JRFB Working Group on Virtual Expeditions: Report and Recommendations to the JRFB

Working Group

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Introduction

The *JOIDES Resolution* Facility Board (JRFB) tasked the JRFB Working Group on Virtual Expeditions (WG-VE) to explore the scope and requirements for developing virtual expeditions that could occur in association with new scientific ocean drilling activities (see Attachment A). The WG-VE met 14 times between August 2022 and April 2023 to learn about different approaches to and interpretations of virtual activities, to discuss the definition of such an activity within the context of a scientific ocean drilling program, to define new terminology for the activity, and to identify key procedural recommendations.

An important finding of the WG-VE was that the term “virtual expeditions” has different meanings and implications to different people and groups. Instead of competing with assumptions already linked to that term, the WG-VE recommends calling these activities Ocean Drilling Legacy Assets Projects (LEAPs).

Ocean Drilling Legacy Assets Projects

Ocean Drilling Legacy Assets Projects (LEAPs) are standalone research endeavors that (1) address at least one aspect of the 2050 Science Framework, and (2) have objectives that maximize the return on the legacy assets of past scientific ocean drilling programs without new drilling. LEAPs are initiated from within the community and are proposal driven.

LEAPs are novel and different from established research endeavors because LEAPs:

- emphasize the use of legacy assets,
- require endorsement or approval from a review body,
- encourage open involvement and participation from the community,
- mentor early career scientists through inclusion in the science party, and
- require focused and dedicated time for the research.

LEAPs are not envisaged to replace other PI or multiple-PI research mechanisms (e.g., proposals to funding agencies for sample requests or data analysis); instead, they are intended to provide new mechanisms for collaboration at scales larger than conventional single or multi-PI research projects.

The approach for funding LEAP proposals could be analogous to IODP, in that future programs provide the mechanism for the activity or sample access (e.g., similar to providing the ship for a drilling expedition) and then the participant raises additional funding to complete the research (e.g., through PMOs, national funding agencies). In the case of LEAPs, the future programs might provide access to core repositories or other resources. Funding procedures would then vary by funding source.

Scope

The WG-VE recommends that LEAPs have objectives that originate from the 2050 Science Framework and that are addressed using legacy assets. Legacy assets are defined inclusively as all material, data, and infrastructure left by the previous scientific ocean drilling programs (e.g., samples, data, open drillholes, and downhole observatories). LEAPs should not include new drilling, as mechanisms exist (and are assumed will continue to exist) for proposing science separately that includes drilling.

The definition for LEAPs is deliberately broad to provide flexibility and inclusivity for future programs, structures, and activities. While a LEAP might have broader impacts that link to new or contemporaneous drilling, the LEAP itself should be a standalone activity that is not dependent on other expeditions or on other active research projects for success. For example, a LEAP should not include scientists participating remotely in a drilling expedition or shore-based activities for a drilling expedition.

Avenues of LEAP research could include the production of new data, integration of data across multiple expeditions and/or multiple boreholes, incorporation of legacy borehole data with new data, incorporation of a new technology that was not available when the

legacy data was collected, or measurements in legacy drillholes to address new problems in innovative and creative ways.

The WG-VE recommends that proposal guidelines for LEAPs encourage new approaches, integrations, and technology uses that foster coordinated, multidisciplinary, and international efforts to address aspects of the 2050 Science Framework. Specific proposal guidelines or individual calls for proposals could contain more detailed requirements. For example, a program might choose to require that proposals address multiple elements of the 2050 Science Framework, or they might decide that certain factors will distinguish stronger LEAP proposals from weaker proposals.

Participation

The WG-VE views international collaboration and multi-disciplinary perspectives as valuable to LEAPs, and hence recommends that LEAPs should include participants from multiple countries who represent a range of disciplines. However, given the broad nature of potential LEAP projects, the WG-VE does not recommend a specific science party size, specific quotas for the composition of their scientific parties, or a requirement that all LEAPs adhere to a prescribed approach for assembling and managing their scientific parties. Unlike participation in IODP drilling expeditions, which is linked to financial contributions due to limited berth space and the high cost of operating the platforms, a financial link isn't necessary with LEAPs. This allows for more flexibility and greater participation than on drilling expeditions. Without specific quotas, the size of the science party should be based on the scope and objectives of the LEAP.

The WG-VE recommends, however, that proponents be required to provide a Management Plan in their LEAP proposal that identifies who would lead the LEAP (e.g., which one or two proponents), how large the science party would be, and how the proponents would solicit and select science party members beyond the initial proponent group. The future programs would define the minimum requirements and provide guidance on what should be included in a Management Plan (e.g., clearly identified leadership, communications strategy), but the needs of the individual LEAP project would determine the specifics of their Management Plan.

