

IODP Forum Meeting #3
Búzios, Brazil
September 21-22, 2016

Participants

BRAZIL

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ECORD

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A. Welcome, Introductions, Approval of Agenda (*presentation A – Austin*)

- Call to Order, Welcome, Logistics (Austin, Brazilian host [TBD])
- Self-introductions
- Meeting procedures
- Overview of agenda (Austin)
- Approval of agenda (All)

Forum Chair J. Austin called meeting to order and thanked the participants for traveling to the wonderful town of Buzios. He thanked host C. Silva who introduced the participants from Brazil: J. Carvalho, L. Jovane and H. Vital. Austin introduced himself and former Forum chair Becker, who was participating at his invitation to take notes of the meeting discussions. Austin summarized the purpose and mandate of the IODP Forum, emphasizing the importance of the Forum as an open discussion venue and encouraging all attendees to participate actively. The attendees then introduced themselves.

Austin then reviewed important consensus items from the 2015 Forum meeting, inasmuch as they frame the agenda for this 2016 meeting and the Program Member Office (PMO) meeting immediately afterward. The Forum then registered the following consensus of approval of the agenda distributed prior to the meeting.

Forum Consensus Item 16-01: *The Forum approves the agenda for its third meeting in Buzios, Brazil.*

Agenda Section B. Agency, PMO, and Operator Reports

NSF: J. Allan started by acknowledging the importance of Brazil joining the program in 2013, when their financial contribution was critical in keeping *JOIDES Resolution* (JR) operating. He then detailed the improved current financial situation for JR operations, which is allowing for 10.5 months of operations over 5 expeditions in FY2017. He noted that the Complementary Project Proposal (CPP) funding mechanism has allowed NSF to shift some of its funding from direct support of JR operations to science costs in support of JR expeditions (e.g., geophysical surveys). He noted that, from the NSF perspective, the FY2017 level of operations should be possible through the next phase of the program (FY2019-2023). He then described

a potential Forum discussion item relating to the definition of “expedition data,” in the light of recent requests for post-expedition collection of extra core-related data: who pays for this, and what is actually considered “expedition data.” He suggested that the Forum discussions could feed into specific approaches to address this issue in memoranda for the next phase of IODP. Allan then described the FY2017-2019 timeline leading to renewal of JR operations in the next phase of IODP. NSF goals for the next phase include: (a) 10 mo/yr for JR operations, (b) partner contributions to increase to 1/3 of JR operations (as at the end of ODP), (c) CPP contributions to increase from the current level of \$6M/ CPP to at least \$8M/ CPP, and (d) introduction of the non-IODP, separately funded “JR100” program (coring to less than 100 m) during appropriate JR IODP tie-up periods. He then highlighted the increase of US scientific staff participation in JR expeditions from 8 to 10, in response to US NAS *Sea Change* report recommendations and the decision to include the onboard outreach program participants within US and partner staffing quotas. He noted that this will be codified in the memoranda for the next phase. Some discussion ensued as to a need for mentoring such outreach participants, requiring them to publish, and determining how their output is evaluated. Allan then described the framework for the non-IODP JR100 program, which is motivated in part by a need to supply a long piston-coring capability for the US scientific community, given the retirement of the giant piston-coring program formerly provided by WHOI/*RV Knorr*. The JR schedule would define the potential time and region for JR100 opportunities, proposals would be required to other sections of NSF, and staffing would be conducted like a typical UNOLS (i.e., US academic research fleet) cruise.

In response to a question from Christensen, Allan suggested JR100 could begin in FY2018-2019. Becker asked if the discussions about the expanded definitions of “expedition data” would include observatory data. Allan responded that those had been treated differently in the past, but indicated that this could be discussed further. Koppers pointed out that the post-cruise core-related “expedition data” also involved a question of access/ownership by the whole scientific party, when individual PIs often were responsible for obtaining the financial support. Klaus pointed out that the JR expedition sample allocation process could allow for restricted access to these data. Austin closed the discussion by indicating that the topic would be revisited later in Forum discussion.

MEXT: Sato reviewed personnel changes in MEXT, including appointment of a new Director for the Ocean and Earth Division, T. Hayashi, and how that relates to the overall MEXT structure. He summarized the Japanese timetable and review process for five-year renewal of *Chikyu* IODP operations for FY 2019-2023. He also summarized current and near-future Japanese/JAMSTEC activities and priorities in ocean research. He highlighted the importance of the ocean research as discussed in

the 2015 and 2016 G7 meetings in Germany and Japan, respectively, and expressed a hope that it would be included in the agenda for the 2017 G7 meeting in Italy.

EMA: Gatliff, representing Camoin (head of EMA, who could not make the meeting), summarized the ECORD/EMA structural organization including ESO, ESSAC and a reduced scope ILP. He then described the ECORD budget, with an average annual budget of \$17.5-19M from 17 current partners, whose contributions range from \$30K to \$5.6M. He described efforts to engage two new partners. He summarized what might be considered as In-Kind Contributions (IKCs) to ECORD, in lieu of financial contribution and how they would be rewarded. He then summarized the current 5-year ECORD MSP operations plan that includes an average of one expedition/yr from FY2014-18, allowed by scheduling a range of low-cost, mid-cost, and high-cost expeditions.

Allan asked whether BREXIT will have any impact on ECORD. Gatliff replied by emphasizing that ECORD gets no direct funding from EU and that ECORD contributions are solely national, so BREXIT should have no financial impact. Austin indicated that the Forum would return to discussions of the financial basis for the program; he noted the conflicting indications of no increase in ECORD funding and declining *Chikyu*/Japanese support, in contrast to the NSF intention to request increased JR partner contributions in the next phase of IODP.

ANZIC: Arculus noted that Australian IODP activities are funded through 2020 at half of regular JR partner level, plus a *Chikyu* partnership, and that New Zealand intends to continue in ANZIC. He summarized the important contributions of DSDP, ODP, and IODP-1 in the region. He outlined the strong rationale for the value of scientific ocean drilling for Australia and New Zealand (NZ), and highlighted the strong package of FY15-18 IODP-2 expeditions in the region. He also highlighted the recent \$N6.5M award from NZ in support of science related to IODP Hikurangi expeditions. In conclusion, he emphasized that Australia and New Zealand have long-term commitments to IODP, recognize the great value they have received for being in the program, hope to bring *Chikyu* to the region for the Lord Howe Rise CPP program, and intend to host a major regional workshop in 2017 to develop proposals in the region for the next phase of IODP.

