Minutes of the iSCIMP portion of the Joint iSciMP-iTAP meeting

1. Review and approval of minutes from December, 2002 meeting (Alberta, Canada).

Minutes were approved as written. iSAS Office asked to post them as "final".

2. Review of proposed agenda (iSciMP portion only).

Murray requested time to review the results of the recommendations and action items from the last meeting. This will be Agenda Item 2A.

Kikawa requested time to provide a follow-up on the Kochi core repository and shorebased facilities. This will be Agenda Item 5A.

With these modifications, the Agenda was unanimously approved.

2A. Results from Previous Meeting

Murray reminds everyone of the several emails he sent out prior to the meeting for iSCIMP to consider, regarding many of the agenda items for this meeting. Copies were passed out to everyone again, along with the latest lab list for the *Chikyu*.

All recommendations of the Alberta meeting were accepted by iPC with the exception of the OPCOM recommendation, which was noted as "received". iPC responded favorably to iSciMP being involved in advice to SAS office and proponents on measurements issues. Changing of the proposal cover sheet fell through the cracks, however, for a variety of reasons.

iSciMP Action 03-01-1: Continue revision of iSAS Proposal Cover sheet to include "anticipated non-standard measurements" section.

Status: On-going. On July 24 the iSAS Office forwarded to iSciMP a suggested revised cover sheet, which iSciMP is currently discussing.

3. Report of Microbiology Working Group.

Smith reported on the Microbiology WG, which was charted in response to an iPC request from the last meeting. The WG met by email and wrote a report. The draft report had been circulated to iSciMP prior to this meeting. Based on the reading of that draft, as well as of Smith's presentation, there were a series of questions regarding sample preservation, routine sampling plans, and so on. On the basis of these discussions, the following recommendation was approved.

Recommendation 03-01-1: iSciMP recommends to iPC acceptance of the **Microbiology Working Group** report, and requests iPC distribute it to the IO's and IMI as soon as possible. The full report of the WG is found in Appendix 3 and includes descriptions of measurements to be made on platforms and shorebased laboratories, curatorial issues, and other topics.

Specific recommendations of the Microbiology WG include:

A. Drilling methods that yield cores of optimal quality for microbiological studies should become standard. (Details regarding APC drill over, development of pressure retaining core barrel, minimizing exposure to oxygen and temperature changes, further improvement of contamination testing are provided in the report.)

B. IODP should establish a repository for samples routinely collected and stored appropriately for subsequent microbiological analysis. The samples should be taken in sterile syringes (50 cm^3 capacity) as soon as the core arrives and stored as described in the report depending on the subsequent analysis. (Details regarding nucleic acid analysis, culturing work, and microscopy are provided in the report.)

C. IODP should adopt similar policies that are established within the international community of microbiologists for the exchange of culture and sequence data. (Details regarding internationally recognized and publicly accessible databases, and subcultures of organisms derived from IODP efforts are described in the report.)

D. IODP should institute routine measurements that will be performed in support of an ongoing study of microorganisms in the marine subsurface. The data produced from these assays will be submitted to the general IODP database and be subject to the same stipulations as other data. To achieve this goal, it is recommended that IODP routinely sail a dedicated technician specifically trained in microbiological techniques and procedures, including the use of radioisotopes, for the microbiology laboratory. (Details regarding routine measurements of biomass and metabolic rates [via radioisotopes] are provided in the report.)

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

5. Report of Database Working Group

Divins provided a summary of the results of the Database WG, that had met this past summer in Boulder, Colorado, USA, with broad international representation. This was a very comprehensive and involved discussion that lasted for over an hour. Much discussion focused on the degree of integration between the multiple IOs, the CMO, and the community; on the need for centralized and consistent data handling that integrates precruise, cruise, and postcruise data, and how to coordinate with publications, curation, and other aspects of the IODP.

Due to the strong enthusiasm on the part of iSciMP for the concepts proposed by the Database WG, the panel solicited guidance from Austin and Moore as to how to best proceed. Austin noted that, as written, this report can be reformatted into an RFP (by IMI or the appropriate IODP entity). It was noted by many panelists that the recommendation is structured in such a way that there is no COI for panel members to respond to such an RFP for database.

On the basis of these discussions, the following recommendation was approved.

<u>Recommendation 03-01-2</u>: iSciMP recommends to iPC acceptance of the **Database Working Group** report, and requests iPC distribute it to the IO's and IMI as soon as possible. The full report of the WG is found in Appendix 4.