The WG-VE also discussed the applicability of the current IODP expedition model to LEAP proposals, wherein a proposal belongs to the community once it is scheduled. This concept, combined with the country/member quotas, can result in proponents not necessarily sailing on the expedition. The resulting science and the overall community benefit from this openness and inclusivity as it brings together scientists who might not have otherwise collaborated. The WG-VE concluded that since LEAP science parties don't have the same size restrictions as traditional expeditions, all proponents of a LEAP should be expected to participate, but the Management Plan should still identify appropriate mechanisms for opening participation to the broader community. Community engagement and participation would benefit LEAPs by promoting diversity in a range of characteristics, including institution, expertise, perspective, career stage (creating mentoring opportunities), and gender.

Evaluation Process

The WG-VE recommends that LEAPs be formally reviewed and endorsed by an international panel. Formal endorsement as a LEAP would bring recognition for the research activity that could provide enhanced visibility for the results and formalized reports (i.e., similar to IODP Preliminary Reports and/or Proceedings), thus ensuring a stronger legacy for LEAP activities and their results. The vetting process that leads to endorsement could also enhance participants' ability and opportunities to seek additional funding from national funding agencies and program partners, and for proponents to request using archived halves of cores. Such an endorsement could also open avenues for other partnerships (e.g., collaborations with ICDP) and access to resources (e.g., supercomputing time).

The WG-VE suggests a model for LEAP proposals that starts with an initial proposal and proponent group. The proposal would be subject to a review process involving an international and collaborative review body and standing criteria. If approved at this first stage, the proposal would lead to a workshop or another mechanism for broader community involvement and discussion, as described in the Management Plan. The proposal would then be revised based on community input and this final proposal version would be reviewed for endorsement as a LEAP. The overall timeline for the proposal process should be shorter than for a traditional IODP expedition because site surveys and ship logistics would likely not be needed.

Once a LEAP is endorsed, the project should be numbered (e.g., LEAP 1, LEAP 2), similar to the way in which expeditions and legs are numbered. Numbering links the endorsed projects to the historical processes of the scientific ocean drilling programs, thereby continuing to grow the legacy, community, and visibility of ocean drilling science through the inclusion of these activities.

The WG-VE recognizes that LEAPs could result in significant demand on the time and resources of the scientific ocean drilling core repositories. If a proposed LEAP will use resources from a scientific ocean drilling core repository, then an appropriate curator should be involved in the evaluation process to comment on the feasibility of the work, similar to how operators have participated in drilling proposal evaluations during IODP. The WG-VE further recommends that LEAPs receiving endorsement should also receive priority, relative to other PI-driven research, from the core repositories when they are responding to sample requests and/or scheduling sampling parties. It might be appropriate for curators or data managers to be involved in reviewing data-focused projects as well.

The evaluation process for LEAPs will need to evolve over time as new scientific ocean drilling program structures are established and the LEAP concept matures.

Implementation

The WG-VE recognizes that many granular details of how LEAPs will be implemented and structured are beyond the scope of this working group, particularly given the many unknowns about the future of scientific ocean drilling. But the WG-VE feels it is important that these details should be developed to reflect the community-driven approach that has characterized scientific ocean drilling programs so that LEAPs fit inclusively within the philosophy and history. Elements such as endorsement, project numbering, and programmatic connections will help to amplify the impact of LEAPs, making the legacy assets used and their contributions to scientific ocean drilling science more valuable.

The lead proponent or proponents should be responsible for implementation of the LEAP; this responsibility and other management roles should be discussed in the proposal's Management Plan. The WG-VE discussed whether a position equivalent to an expedition project manager (EPM) would also be needed for LEAP implementation. The concept of an EPM worked well for drilling expeditions in previous scientific ocean drilling programs because there was a commonality in the way expeditions proceeded; the EPMs provided consistency throughout a long and complicated implementation process. The potential scopes, objectives, and methodologies for LEAPs will likely be much broader and less prescribed than those of conventional scientific drilling expeditions, so the EPM approach would not translate effectively across this range of projects.

While an EPM doesn't fit with the LEAP concept, future scientific ocean drilling programs and the endorsing body still need a connection to endorsed LEAPs, and the project team may need overall guidance. Practically, future scientific ocean drilling programs should be informed of the status of a project's implementation, the obstacles that a project is encountering (e.g., uncertainty about who to coordinate with for sample access), and the progress a project is making in documenting outcomes, which may include specific reporting requirements. A structure for tracking and communicating with LEAPs through a designated point-of contact will be needed, which could be envisioned as a liaison, guide, facilitator, or program manager.