China. Jian started by noting that the Chinese partnership in JR IODP operations is funded through 2023 at \$3M/yr. He also noted that IODP-China is a strong additional contributor by way of the CPP mechanism, and he summarized the three JR expeditions (one completed, two scheduled) based on Chinese CPPs in this phase of IODP. He then described the objectives of a recent letter from the Chair of the IODP-China Scientific Advisory Committee (who is also Vice-President of the Chinese Academy of Sciences). This letter outlines the following four proposed enhancements to China's contributions to IODP in the future that represent a strong consensus of the IODP-China community:

- Organize MSP expeditions and become a fourth platform operator
- Construct a new IODP Core repository in Shanghai
- Design a new generation drilling vessel for post-2023 scientific ocean drilling
- Contribute more to IODP scientific activities by hosting a global monsoon workshop and the next meeting of the IODP Forum, both in September 2017.

The proposed core repository would be housed in a new campus that is already approved by the Shanghai government and partly constructed. The proposed ship is currently envisioned to be about the size of JR but with *Chikyu*-like capabilities, provided by a riserless mud-return system. The vision is that it would be operated 6 mo/yr for industrial use, 3 mo/yr for IODP, and 3 mo/yr for domestic scientific use. As preparation, IODP-China would also like to organize a major international workshop on scientific justification for post-2023 scientific ocean drilling.

Austin applauded the enthusiasm and resources that China proposes to bring to the program and suggested that the Forum should register a consensus of general support (*ref. consensus 16-02*). However, he noted that details of the four proposed enhancements are not for the Forum to decide and should instead be worked out elsewhere at appropriate venues, e.g., at Facility Boards and among IODP funding agencies. Forum participants agreed in principle, but nevertheless raised some questions about details. Given asked when and how the proposed Chinese MSP activity would be organized, given that ECORD is currently defined as the IODP MSP provider. Gatliff responded that ECORD is very interested in cooperating with this effort. Allan suggested that wording other than “mission-specific platform” should be used, because the current IODP memoranda define MSP in a very specific way. He noted that the JR environmental impact statement will expire in 2028, making that a critical year in terms of NSF plans for future JR operations within IODP. He also noted that the storing of U.S. Government property- the South China Sea IODP cores taken by the JOIDES Resolution- at the proposed Shanghai core repository would require a number of steps. The current distribution of DSDP, ODP, and IODP cores was approved by a consensus of the international ocean drilling scientific community. This distribution would need to be changed, requiring discussion at all three IODP Facility Boards with the assistance of the IODP Forum. If all Facility Boards recommend this change to NSF, NSF would consult within the U.S. Executive Branch before reaching a decision to either support or deny the request.

India: Bansal summarized Indian participation in the current phase of IODP and expressed specific interest in developing potential new IODP projects in the Andaman subduction system. Austin suggested that the Forum should be supportive of the latter as a planning effort with a consensus statement (*ref. consensus 16-04*). Arculus suggested including the sedimented back-arc Andaman Sea spreading center as a type example for generation of economic hydrothermal ore deposits. Kimura strongly supported the geohazards aspects of the idea.

Japan: Nishi (representing J-DESC) summarized Japanese contributions in IODP panels and expeditions. He also summarized J-DESC contributions to IODP symposia/workshops and the extensive IODP outreach efforts within Japan. He described Japanese core school efforts and *Chikyu* ship tours. He noted plans for an IODP session being proposed for the 2017 joint JpGU/AGU meeting and encouraged strong international participation. Austin commented on the level of activity that demonstrates enthusiasm for IODP and *Chikyu* operations within the Japanese scientific community, as contrasted with the sobering financial situation that limits MEXT support of *Chikyu* IODP operations. He suggested that a Forum consensus of the importance of *Chikyu* scientific and its societal contributions would be very useful for *Chikyu* renewal efforts (*ref. consensus 16-03*). Christensen suggested that IODP should reconsider whether to provide program-wide education and outreach, noting that could be important for renewal of the program. Austin noted the historical background, a decision at the end of IODP-1 that education and outreach (E&O) were to be national activities. Allan noted some of the structural rationale behind that decision, but also suggested that the rationale could be revisited at high levels. Koppers noted that the most unifying aspect of IODP is the science, as represented for example in the Science Plan, so that scientists should be able to provide summaries of scientific results in support of program-wide renewal efforts. Kimura and Arculus commented on their national situations; the subject was to be revisited under the agenda section re: renewal. Brenner noted the annual fall meetings of the ECORD E&O task force meeting, to which representatives of other IODP partners are invited; he suggested that this meeting is the appropriate venue at which immediate progress can be made on program-wide E&O.

Korea: Kim summarized Korean participation within IODP and K-IODP national education and outreach. Austin asked about Korean interest in renewal of their IODP participation, and Kim noted some lack of interest in the program on the part of the Korean government. Austin suggested that the Forum should be supportive of all IODP partner renewal efforts, to be discussed further in the agenda section re: renewal.

USSSP: Brenner reviewed USSSP personnel and participation of US scientists in IODP expeditions. He summarized USSSP support for and objectives of IODP workshops in the past year. He noted USSSP support for a workshop and short courses for early career IODP scientists. He summarized USSSP support for IODP meetings and USSSP E&O efforts that he noted were to be discussed in more detail at the PMO meeting following the Forum on 23 September.

CDEX: Eguchi reviewed the strong motivation for CDEX to run IODP expeditions in JFY 2016-2018, given the lack of *Chikyu* expeditions in 2014-2015 and the importance of addressing high-impact projects early to justify the MEXT budget allocation. In that context, it was important for two *Chikyu* expeditions (365 and 370) to be conducted in JFY2016. Eguchi summarized recent *Chikyu* maintenance

and lab modification work. He reviewed the successful outcome of Exp. 365 to recover the Genius Plug and install a new LTBMS at the NanTroSEIZE riserless observatory site. He summarized the current status and operational plan of Exp. 370 (Nankai Trough T Limit). He then reviewed provisional CDEX plans for *Chikyu* in JFY 2017-2018. CDEX is still working on potential non-IODP commercial contract activities, and there are firmer plans for non-IODP Japan Methane Hydrate (JMH) and Special Innovation Program (SIP). There may also be an ICDP Oman core description program onboard *Chikyu* in 2017. The vision is that the *Chikyu* IODP schedule for 2017-2018 will allow for at least one riserless expedition to be determined by CIB and the resumption of NanTroSEIZE riser deepening of Site C0002 by the end of JFY2018. Finally, Eguchi reviewed CDEX E&O plans.

Given noted that the proposal associated with Exp. 370 may have passed through the review and scheduling system more quickly than any other proposal, complimented CDEX on the number of women in the Shipboard Party, and commended the CDEX outreach effort. Austin seconded the complement on outreach for Exp. 365, Behrmann seconded the compliment on staffing Exp. 370 so well and so quickly, and Austin noted that Exp. 370 is very important in terms of addressing the Science Plan sub-seafloor biosphere theme.

