



OCEAN WORLDS WORKING GROUP

Michael Bland, USGS Flagstaff, Astrogeology Branch

Cynthia Phillips, NASA Jet Propulsion Laboratory / Caltech



AGENDA

1. Rules of the ocean
2. Introductions
3. Charge from the AGs and NOW
4. Initial thoughts and survey results
5. Discussion and optional breakout groups
6. Summaries and future direction
7. Structure of the OWWG

RULES OF THE OCEAN*

- **Treat others with respect**
- **Be an active ally** to all OWWG members, guarding against forms of harassment
- **Actively contribute** towards an inclusive, equitable, and accessible environment
- **Demonstrate support for others**, including interceding for others unwilling or unable to advocate for themselves
- **Calmly consider your actions** when challenged by someone who feels that those actions have caused harm

All voices and ideas presented in good faith, from any member of the OWWG community, are welcomed and valued! **This is your OWWG** – help us make it a supportive and comfortable environment for all participants. Please contact Cynthia or Mike with any issues or concerns

* Modified from the Europa Clipper code of conduct

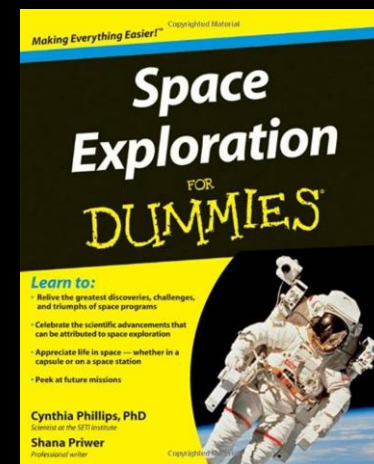


OWWG CHARGE

- Work with OPAG / SBAG / NOW leadership to organize a Cross-AG Ocean Worlds Working Group
- Lead the development of the OWWG charter
- Cultivate an encouraging and inclusive environment for considering and discussion ideas and other input from the Ocean Worlds (OW) community to determine common goals and needs
- Formulate OWWG strategy for communicating evolving goals & needs of the OW community to NASA
- Advocate for the OW community and present OWWG findings and recommendations to the wider planetary science community, through OPAG, SBAG, NOW, and up through the PAC
- Communicate with leaders and members of relevant professional societies

CYNTHIA PHILLIPS

- AB in Astronomy & Astrophysics, and Physics, from Harvard
- PhD in Planetary Science, minor in Geoscience, from University of Arizona
- Spent 15 years as a postdoc and research scientist at SETI Institute
- Have been at JPL since 2015, working on Europa Clipper and other projects
- Research background: image processing, change detection on active worlds, impact gardening, surface / subsurface exchange processes. Have studied Europa, Enceladus, Rhea, Dione, Titan, Mars, Moon, Venus, Io, etc.
- Other interests: Science communications and outreach – Science communications lead for Europa Clipper, lectures & panels at events such as SXSW, San Diego Comic-Con, etc.
- Personal: My partner & I have 5 kids and a rabbit, and are co-authors of about a dozen books. I enjoy gardening in what free time I have!



MICHAEL BLAND

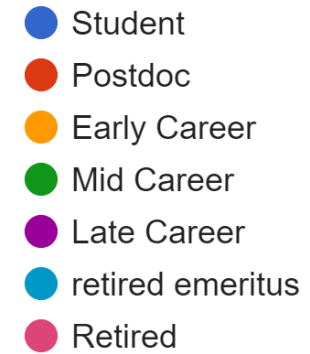
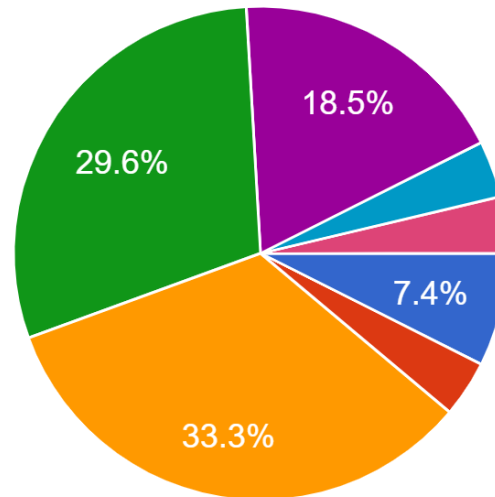
- BA in Physics and Geology from Gustavus Adolphus College, MN
- PhD in Planetary Science from the University of Arizona
- 6 years as a postdoc and Research Scientist at Washington University in Saint Louis
- Have been at USGS for 9 years as a Research Scientist and Lead for Cartographic Product Development
- Research Interests: 1) Tectonic and thermal evolution of ice-rich worlds (Ganymede, Europa, Callisto, Io, Enceladus, Titan, Ceres, Ariel) and 2) Improving the usability of planetary data sets
- Experience: Guest Investigator Dawn at Ceres, Europa Clipper EIS team (affiliate).
- Personal: My wife and I have two kids who play a *lot* of sports. Any free time is spent hiking, backpacking, or traveling.