Another important implementation aspect of traditional drilling expeditions is the coordinated shipboard experience. Shipboard time on expeditions provides international teams with a structure and workflow that supports a sustained and focused research effort, promotes collaboration, and supports active progress toward expedition goals, which ultimately benefits the science. The WG-VE recommends this type of team focus be considered when developing LEAP proposals, with the specific approach (dependent on the specific research objectives and methods) outlined in the Management Plan. For example, a LEAP could take place over a series of scheduled virtual meetings, or the focus could come from an in-person kick-off meeting. Other LEAPs might need the team to work at a core repository for a specific period of time. Ideally, the length of each LEAP would be based on the scientific objectives of its research.

Outcomes and Scientific Legacy

To document outcomes, each LEAP should produce a project report discussing the results from their research. The future programs or the endorsing body they create should develop general requirements for a project report, but proponents would outline the timeline and method (e.g., in-person meeting, workshop, online collaboration) in their Management Plan for producing that project report. This approach recognizes the diversity of LEAP activities and allows for proponents to determine what best suits their project. Future programs may consider whether there should be a maximum amount of time specified for completion of the activity and its project report. In addition, LEAPs would not need to submit their data to a LEAP-specific database, but future programs could provide a list of recommended databases for archiving new data.

The WG-VE recognizes that the research impact of each LEAP is likely to continue after the project report is complete. To track these results, a centralized website could maintain a list of publications or other resources (e.g., links to data submitted to a database, data DOI) that result from each LEAP. This could be similar to the way in which the JRSO publications team tracks references for IODP.

Conclusions

The WG-VE envisions LEAPs as a new and valuable contributor to the overall landscape of scientific ocean drilling science and strongly endorses efforts to strengthen the impact and value of this concept, including integrating LEAPs within the broader fabric of scientific ocean drilling. As future programs are developed, there could be methods for collaboration and coordination with other programs that use legacy assets, as well as additional ways to fully incorporate LEAPs under the umbrella of scientific ocean drilling programs and their alliances.

Attachment A: Statement of Task: JRFB Working Group on Virtual Expeditions

At its June 2021 meeting, the JRFB approved Action Item 6: Virtual Expedition Working Group. “The JRFB Chair will formulate a working group to explore the scope and requirements for developing Virtual Expeditions that could occur in any new phase of scientific ocean drilling. This working group will coordinate with the USAC Legacy Data Working Group and J-DESC.”

The motivation for this effort lies in a desire to explore opportunities and to develop expectations for virtual expeditions that: 1) may be coordinated research efforts during times of reduced platform operations; or 2) may be distinct research efforts not linked to contemporaneous drilling during times of regular platform operations. Based on anecdotal evidence, however, individual views of what might constitute such virtual expeditions vary widely, and the details for evaluating, endorsing, and implementing virtual expeditions are poorly defined. As a result, the Virtual Expedition Working Group is charged with the following two major tasks:

1) To define the minimum requirements for a research effort to be considered a virtual expedition. These might include, but are not limited to, criteria such as:

    a) The scope of the science to be addressed (e.g., minimum extent and nature of links to the various components of the 2050 Science Framework (Strategic Objectives, Flagship Initiatives, and Enabling Elements))
    b) The nature of the equivalent of the science party (e.g., minimum number of investigators, minimum number of institutions, minimum number of international partners)
    c) The nature of the equivalent of an operational platform (e.g., laboratories, digital networks)
    d) The nature of the equivalent of shipboard party activity (e.g., communications, meetings, data sharing)
    e) The extent and source(s) of fiscal support

2) To develop recommendations for procedures related to the evaluation, endorsement, and scientific outcomes/scientific legacy of a virtual expedition. These might include, but are not limited to:

    a) Procedures associated with any programmatic review and endorsement of a proposed virtual expedition (e.g., should a proposed virtual expedition be reviewed by a SEP-like body? What entity, if any, would provide an endorsement of an effort as a virtual expedition? Should a virtual expedition be formally recognized with an expedition number? Should a virtual expedition include a programmatic representative equivalent to the existing EPM?)
    b) Procedures associated with selecting the virtual expedition party members (e.g., should the science party be nominated by PMOs and selected by an operator? Size of virtual expedition party? Should there be national quotas?)

c) Procedures associated with the scientific outcomes and scientific legacy of a virtual expedition (e.g., should each virtual expedition prepare a prospectus, a Preliminary Results volume, etc.? If so, should those publications be prepared by the same group that publishes these documents for platform operators? Should data generated during a virtual expedition be archived in the same databases as prime data generated by shipboard and shorebased science parties? Should publications generated by a virtual expedition be tracked in the same way as publications generated by shipboard and shorebased science parties?)