ESO: Gatliff reviewed the successful operations and scientific outcomes of the recent MSP Expeditions 357 (Atlantis Massif Serpentinization and Life), and 364 (Chicxulub Impact Crater). He noted that Exp. 357 also had a high proportion of women in its Scientific Party, and Exp. 364 enjoyed excellent relations with the Mexican government and generated a huge media impact. He summarized plans for MSP operations in the coming two years for Antarctic Cenozoic Paleoclimate (early CY2018) and Central Arctic Paleoceanography (ACEX2, summer CY2018). He then quickly reviewed the status of five pending MSP proposals at the ECORD Facility Board, as well as MSP proposals currently at SEP.

Austin noted that the multiple pending MSP proposals could represent an excellent opportunity for China to contribute quickly to IODP in the context of their plan to offer a future MSP capability.

JRSO: Clement started by expressing satisfaction at now being able to field 5 JR expeditions per year. He noted that the JR expeditions in the Indian Ocean region collectively will have a major paleoclimate impact in terms of: (a) constraining the overall oceanographic heat input and output (W Pacific Warm Pool and SAFARI, respectively) through the Indian Ocean and (b) an integrated study of the Indian Ocean Monsoon. This will be of high societal relevance for understanding global climate and should be highlighted in program renewal efforts. He also noted that ODP/IODP were pioneers in making data publicly available online – the recent trend in scientific publication - and need a bit more work to continue that effort to make

the online data also machine-discoverable. He then quickly reviewed results of JR expeditions in the Indian Ocean, expedition by expedition.

Agenda Section B consensus statements: After additional discussions throughout the Forum meeting, this section of the agenda produced three consensus statements, as follows:

Forum Consensus Item 16-02: *The IODP Forum expresses its undivided support for the enthusiasm displayed by China in its stated intention to expand its participation in IODP through both an increased investment and potential provision in the future of both additional drilling platforms and shore-based facilities (e.g., a core repository).*

Forum Consensus Item 16-03: *The IODP Forum endorses the unique contribution brought to scientific ocean drilling by Japan and the Chikyu. The Forum enthusiastically supports the internal campaign of the CIB to seek continued funding from the government of Japan for Chikyu operations both for the next ~2 years and for the next phase of IODP (2018-2023). Chikyu continues to deliver world-class science, with tremendous ongoing impact for IODP Science Plan challenges and for societally relevant goals in Japan, involving primarily sub-seafloor biosphere and natural hazard objectives.*

Forum Consensus Item 16-04: *The IODP Forum enthusiastically supports the stated initiative from India to conduct IODP planning in the Andaman Sea and adjacent subduction zone. The Forum notes the importance to IODP of continuing cooperation with prospective member states and other countries in this region, and will support India's engagement of relevant scientific communities in all such planning efforts.*

C. Mid-Term Renewal

Christensen (USAC chair) summarized the US perspective on renewal, including plans for the so-called "Denver-II" workshop (a follow-up to the US renewal activity in the same city for the 2013-2018 phase of IODP) planned for late summer/fall 2017. The goals of this workshop are to provide an American assessment for NSF and its National Science Board of the role of the JR to date in accomplishing the Science Plan, a projection of its role in completing the remainder of the Science Plan, and highlights of the current regional operational/scheduling approach for the US drillship. A steering committee of ten has been appointed; Christensen anticipates that about 40 additional US participants will be selected by the steering committee. For input, there will be a survey open to all IODP participants. There will also be an effort to write summaries of JR scientific highlights before and at the workshop that will in part address the 2015 Forum consensus for producing brief summaries of IODP-2 highlights useful for renewal efforts by all IODP partners. In response to a question from Friberg about the make-up of the workshop participant list, Christensen noted that the purpose of the workshop is specifically defined, but that USAC is considering other means to address issues relevant to overall program

renewal, like expanding the user community for scientific ocean drilling or redefining the Science Plan. Behrmann agreed that Friberg's question was a good one, noting that the geobiology community has begun to be drawn into IODP, but also noted that such a development should be best addressed when the Science Plan is rewritten. Austin reminded everyone that it is not yet time to develop a new Science Plan, in that the current decadal version is very broad and there is still much to be addressed. Friberg commented that the geodynamo community still needs to be drawn in; Allan noted that some JR coring has already addressed this objective.

Gatliff described ECORD plans for renewal, which are complicated because each of the ECORD partners have different end dates for their current financial commitments and timelines for renewal. ECORD is currently seeking nominations for members of its 2017 ECORD Evaluation Committee (EEC), whose members will purposefully not be currently active IODP scientists. The EEC mandate will be to produce a focused, high level document covering a review of: (1) ECORD achievements across IODP, a (2) the impacts of MSPs in particular, and (3) the effectiveness/efficiency of ECORD entities. Once the EEC report is issued in 2017, ECORD will update its internal MOU's in 2018 for final acceptance in 2019.

Koppers asked about the origin of the IODP definition of MSP, as addressing objectives that JR and *Chikyu* cannot address. Austin asked the group if other IODP partners want to make additional statements about renewal. He noted that the Forum's role is to be enthusiastic about renewal and assist philosophically as needed. Friberg commented that the ECORD renewal process will indeed be complicated, partly because of the factors mentioned by Gatliff. Behrmann also emphasized that as there are only three countries (Germany, France, the UK) that provide the majority of ECORD funding, as well two additional significant financial contributors, what happens in those countries will be very important. Austin reviewed the recent effort to engage South Africa by way of discussions with Debeers Marine in Cape Town, noting that Namibia might also represent a potential member because so much of their national economy is based on diamond mining. Christensen noted that ICDP is also interested in engaging African partners with partial support from UNESCO, so there could be promise in exploring the Africa consortium approach for both ICDP and IODP.

D. Forum Mandate #1: Progress Toward Science Plan (SP)

Austin referred to the updated Forum Chair assessment of IODP progress toward the Science Plan available at www.iodp.org/forum. He noted that the current distribution of 43 completed/scheduled expeditions by SP theme includes 20 (47%) in climate and ocean, 8 (19%) in Earth in Motion, 11 (26%) in Earth Connections, and 4 (9%) Biosphere Frontiers. The distribution of active pre-proposals and proposals is similar, but shows a slight increase in

Biosphere proposals. Austin asked for feedback. Koppers noted that the biosphere objectives have also been included as secondary objectives of proposals in other categories. Morris asked if the distribution of proposals by themes is comparable to the distribution of expertise in the larger scientific community. Austin responded that the two biggest sections of AGU, the largest international earth sciences society, are in ocean sciences (linked to Climate/Ocean theme) and tectonophysics (linked to the combination of Earth Connections and Earth in Motion themes), so there is indeed consistency. Given noted that the distributions of proposals by themes has not changed much over the lifetime of the program. Austin countered that the question can still be asked whether the program is engaging the biosphere community enough. Klaus argued that the biosphere community is going through a natural evolution that started by working on programs counted in other themes and is now leading strong biosphere-specific programs (e.g., Expedition 370). Clement noted that other apparently unrepresented communities are actually served by programs in the major IODP themes, e.g., the geodynamo community is served by many paleoclimate expeditions.