COMMUNITY RESPONSES

Career Stage

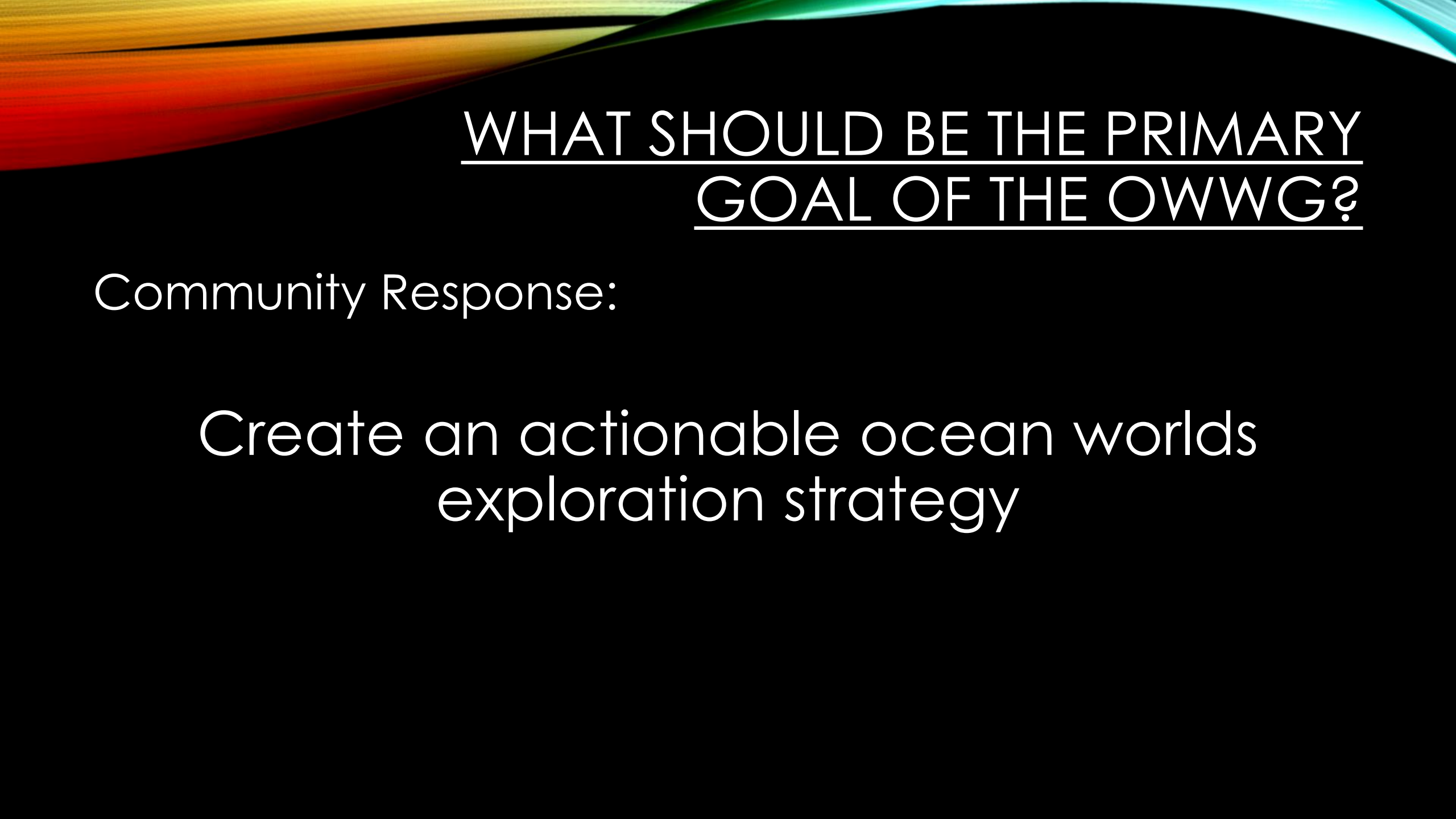
27 responses



WHAT SHOULD BE THE PRIMARY GOAL OF THE OWWG?