Specific recommendations of the Database WG include:

A. That an IODP Information Services Center (ISC) be established to provide database services within a distributed networked system and not within a centralized system. The system, termed the IODP Information Services, is composed of the database management activities of each of the IOs, a database of legacy data (DSDP and ODP, where these data will be maintained is not specified), and, at its heart, the Information Services Center operating directly under the IMI. The primary functions of the ISC should include:

- A **clearinghouse function** provided by ISC management, technical, and communications staff with appropriate network and computer infrastructure to provide integrated access to the program-wide information; and
- A **coordination function** provided by an assemblage of information services staff from each of the IOs as well as the ISC, site survey data bank services staff, and scientific drilling legacy data staff.

B. That the ISC have the following specific responsibilities:

- Provide integrated access to all IODP data (e.g. shipboard and shore-based)
- Develop & maintain:
  - --the central program-wide web-based portal to stakeholders (scientists, educators, industry, policy-makers, public). Note: this portal should be dynamic & open to other international information systems & communities (e.g. physical oceanography)
  - --portal user interfaces that are scalable for different stakeholders
- Following SAS advice, adopt & maintain standards to:

--capture, storage, and distribution of data and metadata on each platform and of shore-based data. Required developments and implementations should be largely based on ISO, OGC, W3C standards and recommendations (for more information see http://www.fgdc.gov/standards/related_activities.html)

- --foster publication of data within IODP information services, e.g., using Digital Object Identifiers (DOI, http://www.doi.org)

- Perform regular (360 degree) evaluations of the performance of the clearinghouse and the IOs in the delivery of IODP information services
- Oversee the archiving of IODP legacy data (e.g, in partnership with recognized data centers)
- Maintain and provide access to the program's publications database and integrate IODP information/data with IODP publications, e.g., using DOIs
- Provide access to IODP curatorial information
- Coordinate the development of data capture interfaces for specific platforms on an as-needed basis
- Coordinate communications among the platform operator's IT/IS managers to share new ideas, resolve problems, and to adopt new information technologies.
- Maintain links with other data groups (e.g. WDC, NGDC, ICDP, DEOS) and disseminate relevant information among IOs.

C. That IODP Information Services include the following standard practices:

- The ISC should be regularly evaluated following IODP project management standards to ensure that it meets the data and information needs of the IODP stakeholders as defined by the SAS
- An annual review of the ISC by external IT/IS experts to ensure that IODP is utilizing the best technology possible (e.g. in terms of cost, applicability or efficiency)
- IOs should ensure that the standard (as defined by SAS) shipboard IODP data are captured electronically by the end of the moratorium period for each project
- IOs will work together with the ISC to provide consistent data collected on all platforms with particular attention given to common units, calibration information, and standardization of measurements (e. g. depth, age models, etc.)
- IOs are responsible for performing quality control and consistency checks on all data and metadata generated on their platform for each project
- The ISC will provide feedback to the IOs on the quality and consistency of the metadata supplied

D. Standards are essential to the success of the ISC clearinghouse. The Group recommends that:

- Based on advice from the SAS, the ISC will adopt data standards for IODP consistent with international and emerging standards such as ISO and FGDC

- IOs provide the ISC with access to IODP data using consistent, standard metadata catalogues (e.g. in XML following adopted IODP standards)

E. Information includes, but is not limited to:

- Shipboard and shore based collected data (ODP Janus data and microbiology, drilling parameters, downhole measurements, site-specific survey, paleontology, visual core description, XRF, CT data)
- Engineering data
- Citations that include IODP information
- Curation information
- Observatory data links
- Ship schedules
- Applications
- Project description information
- Policies
- Publications.
-

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

5. Remaining Lab Working Group Reports:

At this point, the remaining laboratories provided the summary of their reports. With the exception of Chemistry WG, Downhole WG, and Core Description WG, the reports can be fine-turned on the basis of the discussion here at the meeting, and forwarded to iPC for approval, and distribution to the IO's and relevant IODP entities. In terms of implementation of the WG recommendations (assuming approval), Davies noted that, for example, in ODP that TAMU refers back to the report and will often get further information if needed from SciMP (JOIDES) and the WG authors. Thus, the following Action Item was generated, which applies to all the reports as described in this section:

iSciMP Action 03-01-2: Revise WG reports by Aug 14 for distribution, recommendation, and comment at September iPC meeting.

a. Chemistry WG

Neal provided the Chemistry WG report. This report is not yet completed enough to be forwarded to iPC/SAS, but will be in the next few months. Discussion centered around methods of extracting pore fluids (e.g., should a centrifuge system be added to the current squeezing system, particularly since centrifuging may be better for microbiology?). Also, Neal highlighted the importance of uniformity across the platforms, and the need for continued use of internationally accepted reference materials, and so on. Regarding core diameter, it was generally thought the chemistry would be better off with more material if possible, as a general guideline. Neal, Tsunogai, Murray, and the potential new panelists will work on this report and distribute it when it is ready.

b. *Paleomagnetics WG*

Kikawa provided the Palemagnetic WG summary, which led to the following recommendation.