Austin noted that the overall question is whether the current distribution of proposals and expeditions suggests that there are any themes or challenges for which the Forum should specifically encourage or solicit proposals. In the discussion, the consensus seemed to be that the distribution is reasonable, given the breadth of the Science Plan and stability of distribution. Available statistics also noted that there are over 1000 identified proponents, which suggests that the program is engaging a large and presumably representative community. Friberg, based on studies he is involved in producing, noted that the number of unique authors on publications stemming from scientific ocean drilling is ten times greater, reinforcing the consensus that the program is effective at engaging a large scientific community.

E. Planning progress at SEP and Facility Boards

Science Evaluation Panel: SEP (science) co-chair Miller started by quickly summarizing the SEP terms of reference and how SEP fits into the overall IODP structure. He noted some issues about the definition of the expected financial contribution of CPPs and the number of days allowed for an APL. He reviewed: (1) the histories of proposal submissions at the biannual IODP deadlines, (2) SEP activities since the start of IODP-2, (3) SEP proposal decisions at the two 2016 SEP meetings, and (4) plans for two 2017 SEP meetings. He reported the name of the next SEP (data) co-chair, Sean Gulick of UT/Austin Institute for Geophysics. He reviewed the latest JRFB projection for the JR track and the map of full proposals in the Atlantic, and noted that there is a question as to whether there are sufficient Atlantic proposals to support the projected (multi-year) JR track in that region.

Adding current pre-proposals would indicate that there probably will be enough, although Miller pointed out that some of them will need additional site survey data. He noted some issues in reviewing long piston-coring proposals submitted as MSP-only, when the work could be done by JR, and suggested that proponents be asked not to be specific as to the required drilling platform.

Austin commended the choice of the next SEP co-chair and also noted the positive contributions of the outgoing SEP co-chair, Dave Mallinson. Friberg asked what SEP would do if they received a proposal that is not related to any Science Plan theme or challenge. A number of attendees responded that this was not likely, given the breadth of the Science Plan, but that SEP would still evaluate such a proposal. Koppers asked about the issue for definition of APLs, suggesting that some flexibility in the time allowed would be good. Austin recounted the history and noted that the issue is one of both cost and time limits. Miller suggested defining a stricter limit, like 6 days, rather than the current 10-15% of expedition time. Arculus asked whether there is an assessment of the scientific impact of APLs; Miller noted two examples with excellent return. Koppers suggested the program should accept proposals regardless of whether they fit a standard (JR) expedition length. Behrmann noted a recent example offshore Costa Rica of combining two programs into a full expedition, and Clement also noted the upcoming successful APL example off Hikurangi. Miller closed by reiterating that the three facility boards should reconsider making a clearer definition of APLs as applied to the respective IODP platforms.

ECORD Facility Board: Behrmann (ESSAC chair) reported on behalf of EFB chair Lericolais, starting by reviewing recent and upcoming MSP expeditions that Gatliff had summarized previously. He then reviewed the unscheduled MSP proposals that are still at EFB, in the context of a long-range ECORD financial projection for 2019-2023 to be able to field three low-cost expeditions, one medium-cost expedition, and one high-cost expedition in the final year. Friberg noted that ECORD/EFB should not be blamed for some descoping of the Chixculub program, given the fiscal limits. Austin noted again that the Forum is very enthusiastic about MSP science and commended the EFB approach to identify expeditions by cost levels in order to do long-range planning constrained by reasonable budgets. Morris noted that seabed rock drills had been used successfully before Exp. 357 (Atlantis Massif) in support of IODP objectives. Miller revisited the history of the Chixculub descoping, since original proposal submission in 2000.

Chikyu IODP Board: Eguchi presented a summary on behalf of CIB chair Tatsumi. He reviewed the status of the search that is currently underway to replace three of six CIB science members who rotate off as of September 30, 2016. He then reviewed the important consensus items from the 4th CIB meeting in March 2016. He showed

the lists of *Chikyu* proposals: (a) now at CIB and (b) at SEP, classified by Science Plan theme and challenge. Austin noted that it was clear at the last CIB meeting that it would be important to see real progress on the NanTroSEIZE program and the geohazards objectives offshore of Japan by the end of this phase of IODP (as was reinforced by the Forum Consensus Item 16-03, see above).

JR Facility Board: Chair Koppers reported on the outcomes of the May 2016 meeting. He noted that the JRFB had simplified the proposal guidelines, and showed three relevant consensus items, including one establishing a JRFB subcommittee to simplify JR policies and procedures that have also been adopted by CIB and EFB. He noted JRFB support for: (a) the collection of post-expedition XRF core scan data and (b) the JR100 program (see also above) for using the JR in non-IODP mode for long piston-coring at appropriate windows of opportunity in the JR IODP schedule. He noted the Amphibious Drilling Proposal (ADP) model that was approved in concept in 2015 by ICDP and the three IODP facility boards and the IODP Forum, and reported on the status of updating the IODP proposal guidelines to include ADPs. Koppers then moved on to the FY2017-2019 scheduling decisions made at the same meeting. This window includes a mandatory 5-year inspection in FY2018, and the first potential window for a JR100 program during a scheduled transit. Austin noted that the schedule included two APLs that fit well with the APL model. Arculus noted that the Brothers Flux program (Exp. 376) brings to IODP a new scientific community in on-land economic ore geology. Koppers noted that one of the scheduled programs is contingent on availability and funding for an ice-breaker in support of JR Antarctic operations. He noted that there are five current Antarctic JR proposals and weather-window potential to consider scheduling three in three consecutive austral summers.