Community Response:

- Create a concrete and actionable ocean worlds exploration strategy
- Establish a long-term (multi-decade) strategy for exploration of ocean worlds that is not just a list of all we'd like to do, but a logical program.
- Defining scientific areas the OW community should focus on and Advocate for funding for technology developments and life detection missions
- Come up with a consistent/coherent set of community priorities for ocean worlds exploration, which is consistent with the OWL Decadal Survey but also strategizes for the future.
- Determine OW science and exploration priorities, build multi-decade timelines for OW science and exploration, advocate and lobby for those priorities and timelines within NASA, US congress, ESA, and other space agencies
- To provide a unified voice to NASA expressing the community's priorities relating to ocean worlds (missions, studies, R&A, technology investment, etc.)
- Providing a united voice for interdisciplinary community of Ocean Worlds Research and Exploration
- Assess priority questions for ocean worlds, deduce how these questions can be addressed with missions and R&A funded science, and advocate/communicate these findings to NASA and/or OPAG/SBAG.
- Mission strategy through working closely with/integrated with OPAG
- Helping advance a coherent Ocean Worlds Exploration plan/program/collective



WHAT SHOULD BE THE PRIMARY GOAL OF THE OWWG?

Community Response:

Create an actionable ocean worlds
exploration strategy

WHAT DOES “STRATEGY” MEAN?

The Mars Program “Future Plan” Example:

- Multi-decade science themes
- Program initiatives
 - Expanded opportunities for lower cost, more-frequent missions
 - Invest in key technologies
 - Enable participation for all communities
- Aspirational timeline

The OW community is NOT the Mars Program, but there are lessons to learn.

THE OWWG GOAL (INITIAL THOUGHTS)

To create an environment that facilitates the selection of missions to ocean worlds in our Solar System

- Well-defined, multi-decade prioritized scientific goals and objectives
- Robust, well-costed mission concept studies to high-priority targets
- High-heritage technologies
- A thriving research community



POSSIBLE SCIENCE GOALS

1. Complete the inventory of ocean worlds in our Solar System
2. Characterize ocean worlds to assess habitability and search for biosignatures.
3. Determine how ocean worlds form and evolve, and characterize their geophysics.
4. In situ exploration of ocean worlds from the surface or subsurface to search for biosignatures



MORE MISSIONS TO OCEAN WORLDS

- Additional PMCS opportunities?
- Robust costing exercises?
- Realistic opportunities for OW missions in Discovery?
- Inclusion of Ocean Worlds on the New Frontiers list?
- Maturation of Flagship concepts for selection by next Decadal Survey?
- International and private partnerships?



MORE FUNDING FOR OCEAN WORLDS RESEARCH

- Continuation of PSIE?
- Future of CDAP?
- New Outer Planets or Ocean Worlds R&A programs?