<u>Recommendation 03-01-3</u>: iSciMP recommends to iPC acceptance of the **Paleomagnetics Working Group** report, and requests iPC distribute it to the IO's and IMI as soon as possible. The full report of the WG is found in Appendix 5 and includes descriptions of measurements to be made on platforms and shorebased laboratories, curatorial issues, and other topics.

Specific recommendations of the Paleomagnetics WG include discussions of u-channeling, instrumentation, sampling frequency and type of sampling.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

c. *Core Description WG*

Saito provided the Core Description WG report. This report is not yet completed enough to be forwarded to iPC/SAS, but will be in the next few months. Discussion was lengthy and included the following:

- The importance of MST's on every platform, including MSP's.

- That the scientific needs of the expedition drive whether cores need to be split and described on the exact platform, at a shorebased facility near the plaform shortly after acquisition, or at a shorebased facility significantly later (one month?). Much of this discussion was generated by questions about the "minimum needed" for MSPs, and it was recognized that on the *Chikyu* and non-riser ship core description would be on-site and analogous to current ODP practices.

- how to address archives. Saito presented a potential scheme, similar to the one that had been presented at Alberta, that showed a sub-dividing of the archive, with different fractions of the archive half being segregated, treated, and archived separately. Very serious concerns were expressed about the effect this would have on future measurements (by instrumentation perhaps not yet invented), affects on measurements, curation needs, and other points. Overall, subdividing the archive was not received positively, and it was thought that this should not be considered further.

- visual core description (VCD). Saito provided a summary of the latest VCD ideas, and they were very positively received. This looks to be a significant improvement and the panel welcomed the excellent progress.

Saito and other members of the Core Description WG will be working on their report for presentation at the upcoming December meeting.

d. Physical Properties WG

Schmitt presented the Physical Properties WG report. Discussion included reviewing the role of MSTs, and how to integrate best with other physical property measurements. Discussion led to the following recommendation:

Recommendation 03-01-4: iSciMP recommends to iPC acceptance of the **Physical Properties Working Group** report, and requests iPC distribute it to the IO's and IMI as soon as possible. The full report of the WG is found in Appendix 6 and includes descriptions of measurements to be made on platforms and shorebased laboratories, curatorial issues, and other topics.

Specific recommendations of the Physical Properties WG are based on discussions on how to best integrate with logging and other associated measurements, which are minimum measurements (for all platforms), and other issues.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

e. Paleontology WG

Thomas provided the Paleontology Working Group report. Sample frequency, database, dealing with cuttings, and the overall need to increase input from expanded discussion from the community were discussed. The discussion led to the following recommendation:

Recommendation 03-01-5: iSciMP recommends to iPC acceptance of the **Paleontology Working Group** report, and requests iPC distribute it to the IO's and IMI as soon as possible. The full report of the WG is found in Appendix 7 and includes descriptions of measurements to be made on platforms and shorebased laboratories, curatorial issues, and other topics.

Specific recommendations of the Paleontology WG are oriented towards how to best incorporate the skills and expertise provided by the Micropaleontological Reference Centers (MRCs) as well as potential development of a new sample processing scheme for routine use. This resulted in the following recommendation:

A. That the iSciMP populate an *ad hoc* Working Group that would meet once to discuss these multiple issues. Analogous to the former Microbiology WG and Database WG, the *ad hoc* group would be composed of 8-10 US, Japanese, and European experts and would provide a final set of recommendations to iSciMP for consideration at their Nagasaki meeting. Proposed co-chairs are Yoshiaki Aita and Ellen Thomas, with potential members tentatively including M. Knappertsbusch, B. Huber, N. Suzuki, M. Iwai, plus others.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

f. Underway Geophysics and Core-Seismic-Log Integration WG Report

Gulick presented the Underway Geophysics and Core-Seismic-Log Integration Report. The discussion centered on the need and capability to integrate between the various data sets that are gathered, and that the value added by doing so was likely to be extremely great. The discussion led to the following three recommendations.

Recommendation 03-01-6: iSciMP recommends to iPC acceptance of the **Underway Geophysics Working Group** report, and requests iPC distribute it to the IO's and IMI as soon as possible. The full report of the WG is found in Appendix 8 and includes descriptions of measurements to be made on platforms and shorebased laboratories, curatorial issues, and other topics.

Specific recommendations of the Underway Geophysics WG include:

A. Each platform needs adequate navigation and bathymetric data collected underway and on site.

B. All site surveys should be acquired by bona fide seismic vessels prior to drilling. However, seismic capabilities need to be continued on the non-riser platform primarily as a support for VSPs and Checkshots rather than using the non-riser platform as a seismic survey vessel. Seismic capabilities on the *Chikyu* should exist to provide adequate seismic sources for downhole VSP or Checkshot acquisition but no underway seismic capability is recommended. It is not necessary for MSPs to have seismic capabilities unless it is required for VSPs and Checkshots or it is required by the contractor for safety purposes.