Koppers then showed the modifications made at the May 2016 JRFB to the projected long-term JR ship track and explained the rationale, which is centered on the timeline needed to cultivate a strong Atlantic proposal pool and the locations of the current mature JR proposals, including a CPP in the Gulf of Mexico. He reported SEP co-chair and JRFB science board rotations, and noted that JRFB: (a) deactivated 16 proposals at SEP that had been inactive > 5 years and (b) decided to limit the number of proponents to 20 on a given proposal, including up to 10 main proponents, with one identified as primary site survey contact. He noted both the JRSO FY2015 review panel in February 2016 and plans for a JRSO FY2016 mid-term review panel, to be chaired by M. Torres, in February 2017, in conjunction with a JR annual co-chief review to be chaired by L. McNeill. He closed by: (a) stating that the SEP proposal review process for regional planning of the JR ship track works efficiently and (b) commending the improved JR business model. Austin pointed out that the JRFB is also working very well in its long-term regional JR ship track mode,

commended the EFB for its mode of cost-based mode of MSP planning, and noted the Forum support for CIB and its encouragement of *Chikyu* renewal.

Day 2 - September 22, 2016, 9:00 AM – 5:00 PM

F. IODP Results Since Forum Meeting #2

The group agreed that this agenda item was covered adequately by the Day 1 presentations.

G. Forum Mandate #6/Consensus15-05: Overarching public relations + educational activities

US: Brenner summarized the five core E&O activities conducted by USSSP: the Onboard Outreach Program involving US and international outreach officers on JR plus US officers on other platforms, School of Rock, informal science programs such as the collaboration with the American Museum of Natural History (AMNH), the Schlanger graduate student fellowship program, and the Ocean Discovery Lecture Series. For the onboard outreach program, he presented some statistics related to ship-to-shore video presentations over 4 expeditions, noting that it is not clear what metrics should be used to evaluate the impact of such activities. He described the 2016 School of Rock conducted during the JR tie-up in Cape Town that included 12 US participants, 2 from Europe, and 2 from South Africa. He noted that the AMNH program engages teachers, underserved youth, and the general public, including a wide audience of international visitors to New York. He showed the latest groups of: (a) five Schlanger graduate student fellows, who are involved in both shipboard and shore-based IODP-related work across a range of IODP themes and (b) six Ocean Discovery Lecturers for 2016-2017, who are each giving an average of 8 lectures at various institutions across the US. He then briefly summarized other USSSP activities, such as an LDEO undergraduate summer internship program, the Ocean Discovery print newsletter, the USSSP electronic community updates, social media and an IODP Wikipedia page, and participation at US conferences such as AGU, Ocean Sciences, NSTA, GSA, etc. He closed by summarizing the US efforts at international E&O collaborations, such as non-US outreach officers on JR, US officers on other platforms, ideas for a joint School of Rock with other IODP partners, and collaboration on E&O-themed summer schools.

Given asked about opportunities to engage young scientists who are interested in the program but do not intend to pursue a Ph.D., such as internships, short-term stints on the IODP shipboard technical staff, etc. In discussion, it seemed that there is no systematic approach. Brenner noted a UNOLS program for undergraduate short-term sailing opportunities that IODP might emulate for short expeditions or transits. Christensen mentioned that USAC has discussed whether to open the fellowship program to MS students. Koppers wondered if master's level (MS)

students would be able to fulfill all the expectations of a shipboard scientist, but Klaus noted that there have been some international MS student participants. Allan also brought up the issue of MS students fulfilling the expectations of shipboard scientists. Clement noted that TAMU is involving undergraduate students with shorter-term research projects that utilize IODP data and samples and suggested other elements of the program should consider such an approach. Morris noted that ECORD also has a lecturer program that is quite successful, but he suggested that they don't have much impact beyond the specific lecture venues. He asked whether such presentations should be recorded to make them available more widely. Austin noted the difficulties in recording to preserve the fidelity of the lecture, but there was sentiment to pursue more effective ways of doing so.

ECORD: Behrmann presented a report from the ECORD E&O Task Force, which meets twice annually and invites participation of E&O personnel from other IODP partners and ICDP. He reviewed the mandate, membership and meeting schedule of the Task Force. He then summarized the various print resources produced by ECORD (annual reports, newsletters, calendars, etc.) and ECORD communication activities at international and national conferences and workshops. He reviewed the current set of four ECORD distinguished lecturers. With respect to IODP Town Halls, Behrmann noted that ECORD is focusing more on the EGU meeting and not the Fall Meeting of the AGU, primarily because of prioritizing costs. He then summarized ECORD efforts at communicating with the general public and classrooms, including ECORD's teacher-at-sea programs on all IODP platforms. He noted that Expedition 364 (Chicxulub) had a huge international outreach impact, reaching widely across the globe (other than Africa and the Middle East). He then presented the calendar of ECORD E&O activities for the remainder of 2016 and all of 2017.

Austin noted the challenges faced by IODP as an international program for the Fall Meeting AGU Town Hall. He emphasized that 25% of Fall AGU attendees are students who represent a prime audience to be engaged. Brenner suggested that the plans for that Town Hall will still represent the entire program, but noted that ICDP will not be co-sponsoring as in past years. Behrmann noted that EGU is the second-largest geoscience meeting in the world, which also helps to justify the ECORD focus on the Town Hall there. Morris asked whether ECORD and USSSP could coordinate to use a common booth design at both AGU and EGU. Austin suggested that these town halls should be a subject for further discussion at the PMO meeting.

Japan: Eguchi summarized Japanese E&O activities coordinated between J-DESC and JAMSTEC/CDEX. He highlighted the *Chikyu* 10th Anniversary Event that included a special symposium in Tokyo, an event for youth, *Chikyu* open ship events for government agencies, mass media and the general public, as well as special publications and video footage. He then summarized Japanese IODP lecture/seminar and symposium/workshop activities, noting that, upon request,

JAMSTEC/CDEX have made presentations about *Chikyu* at a wide range of venues. He summarized the J-DESC/JAMSTEC/CDEX booth activities at a range of international and national scientific conferences. He also summarized JAMSTEC/CDEX media outreach activities, including Japanese National Geographic magazine, and NHK and TBS television. He reviewed the *Chikyu* open ship events involving thousands of visitors in 2015 and 2016, and plans for a 2017 event. He then described a 3-day long *Chikyu* onboard school conducted by J-DESC and JAMSTEC in July 2016, with strong international participation. He highlighted the excellent *Chikyu*-TV video segments produced during Expedition 365 and noted that more are planned for Expedition 370.

Given noted there are also a lot of JR online videos and wondered about creating a program-wide online video channel. Nishi commended JAMSTEC for its media efforts and noted the opportunity to highlight the geohazards aspects in the Japanese media strategy to support the *Chikyu* renewal efforts.

