its impact on the earth system

- a. How does lithospheric architecture and evolution vary in response to spreading rate and tectonic setting?
- b. How do lithospheric plate boundaries (subduction zones, transform faults, rift zones) form and evolve?

Characterize the transfer of water, energy and matter in the earth system

- a. What are the mechanisms and processes associated with geomagnetic reversals and secular variation as recorded in oceanic crust and sediments?
- b. What processes influence the tempos of volcanism?
- c. How is fluid flow affected by subsurface structure, how do fluid systems evolve, and how do these processes influence life, climate, and geochemical cycles?

Assess the conditions and processes that control the occurrence of natural hazards that affect society

- a. What are the rates, magnitudes and impacts of natural disasters?
- b. What are the feedbacks between sea level and hazards such as tsunami, hydrate stability and storm surges?