C. Magnetic capability underway on the non-riser platform is desirable but no routine towed underway geophysics capability can be reasonably discussed for the *Chikyu* or MSPs.

D. Gravity and Swath Mapping systems are seen as too expensive in personnel and operating costs to be maintained on any of the drilling platforms.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

Recommendation 03-01-7: iSciMP recommends a **Seismic Integrator** be included as part of the scientific party for any drilling project where core-log-seismic integration is required.

> Background: The position should be filled by a person with scientific background in seismic interpretation and core-log-seismic integration. The person should facilitate integrated interpretations. The responsibilities of the Seismic Integrator are to: receive pre-cruise training on the seismic interpretation and integration package prior to the cruise, ensure the backing up and loading of the seismic dataset that is associated with the drilling project prior to the cruise, do on-board core-log-seismic integration and prepare results for the Expedition Report, establish a depth-time model for each logged hole to be incorporated into the platform database, and create a backup tape of the workstation project at the end of the cruise.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

Recommendation 03-01-8: iSciMP recommends that whenever correlation of logs to seismic is required for any IODP drilling project, either **checkshots or zero-offset VSPs** should be routinely collected.

> Background: It is expected that the need for VSPs will increase with increasing target depth and therefore the Chikyu and JOIDES Resolution replacement should have the capability to collect checkshots and zero-offset VSPs. Collection of checkshot or VSPs during MSP drilling project should be dependent upon logistics and science needs. The quality of VSPs is expected to increase in IODP versus ODP through the use of appropriate tools for lithologies and depths of a drillsite, cumulative experience, and standardized procedures.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

g. Downhole Measurements WG Report

Saito reported that the Downhole Measurements WG report is in progress, and will be ready for presentation and discussion at the next meeting.

5A. Kochi Core Repository and Shorebased Facilities

Kikawa presented an additional summary of the breadth of functions that the Kochi facility appears able to add to scientific drilling. The panel was impressed by the combination of curation and shorebased laboratories (both sample preparation and analytical) being jointly located and apparently supported so well at Kochi. After discussion, the following recommendation resulted:

Recommendation 03-01-9: iSciMP identifies the importance of **shore-based facilities** to complete routine measurements after IODP drilling expeditions and to calibrate and develop the measurements facilities continuously on shore. iSciMP recommends that integrated laboratories of core repository and shore-based facilities (“IODP integrated core repository”), which does not exist in the ODP period, are required to maximize the IODP multi-platform operations and to create new sciences.

Potential examples of such combined laboratory and curatorial facilities include, but are not limited to, the Center for Advanced Marine Core Research (CMCR), Kochi University, Japan, operated in cooperation with JAMSTEC, and the Bremen Core Repository at Bremen University, Germany.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

6. Micropalentological Reference Centers (MRCs)

Thomas presented the latest report from the MRC’s (Appendix 9). She noted that MRC’s are not just repositories but are also “knowledge centers”. The satellite MRCs are loans dependent on the locations of key experts and are effectively non-permanent loans. Thomas notes that the MRCs are requesting to be a formal part of IODP, in that they are involved with curation, distribution, and education. They need access to samples, sets of IR/SR publications, should have a formal liaison to SciMP, financial support, etc. Saito suggested that because one element of the proposed Information Services Center will be curation, that perhaps MRC’s could be folded into the Database WG report. Thomas and Moore noted that MRC financial support primarily comes now from the local museums. Murray commented that the access to core material is already allowed by the IODP Sampling Policy, and the liasions can certainly continue and be encouraged. Farrell noted that for a variety of MRC issues, if they are deemed appropriate, would need to come from commingled funds. It was clear that the MRC issues need to be considered in the context of the Paleontology WG Report. The discussion resulted in the following Consensus Statement:

Consensus Statement 03-01-1: iSciMP thanks Dr. Ellen Thomas for providing the Micropaleontology Reference Center (MRC) Report (see Appendix 9). iSciMP acknowledges the value the MRC’s have provided to scientific ocean drilling in the past, and hope they will continue to be of assistance to IODP in the future.

7. Drill Cuttings

Due to time constraints, this discussion was moved until later in the day (see Section 10, below).

8. Portable X-Ray CT System

Freifeld provided an exciting presentation about the portable X-ray imaging system that he and his colleagues at Lawrence Berkeley Laboratory have developed. There was widespread support for the capabilities of the instrument (Appendix 10). It is truly portable in that it is low weight, small size, inexpensive, and could even be used on MSPs. ISciMP will continue to be appraised of the system as it continues to be developed and improved, and there is potential for future use within IODP. X-ray imaging is clearly something of interest to drilling scientists, as manifest by the large system on the *Chikyu*, and the ability to have a small system with equally impressive capabilities on the non-riser vessel and MSP's deserves further consideration.