China: Shouting summarized IODP-China E&O activities since the 2015 Forum meeting. These included an opportunity to send a Chinese reporter as a JR E&O Officer on Expedition 360, with resulting high impact in China. IODP-China also conducted a short course on Earth system history involving P. Falkowski from Rutgers University. IODP-China helped organize the fourth Chinese Conference on Earth System Science in 2016, with 7 main themes for which IODP was highly relevant. He also noted two IODP-related short courses to be held in the next month, with a goal of engaging young students. He closed by noting that IODP-China will welcome JR to Shanghai for the Exp. 368 port call in June 2017.

Morris confirmed that the Chinese reporter on Exp. 360 was very effective as an Outreach Officer.

ANZIC: Arculus summarized E&O activities. He highlighted a geo-marine master class run three times so far, each composed of about 25 2nd-year university students, with lectures and a short research vessel excursion. He then reviewed the two E&O officers on recent JR expeditions, as well as the JR ship tours held during port calls in Fremantle and Darwin. He described: (a) an annual 3-day “Science Meets Parliament” event and (b) sustained lobbying efforts, both of which have elevated the understanding of IODP within Australian government.

Brazil: Vital presented recent E&O activities in their IODP program, coordinated through CAPES. This included two short courses presented by A. Droxler (Rice U.) and J. Webster (U. of Sydney). An IODP Summer School is planned for 2017, as well as important upcoming site survey opportunities in 2017. Austin noted that these represent constructive steps toward strong JR proposals on a timeline consistent with the new JR ship track described earlier by JRFB chair Koppers.

In response to this presentation and the earlier IODP-Brazil presentation under Agenda Item B., the Forum adopted the following consensus:

Forum Consensus Item 16-05: *The Forum supports the continuing efforts of Brazil to develop a range of scientific ocean drilling proposals for addressing Science Plan challenges in the western South Atlantic. The Forum recognizes the challenges of implementation of the IODP structure within the Brazilian scientific community and is pleased to see plans for site survey data acquisition as well as continued proposal development. The Forum is also encouraged by ongoing outreach to students in Brazil through short courses and related activities.*

JRSO: Klaus briefly reviewed the history of E&O participation on JR expeditions in the current phase of IODP. A total of 29 E&O officers have sailed or will sail, averaging nearly 2/expedition. Of them, 16 have been from the US; 7 other IODP countries have been represented (China, Germany, France, Canada, UK, Belgium and Australia). Nishi asked about shipboard scientists who want to do E&O. Klaus responded that many JR scientists do participate in E & O, with their efforts normally coordinated by the shipboard E & O Officer.

Taira Prize: Given described the recently established AGU Taira Prize for “Outstanding transdisciplinary research accomplishment in ocean drilling” for an early- to mid-career researcher within 15 years of his/her Ph.D. She noted some concerns about the size of the recent pool of nominees, described the nomination process, and suggested that the Forum should encourage nominations more actively. In discussion, it was suggested that the nomination opportunity should be highlighted at the Fall AGU IODP Town Hall and IODP booths, as was done in 2015 when the Award was first announced.

H. Forum Mandate #3: Effectiveness of “new” IODP web site

The presentation by Given of the Science Support Office (SSO) was deferred to late afternoon of September 22, but is reported on here in its original agenda position. Given started by showing the four specific tasks that are supported under the NSF award for the SSO, as well as the staff associated with these tasks. She reviewed the IODP proposal submission history since 2005, including 75 new proposals since the beginning of IODP-2. Of them, 48% have been deactivated (most as pre-proposals), 36% are still under active review, and 16% have been forwarded to Facility Boards. Of the last group, half have been scheduled or drilled. Christensen asked for documentation as to how many of the deactivated proposals were resubmitted as new proposals, suggesting that the high deactivation rate could be perceived negatively in review of mid-term renewal efforts. *(Note: Post-meeting investigation by Given showed that of the 36 (48%) that were de-activated, 19 (25%) have come back. 7 (16%) of these reincarnations were de-activated, and 12 are still under active review.)* Allan noted that a 48% deactivation rate would actually be perceived as a suitable competitive rate by NSF, given the magnitude of resources devoted to the

program. Behrmann suggested that a prospective proponent would perceive that it would likely take a minimum of 5 years from submission of an excellent pre-proposal to its actually being drilled. Arculus suggested that the success rate is actually good on a per-scientist basis, given that on average 30 scientists participate in each expedition.

Given then showed the carefully worded SSO mandate for providing the web site www.iodp.org, noting that by design it does not include program-wide E&O. She displayed the current home page as recently redesigned, highlighting various features. She noted the improvements made to the pages that display active proposals, which now provide links to the proposal statistics pie charts and in which the tables of proposals have been made sortable. Allan noted the value of the pie charts in documenting the impressive numbers of scientists involved in IODP. Given also noted that the expedition pages also display a sortable table, and that locations of sites for scheduled expeditions are now available on a Google Earth display of all scientific ocean drilling holes since DSDP. She stated that the site still includes documents from the former IODP that will be reorganized in the future. Austin commended the effectiveness of the website, especially in providing organized and ready access to new users.

I. Discussion of structural linkages between seismic imaging and scientific ocean drilling [and international support for imaging]

Austin introduced this agenda item by reminding the Forum of its 2015 consensus in support of the importance of seismic site survey data and challenges in its acquisition, as well as the action item to discuss this in detail at this Forum meeting. He noted that he had invited seismic experts from several IODP partner countries (US, Japan, UK, Germany) to present their perspectives, in preparation for Forum discussion and a potential Forum consensus statement.

Bangs (the nominal leader of the invited group of experts) started with a presentation on the value of seismic imaging for scientific ocean drilling. He summarized the benefits provided by good seismic imaging: (a) as preparation for drilling, (2) in providing context for interpretation of drilling results, and (3) in providing important inherent value-added, stand-alone scientific results. He noted that continuing to provide these benefits will require provision of an adequate seismic capability, as well as exploration of new models for acquiring better, less expensive image data. He presented some excellent examples of the three benefits from the Nankai, Barbados and Costa Rica subduction margins, respectively. Silver continued by presenting further details of the outstanding Costa Rica 3-D seismic data and its advanced processing (by C. Ranero and others) in terms of imaging complex structures and revealing processes and geological history at what has previously been considered a type example of a non-accretionary/erosional subduction margin. He emphasized that the 3-D data suggest a fundamentally different interpretation – that this margin has actually had periods of short term

accretion instead of consistent subduction erosion. He closed by suggesting that drilling in complex margins should always be accompanied by 3-D seismic data.