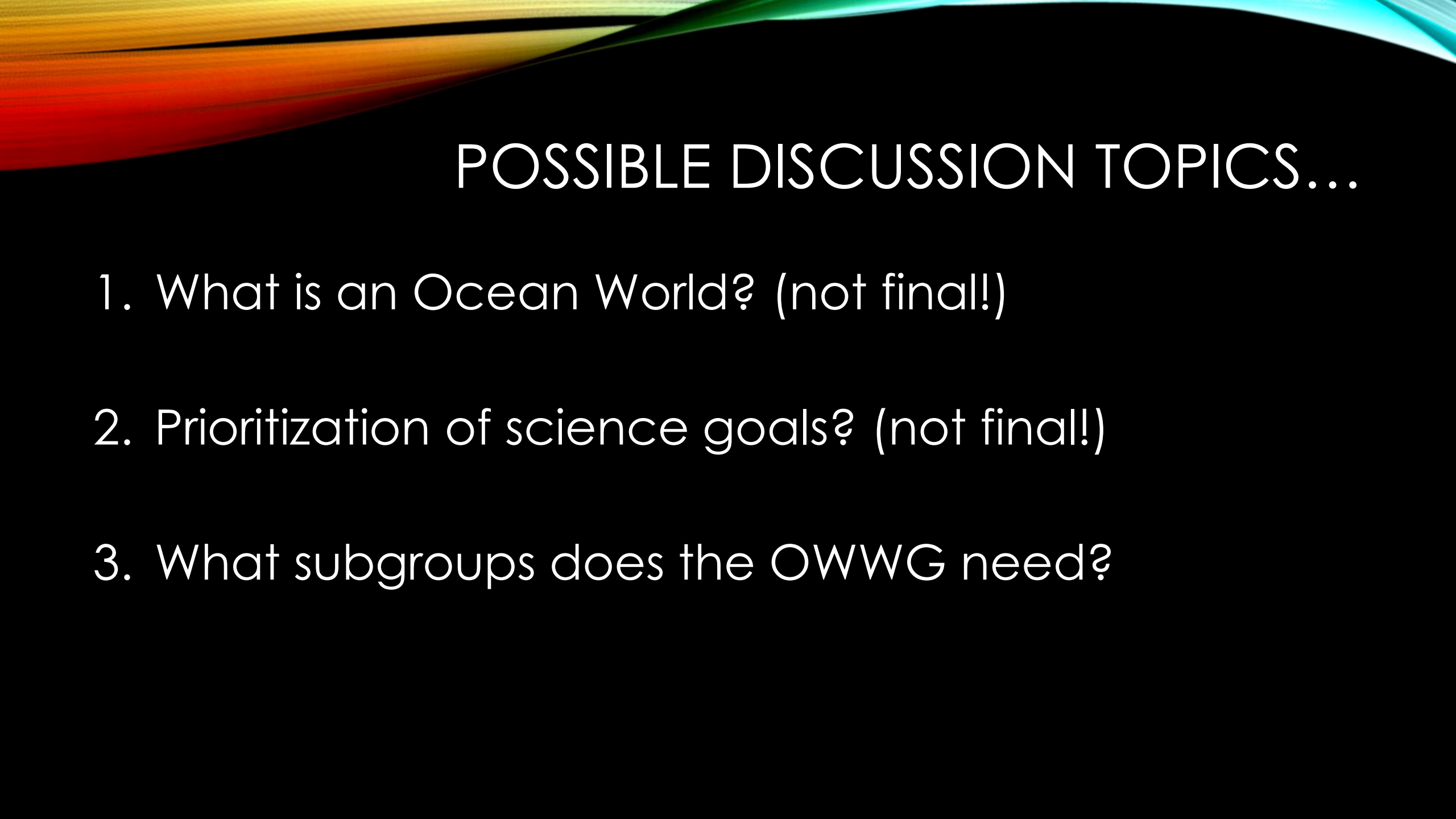
MORE OCEAN WORLDS TECHNOLOGY DEVELOPMENT

- Ocean Worlds technology Roadmap?
- ICEE, ColdTech, SESAME (precedent)?
- PICASSO, MATISSE (current)?
- PSTAR (field work)?
- Dedicated test facilities?

WHAT IS AN “OCEAN WORLD”?

Thoughts For Discussion...

- OPAG/SBAG/NOW fall under PSD and we therefore are focused on Oceans beyond Earth
- The OWWG is focused on missions that explore ocean worlds and we therefore focus on our Solar System (**visit!**)
- We include bodies that currently either have or may have substantial subsurface liquid water reservoirs.
 - Europa, Ganymede, Callisto, Mimas, Enceladus, Dione, Titan, Uranian Satellites, Triton, Ceres, Pluto, large KBOs.
- We explicitly do not include Mars and Venus (ancient oceans) and Io (magma oceans)



POSSIBLE DISCUSSION TOPICS...

1. What is an Ocean World? (not final!)
2. Prioritization of science goals? (not final!)
3. What subgroups does the OWWG need?



BREAKOUT ROOM SUMMARY

HOW SHOULD THE OWWG BE STRUCTURED?

Community Response

- “Lean”, “As simple as possible”, “Flat”, “Subgroups”
- Opportunities for early career, broad interest and expertise
- Note: AGs are relatively hierarchical, NOW is extremely “flat”

ORGANIZING THE OWWG

- 2 Co-chairs with rotations every 3 years
 - Cadence typical of OPAG and SBAG
 - Co-chairs are accountable to OPAG, SBAG, and NOW
- No standing Steering Committee
 - Avoids perception of an “in group”
- Ad hoc subgroups formed as needed
 - Organized by Co-chairs
 - Lots of room for participation and leadership
 - Early career
 - Graduate student mentoring
 - Reach out!

FUTURE PLANS

- Watch for a future survey on subgroups and volunteer to join or help lead them!
- Current goal: have a group structure and meeting cadence in place by this Fall, 2023
- Make sure to sign up for our mailing list to get notified of upcoming OWWG surveys and events
 - Visit <https://www.lpi.usra.edu/owwg/> and click on “Mailing List” at the top left
- We are always open to feedback:
 - cynthia.b.phillips@jpl.nasa.gov
 - mbland@usgs.gov