<u>Consensus Statement 03-01-2</u>: iSciMP thanks Barry Freifeld of Lawrence Berkeley Laboratory for his presentation on the portable x-ray CT system (see Appendix 10) and acknowledges the potential opportunities this instrument presents to the multiple platforms and laboratories of the IODP.

iSciMP Action 03-01-3: Get more information on Friefeld's x-ray CT system for inclusion as Appendix into minutes of meeting and for potential further consideration by SciMP and IOs.

9. Publications

Murray reviewed the different options for publications in the IODP, ranging from having none at all, to a full book for both IR and SR (or their equivalent under a new naming scheme), having only www-based publications, both www- and print-based, etc. The CUSP (US) recommendation was presentation. The ensuing discussion was quite lengthy and wide ranging.

At all levels, of both the IR and SR volumes, it was clear that the need to integrate with the database was absolutely essential. Furthermore, there was strong support for having both electronic and print versions for an "IR", in that the print version is very useful for shipboard collaborations as well as general ease of use. Saito noted that the print versions are very important for educational and marketing reasons in Japan. Murray and Divins noted, based on their SciMP (JOIDES) experience, that most of the costs of publication are not in the print run but more in the production, which needs to occur regardless of whether the final deliverable is print, electronic, or both. Farrell confirmed this. Murray commented that it is a common misperception that “the IR is ‘done’ on the ship”, whereas the reality is that only data is generated on the ship…the IR volume—and its costs—occur entirely on shore. Moore further commented that large print runs brings down the cost, and so that limited print runs for ships and selected libraries may not make economic sense. Overall, a strong consensus from the panel is that (1) an IR-type volume should exist, and (2) that it should be issued both in print (full-version) with a wide distribution and electronically. There was discussion as to whether the IR should be issued by the IO’s or by the CMO, with Moore suggesting that IO’s running it may be inefficient in terms of duplication of personnel etc. Rather than an “Initial Report”, it was recommended to call the “new IR” an “Expedition Report”, so as to differentiate it from DSDP/ODP but also, more importantly, to acknowledge and allow for the multifaceted nature of riser, non-riser, and MSP projects.

For the SR volume, many analogous options were discussed. There were questions as to whether an SR volume could merely be bundled related material including reprints. Several persons noted that the old ODP SR volume was formally considered ‘gray’ literature by many European countries. Panel discussion centered around how to adequately ‘capture’ those publications akin to data reports that are essential post-cruise data but that is very unlikely to end up in the open literature. Divins and others noted that such data could be supplied to an ISC or other non-IODP data center and given a DOI. That DOI, then, would serve as the reference and thus the data would be publicly available and also, perhaps, the issue of obligation would be met. Overall consensus was that such a system would work and would also fulfill the need to have the scientific results out in the open literature (as per latest phase of ODP policies). Farrell and Kuroki noted that it may not be advisable to have a system such that there is no book / volume produced that has the word “Results” in the title, and that while “Expedition Report” (for the new IR) is fine, if there is no SR at all then where are the “results”?

In terms of obligations, it remained unclear as to how and when to integrate the enforcement (or definition) of non-conformer status. Consensus was towards centralized tracking of non-conformers (e.g., at CMO level). There is strong feeling that although the non-conformer issue is likely to small in terms of the number of persons who will unfortunately qualify for this, that the teeth in the enforcement needs to come from CMO. It should be straightforward for the IO’s to check with the CMO regarding staffing, and if a person—no matter how senior or highly-regarded—is a non-conformer than the CMO will not allow the IO to staff him/her. In this context, the ability to fulfill an obligation via data report and DOI in database was thought to be very important. It was acknowledged that after the September meetings—at which it is anticipated that the SPC will provide further guidance regarding publications—that it will be necessary to weave together the Sample and Data Policy with the ‘obligations’.

The following Action Item and Recommendation resulted from the discussions.

iSciMP Action 03-01-4: Revisit IODP Sample and Data Policy with regard to linking obligations to publication policy.

Status: On-going.

Recommendation 03-01-10: iSciMP recommends that the **publications program** of the IODP include the components listed below. The responsibility for implementing and overseeing these components will lie within central management of the IODP. The publication obligations incurred by a member of the Scientific Party are described in the IODP Sample and Data Policy.

1. A complete print and electronic Expedition Report volume. Both versions will capture all information produced by the Scientific Party for each drilling project, including core images and descriptions, and will be consistent and standardized across all platforms and shorebased components.