Clement noted a mismatch in the timing of 3-D seismic acquisition at Costa Rica versus drilling to date, and Silver explained the historical context. He wondered if the mismatch in timing of 3-D data acquisition would also be an issue at the Hikurangi (NZ) margin, but Silver and Austin noted that such imaging would still provide excellent context for understanding anticipated drilling results. Bangs emphasized that the Costa Rica seismic data provide excellent context for addressing the primary goal of understanding the fluid flow system, and also noted the potential for funded 3-D imaging to fulfill that goal at Hikurangi. Koppers noted that the Hikurangi proposals went through the proposal evaluation and scheduling system quickly, and that the IODP proposal success helped to justify funding for the seismic data; the drilling program should try to do better in coordinating earlier acquisition of seismic data for high-priority proposals. Austin noted that this is one of the primary objectives behind this Forum agenda item. Friberg asked about the cost differential between 2- and 3-D seismic surveys. Bangs noted that difference in acquisition costs is not prohibitive, but Allan noted that the difference in processing costs is quite significant. Huebscher commented that the cost difference might not be that bad for an academic 3-D survey, as opposed to a full commercial 3-D survey. Miller noted that 3-D seismic is normally not necessary for typical sedimentological/paleoceanographic objectives, but may be required in other complex sedimentary settings, in addition to subduction zones. Behrmann suggested that in some subduction settings, the program could accept good 2-D data to define targets and justify drilling; 3-D surveys might not be required. Austin noted that 3-D has never been a requirement; he is equally concerned about the quality of 2-D data used to justify many drilling proposals in regions with simpler structures. Allan asked why the program has not done more walkaway VSPs. Bangs responded that walkaway VSP's are expensive, because they require a second ship, and Austin commented about the added potential for conflicting time demands with drilling/coring.

Bangs then moved on to describe the US academic seismic capability provided by the *R/V Marcus G. Langseth*, a former industry seismic vessel now owned by NSF and operated by L-DEO. The vessel can field a 15-km 2-D seismic streamer or conduct a 4x6 km 3-D survey, and it can also deploy up to 100 ocean bottom seismometers (OBSs). The ship's source array can provide a very clean output pulse, producing excellent data with minimal reverberations. The long streamer also allows much better resolution of the vertical seismic velocity structure, with significant benefits in migration and image quality. He then summarized recent developments in the *Langseth*/US seismic program. UNOLS is broadening the scope of its former *Marcus Langseth* Seismic Oversight Committee (MLSOC) to include all US seismic efforts as the Marine Seismic Research Oversight Committee (MSROC). Given the current US funding climate, NSF has capped its contribution to the *Langseth* operating costs at \$10m/year (about $\frac{3}{4}$ of the annual vessel costs). Furthermore, NSF has committed to operating *Langseth* only through early 2018 (the time it is scheduled to conduct the Hikurangi 3-D survey); details of a future operational model are unclear. The US

is also adopting a regional planning model for *Langseth* that ideally will be forward-looking by 4-5 years in projecting a ship track, with the goals of providing sufficient lead time for generation of good proposals along the track and maximizing efficiency of operations. Bangs showed the projected 2016-2019 *Langseth* ship track on top of the projected JR track, noting that the two do not currently show a strong degree of coordination.

Huebscher then provided an overview of marine seismic capabilities in Germany, which has a long tradition of providing site surveys in scientific drilling involving several universities and national organizations. There are several German research ships capable of collecting seismic data as well as conducting other research, so seismic acquisition equipment is installed only as needed. The German deep-water seismic-capable vessels include R/Vs *Polarstern* (usually working in polar regions), *Meteor* (usually in Atlantic and Mediterranean), the new *Sonne* (mainly in Indian and Pacific oceans), and the new *Maria S. Merian* (usually in the Atlantic, Baltic and Mediterranean). Two institutions can provide deep reflection seismic capabilities, the BGR with a 10.5 km streamer and AWI with a 3 km streamer, and Geomar is proposing to provide a third capability. BGR and Geomar can provide some 3-D capability, and the universities of Hamburg, Bremen and Kiel can provide shorter streamers for work in shallower water regions. Huebscher then described the German funding process for shiptime proposals, e.g., seismic survey programs. He noted that seismic acquisition cruises and post-cruise analyses typically require two separate proposals, although he highlighted a special German Science Foundation program of support for IODP-related proposals. In discussion, Koppers asked if there were examples of international scientists cooperating with German scientists to utilize the German seismic capabilities, and Austin cited the US-German cooperative effort to collect the seismic data in part behind the current JR expedition to the Sumatra subduction zone (Exp. 362).

Morris reviewed the UK situation regarding site surveys. As context, within UK the funding for IODP is reviewed every five years, and that review also includes funding for UK site survey support. He noted that the most recent five-year review was quite positive about site survey funding for three particular IODP proposals, including collaboration on the Hikurangi site survey program, and those site surveys are now scheduled. Morris noted that UK is also funding "virtual site surveys" to analyze existing data in support of two other IODP proposals. Morris then reviewed the 2-D site survey capabilities that can be provided by three ships *RRS James Cook*, *RRS Discovery*, and *RRS James Clark Ross* (to be replaced in 2020 by *RRS David Attenborough*). He also noted access to a pool of >50 OBS. He then outlined the NERC proposal mechanisms for providing funding for site surveys. He noted that the renewal discussions with NSF for the last phase of IODP included discussions about joint site survey funding, and he suggested that this could be explored further during the next IODP renewal stage. He also cited a current UK-Spain cooperation for use of a Sercel MCS system and suggested that such cooperation could be enhanced in the future. Austin asked how the NERC site survey review panel was selected, and Morris described the NERC process to assemble the panel. Austin

asked Morris if he had any thoughts about continuing cooperative international surveys like the Hikurangi example, and Morris cited the close interactions of the international PI team. Austin also noted the difficulties in bringing in a younger generation of seismic scientists, given the complexities and competition in the various seismic funding systems. For the multi-national Hikurangi survey example, Koppers cited the successful leveraging by multiple international PI's. Austin cited a model like the US DESSC committee, for planning use of and engaging younger investigators to use multiple US deep-submergence assets. He suggested that a comparable model could be implemented on an international basis among the countries that provide IODP seismic imaging capabilities.

Eguchi reviewed the Japanese seismic imaging capabilities provided by JAMSTEC. Currently the *R/V Kairei* can provide an MCS capability with a 6 km streamer. *Kairei* is also heavily scheduled by the Japanese government for geohazards surveys around Japan, and is also booked for surveys at Lord Howe Rise in 2017. He noted that in 2018 the MCS capability will be transferred to and enhanced on the newer *R/V Kaimei*, which will allow three acquisition modes: 2-D with 12km streamer, 3-D with four 3km streamers, and high resolution 3-D with twenty 300m streamers. *Kaimei* is expected to operate with all three modes around Japan for the next five years, with special funding from the Japanese government. He suggested there could be possible options to use *Kaimei* collaboratively for IODP site surveys or to charter it for a specific research cruise.