2. A continually updated on-line bibliography of each drilling project.

3. An Expedition Science Summary written by the chief scientists of the expedition will serve as a lead-in to the on-line bibliography. The Expedition Science Summary will be submitted 32 months post-moratorium.

Vote: 14 yes, 0 no, 0 abstain, 1 absent (Lovell).

10. Drill Cuttings

Over the past months Murray had solicited feedback from a number of industry and iSAS Panel (e.g., ILP, PPSP, CDEX) contacts. This resulted in receiving many different schemes for frequency of sampling, how to sample, how to archive, and other issues. Saito suggested that this information be forwarded to CDEX through himself and that CDEX would work with a number of external experts in addition to its own staff and provide a report and recommendations to SciMP at our next meeting.

iSciMP Action 03-01-5: Forward to S. Saito all information gathered so far regarding drill cuttings. Kingdon to solicit European input and forward names to Murray. Saito and CDEX to provide full report and recommendations at next SciMP meeting.

Status: Done. On July 21, Murray forwarded to Saito all relevant information gathered to date. On August 8, David Roberts of British Petroleum provided to Murray via Kingdon the contact information of Paul Page (Sudbury), Bryan Chambers (Aberdeen), and Juan Carlos Rojas (Houston), and Murray forwarded it to Saito.

11. Technical Support and Scientific Staffing

Due to time constraints, these subjects were tabled until the next meeting.

12. Membership Rotation

With the exact membership of IODP remaining unclear at this point in time, Murray reminded the panelists to keep himself and Kikawa closely informed about membership rotations, particularly with regard to changes in expertise. Membership from Japan and US is likely to expand, and as these new members are added the panel will be informed as to the new personnel.

Since Christian Buecker (Germany) is rotating off, Murray expressed his and the panel's appreciation for his dedicated and selfless efforts on behalf of the ODP and IODP, particularly with regard to his recent work with the Joint Logging Sub-committee. Buecker's input and personal presence will certainly be missed in the coming years, and it is hoped that he can maintain an IODP presence in any way possible.

13. iSciMP / iTAP Future

There had been much discussion at the Alberta meeting and since then about potential overlap issues between iSciMP and iTAP, and which of these overlaps are likely to be productive and which may need clarification. TAPs current mandate includes the phrasing "long term" needs, but Moore noted that some of TAPs interests are indeed current. Murray noted that at the iPC meeting he was quite frustrated when members of iPC and more senior oversight positions would repeatedly confuse TAP and SciMP, and he thought that much of that confusion had to do with their similar names. The consensus, however, was not to rename the panels, but that every effort ought to be expended to ensure that the SPC , SPOCC, etc., be familiar with each panel's mandate. It was recommended that the iSciMP presentation at each SPC meeting begin with an overview of our mandate, to remind the SPC about the program that they are overseeing.

It was questioned whether iTAP and iSciMP would always need to meet together (as do the SSEPs) or would on a case-by-case basis be preferred. It was thought that while it was efficient with regard to time to have the reporting phase of the meetings (e.g., Day 1) be common, there really was not as much interaction between the panels at this particular meeting as had been anticipated. Several panelists noted that it was helpful at times to hear from iTAP regarding common issues such as pipe diameter and other overlapping issues such as long-term monitoring, downhole tools and measurements, etc.

14. Review of Recommendations

All recommendations were reviewed, with their final wording being agreed upon as written in these minutes.

15. Next meeting location and time.

Saito extended an invitation to SciMP to view the *Chikyu* during our next meeting. This suggestion was highly appreciated and greatly approved.

Consensus Statement 03-01-3: iSciMP will hold their next meeting in Nagasaki, Japan, with iSciMP member Dr. Saneatsu Saito serving as host. The meeting will occur from December 15-17, 2003, and will include a visit to the *Chikyu*.

Proposed Agendas for the
Joint Meeting of iSCIMP and iTAP
July 13 - 16 2003

University of Rhode Island
Graduate School of Oceanography
Narragansett Bay Campus, Narragansett Rhode Island

Overview

July 13th (Afternoon – starts at 13:00) Joint iTAP/iSCIMP Logging Subcommittee Meeting
July 14th (Full Day) Joint iTAP/iSCIMP Meeting
July 15th (Full Day) Separate Meetings of iTAP and iSCIMP
July 16th (Morning) Separate Meetings of iTAP and iSCIMP
July 16th (Afternoon) Joint iTAP/iSCIMP Meeting

July 13th Afternoon

Meeting of the Joint iTAP/iSCIMP Logging Subcommittee (Subcommittee Members are: Buecker, Schmitt, Gulick, Kamata, Arai, Gearhart, Becker)

July 14th Morning (Joint iTAP/iSCIMP)

1. Welcome
2. Introductions
3. Review and Approval of Joint Agenda
4. IODP Overview (Austin, Interim Director)
5. Reports
    a. iSSEPs (Escartin & Masuda)
    b. iPC (Moore & Ito)
    c. OD21 / CDEX (Kuroki & Ikehara)
    d. OD21 / J-DESC (Ito & Saito)
    e. ECORD (Skinner)
    f. Leg 209 Report (Kikawa)
    g. Status on Pipe Diameter

July 14th Afternoon (Joint iTAP/iSCIMP)

6. Joint Panel Issues
    a. Overview (Murray)
    b. Procedures for Technology Development & Implementation (Masuda)
    c. Discussions on IODP Standard on Drillpipe and Core Diameter (Moran)
    d. Logging Subcommittee Report/ IODP Logging Standard (Buecker)
    e. Measurement While Drilling and Coring (Huey / Goldberg)
    f. Status of CDP Planning
7. Project Management for IODP (Becker)

July 15th Morning & Afternoon

Proposed ITAP Agenda

1. Review, changes & approval of iTAP Meeting #2 minutes and iTAP agenda
2. Business arising from iTAP meeting #2
    a. Project Task Group Status (Moran)
    b. Legacy Project Report (TBN)
3. Prioritize & Recommend Technical Challenges from ISP:
    a. Climate history challenges (Taylor)
    b. Gas Hydrates (Masuda/)
    c. Hydrogeology (Becker)
    d. Zero-age Crust (Huey)
4. Other Important Technical Challenges
    a. TAGII Presentation (Rona)
    b. Difficulties in Deep Drilling (Arai)
    c. Long-term Monitoring under High Temperature (Kamata)
    d. MSP Technical Needs (Skinner)

Proposed iSCIMP Agenda

1. Review & approval of Alberta minutes
2. Review & approval of iSciMP agenda
3. Report of Microbio WG (Smith)
4. Report of Database WG (Divins)
5. Remaining Lab WG Summary Reports
6. Micropaleo Ref Centers (Thomas)
7. Drill Cuttings: Acquisition, Curation, etc.
8. X-Ray CT System (Friefeld)
9. Publications (Murray)

July 16th Morning

Proposed ITAP Agenda (continued)

5. Role of iTAP for the IODP proponent community & iSAS
    a. Discussion on relationship among SSP/SSEPs
    b. Clarify iTAP's role in iSAS
    c. Identify iTAP members to work on technical briefs
6. Cross-platform technical issues
    a. Logging tools
    b. LWD for detecting hydrocarbons
    c. Other Issues
7. Future Structure & Membership in IODP
8. Review of Recommendations and Action Items

Proposed iSCIMP Agenda (continued)

10. Technician Support (Murray)
11. Scientific Staffing (Murray)
12. Membership Rotation (Murray)
13. iSciMP/iTAP Future (Murray)
14. Review of iSciMP Recommendations

July 16th Afternoon (Joint iTAP/iSCIMP)

Science & Technology Panel Structure in IODP

8. Review of Recommendations
9. SciMP/iTAP future (Murray, Kikawa, Moran, Masuda)
10. Any Other Business
11. Next Meeting(s) and Hosts