Bangs presented some ideas for working on an international basis to develop more collaborative use of existing seismic survey resources. Goals would include developing scientific collaborations, sharing resources, capabilities and expertise, and increasing efficiencies by minimizing transits. Structural mechanisms could include charters, ship exchanges, and/or subscription models like IODP. Additional benefits could include access to better and less expensive data, more sharing of data, processing facilities and expertise, and more flexibility to coordinate among international and national programs. He suggested considering a formal "International Seismic Science Program" partly modeled on the success of IODP, noting multiple questions that would need to be addressed. These include whether there is real interest in such a model, whether it is possible to structure such a program in a similar fashion as IODP - coordination, funding models, proposal evaluation, and so on. Austin argued against repeating the original "integrated" IODP model, with concomitant strong commingling of funding. Bangs noted that this is the kind of question up for discussion at the Forum. Austin opened the floor for questions and comments.

Morris noted that NERC would be interested in ways to collaborate without exchanging funds, and also argued against a commingled funding model. Friberg cited a collaborative international program to map the seafloor and suggested approaching them to support seismic imaging of the sub-seafloor. Austin suggested that there essentially is an international seismic science effort already, but that it is structured in a similar fashion to the current phase of IODP, with cooperation as

opposed to central management. He suggested that the question is one of finding a mechanism to get the relevant international seismic imaging stakeholders to work more closely together. After further discussion, Allan suggested that a critical US question is trying to find funding for the *Langseth*, and that funding managers in other countries might have similar questions for supporting their seismic imaging capabilities. He noted that there is an international ship operators meeting that might be an appropriate venue to explore feasibility of various models to collaborate on seismic imaging. Clement suggested an ICDP-like model as an alternative to an IODP-like model for bringing seismic resources and expertise together. Austin suggested expanding the US MSROC committee model to encompass international and industrial representation. He suggested that what is needed is a more efficient model to utilize existing international resources, as opposed to seeking increases in the national funding in support of seismic surveys. Allan noted the number of options for future use of *Langseth* that are currently on the table. Huebscher agreed on the importance of bringing all the relevant international seismic expertise together, but wondered if we need a more comprehensive white-paper document first. Given cited the recent US community survey about both the use of seismic data and *Langseth* that would provide important input to an international seismic group; Bangs agreed. Arculus alluded to the fiscal tightening philosophy triggered by the US NAS *Sea Change* report, and noted that has set a model that could be applied internationally.

In response to these presentations and ensuing discussion, the Forum adopted the following consensus statement:

Forum Consensus Item 16-06: *The international marine seismic imaging community has moved toward conducting IODP site surveys in more cooperative ways with combined resources. The IODP Forum endorses that trend and encourages that community to explore options for more efficient and cost-effective use of existing seismic imaging assets and survey funding across all IODP partners. The Forum suggests that the initial steps should include a formal meeting of the international seismic imaging stakeholders within the next year to develop a framework and justification for utilizing existing resources more efficiently in support of IODP, ICDP and other scientific requirements.*

J. Forum Mandate #2: Coordination among FBs and platform providers

Austin asked the group for input on this agenda item. There was none.

K. Forum Mandate #4: Collaboration with other programs, e.g., ICDP...

Austin asked the group for input on this agenda item. Earlier in the meeting, discussion took place about international coordination of Town Halls – at EGU, AGU,...the group did not provide further input.

L. Forum Mandate #5: Recommend topics for workshops

There was strong Forum sentiment for a global monsoon synthesis workshop, as stated in its 2015 consensus. In discussion, Zhimin confirmed that such a workshop is now being planning for 2017 as a joint IODP-PAGES global monsoon workshop in China. Arculus also expressed a strong sentiment for a synthesis workshop for the three IBM expeditions conducted during this phase of IODP; the group concurred. That is reflected in the following consensus:

Forum Consensus Item 16-07: *The Forum endorses the suggestion that a workshop be organized to review the results of the extensive drilling by three IODP expeditions that took place in the Izu-Bonin-Mariana (IBM) convergent margin region during 2014. Those expeditions tackled several challenges posed in the decadal Science Plan relating to subduction initiation and generation of continental crust. The workshop should integrate the expeditions' collective results, with a focus on those goals that were achieved, implications of new and surprising results, goals that were not achieved but could be with available and emerging technology, and the relevance of understanding gained in the IBM system to other convergent margins.*

Bansal suggested that future workshops and other IODP activities should emphasize societally relevant IODP results in preparation for mid-term renewal. Austin noted that this is being done on several fronts, such as the upcoming global monsoon workshop, the IODP emphasis on earthquake hazards, and others. Bansal clarified that IODP science is excellent, but his government is asking how IODP will be societally relevant and of economic benefit to India in the future. Austin cited the Andaman Sea example and opportunity to engage economic ore geologists. Brenner asked if a document emphasizing IODP societal relevance would be useful; Bansal agreed. Clement suggested taking as a model the recent Australian document about the value to Australia of membership in IODP. Friberg suggested that doing great science should be sufficient to justify IODP renewal.

M. Forum Mandate #7: Advising on “ethical issues”

Austin queried the group on this matter, and there was no input.

N. Other Matters Arising from Day 1 and 2 and/or New Business

No other matters arose.

Forum Consensus Item 16-08: *The Forum enthusiastically thanks the Brazilian organizations sponsoring its third meeting – specifically, Universidade Federal Fluminense, CNPq, CAPES and FAPERJ - in the evocatively beautiful resort town of Armação dos Búzios. We are especially grateful to our colleague Dr. Cleverson Guizan Silva in his role as our personal host and guide, and the excellent coordination by the meeting organizer META. Several Forum members were visiting Brazil for the first time and all enjoyed the climate, the warm hospitality, and the regional food and drink. The Forum acknowledges the participation of Dr. Janaina de Cássia Carvalho (Coordinator of Special Programs, CAPES), Dr. Helenice Vital (member of the Executive*

Office, CAPES-IODP, and a current member of IODP SEP), and Dr. Luigi Jovane (member of the Scientific Office, CAPES-IODP), and looks forward to the continued engagement of the Brazilian scientific community in all aspects of IODP.

O. Future Forum Meetings

Forum Consensus Item 16-09: *The Forum enthusiastically accepts the invitation from our Chinese colleagues to hold the next meeting of the Forum (#4) in Shanghai in September 2017 (exact dates to be determined). India has offered to host Forum #5 in Goa in September 2018. The Forum accepts that invitation with equal enthusiasm.*

Before adjourning, Austin thanked everyone, and reminded those interested about the PMO meeting to be hosted by Brenner the following day.

Austin adjourned the 3rd meeting of the IODP Forum.