OD21 SHIPBOARD LAB EQUIPMENT (DRAFT) Status

As of June 31, 2003

	Item	No.	Provider/manufacture	Specification	Purchased
	CO-CHIEF & STAFF SCIENTIST'S OFFICE (Lab. Management Deck)				
H-50	PC(win)	3			
H-51	PC(mac)	3			
H-60	Compact Copy machine	1			
H-61	CATV monitor	1			
	Lab. Roof Deck				
Q-1	Core Container (20ft)	10			
Q-2	Gas monitor for Core container	1set			
Q-5	Core catcher bench with sink	1	Ship yard	Steel bench with steel sink, Hot, and cold water, and compressed air	yard provided
Q-7	Core rack	1	Ship yard		yard provided
Q-100,101	Utility for container lab. and RI lab.	1set	Ship yard	Hot and cold water, Chemical drain, Compressed Air, Telephone, and other utilities.	yard provided
	CORE REGISTRATION ROOM (Lab. Roof Deck)				
S-50	PC(win)	1			
S-60	BC printer	1			
S-61	Printer (mono)	1			
S-62	CATV monitor	1			
	DOWNHOLE MEASURE LAB (Lab. Roof Deck)				
P-4	Chain Block	2set	Osaka Futaba (Japanese)	Electric powered, Lifting weight: 250Kg. Lifting speed : 8.5m/min Chain size: 6.3	Yard Provided
P-50	WS	2			
P-51	Logging Units	1set			sub-contractor
P-52	PC(win)	6			
P-53	PC(mac)	2			
p-60	Printer (color)	1			
P-61	Compact Copy machine	1			
P-62	Plotter(A0)	1			
P-63	CD-RW	1			
P-64	MO	1			
P-65	ZIP	1			
P-66	DAT	1			
P-67	EXBYTE	1			
P-68,69,70	CATV monitor	1ea.			
	X-RAY CT SCANNER LAB (27m2) (Core Processing Deck)				
G-1	X-ray CT Scanner	1	GE Medical Systems: LightSpeed Ultra 16	16 channel, 1 slice: 0.65mm, x-y resolution: 0.35mm, axis resolution: 0.4mm	FYJ2003
G-100	X-RAY shield structure	1	Ship Yard	passed test (2mm pb, 4mm pb for the floor)	Yard provided
	QA/QC Sampling Room (35m2) (Core Processing Deck)				
I-1	Sampling device for microbiology	1			
I-2	Fluorescence microscope	1			
I-3	Gas chromatograph (ECD)	1			
I-4	Liquid chromatograph	1			
I-5	Fume Hood	1	Yamato kagaku (Japanese): RBF-180S-Y	inside dimension: approx. 150x55cm, exhaust air volume: 19m3/min, Air flow rate: approx. 0.5m/s	Yard provided
I-6	Clean Bench	1	Yamato kagaku (Japanese): PCV-1305BNG3	inside dimension: approx. W116xH72cm, Air flow rate: approx. 0.3m/s w/HEPA filter, Class 10	FYJ2003
I-7	Anaerobic glove box	1	Coy: 7000-000BT Special	similar to JR's glove box: 195x99x102cm with two pair gloves on opposite side, airlock, oxygen and hydrogen analyzer, gas leak detector and so on	Supplemental budget FYJ2003
I-8	Autoclave	1	Tomy (Japanese): BS305	Chamber Capacity: 45 litters, Operating Temperature: 105~127degree C, Max Operating pressure: 167kPa	Supplemental budget FYJ2003
I-9	4-Column 100-ton Press	3			
I-10	Fume Hood	1	Yamato kagaku (Japanese): RBF-120S-Y	inside dimension: approx. 100x55cm, exhaust air volume: 12m3/min, Air flow rate: approx. 0.5m/s	Yard provided
I-11	LN2 bottle	2			
I-12	LN2 rack	1			
I-13	Ultrapure water system	1	Millipore Corporation: Milli-Q EQG-10L	Elix 10 UV Purification System with Mili-Q Gradient System: Use for Analytical chemistry, Resistivity: 18.2, TOC(ppb): 1-5, Pyrogens(EU/mL): NA, Bacteria(cfu/mL): <1, Flow Rate(L/min): 1.5	Supplemental budget FYJ2003
I-14	Dry Heated Sterilizer	1			
I-15	Centrifuge	1			
I-17	Balance	1			

I-18	Drying oven	1	Tokyo rika (Japanese): WFO-451SD	Internal Dimensions: 450mmWx450mmDx400mmH, Temperature control range: 40C~200C +/-1C	FYJ2003
I-50	PC(win)	2			
I-51	PC(mac)	2			
I-52	CATV monitor	1			
I-60	BC printer	1			
	Microbiology Laboratory (80m2) (Core Processing Deck)				
J-1	Safety cabinet	1	Yamato kagaku (Japanese): SCV-1305ECIIAB	internal dimensions: 1300mmWx520mmDx675mmH, Air flow rate: 0.3~0.5m/s, Exhaust air volume: 8.6~10.9m3/min w/HEPA filters, Class II based on National Sanitation Foundation	Yard provided
J-2	Pharmaceutical refrigerator	1	SANYO (Japanese): MPR-513R	internal Dimensions: 800mmWx465mmDx1300mmH, effective capacity: 486L, Temperature control range: 2C~14C,	FYJ2003
J-3	Freezer_-85 _C_	2	SANYO (Japanese): MDF-493AT	360 Litter, open top type with Liquid CO2 support system	Supplemental budget FYJ2003
J-4	Freezer_-150 _C_	2	SANYO (Japanese): MDF-1155AT	128 Litter, open top type with Liquid CO2 support system	Supplemental budget FYJ2003
J-7	Pressure pump	1			
J-8	Pressure chamber for sample preservation	5			
J-9	Freeze drier	1	Labconco: FZ-4.5CL	FreeZone 4.5 litter Console Freeze Dry System, 10 drying chamber, capable of 4.5 litters of ice, remove over 2 litters of water in 24 hours	Supplemental budget FYJ2003
J-10	Incubator (0-30_, 10-60_, 25-150_)	3			
J-11	Anaerobic glove box	1	Coy: 7000-000BT Special	similar to JR's glove box: 195x99x102cm with two pair gloves on opposite side, airlock, oxygen and hydrogen analyzer, gas leak detector and so on	Supplemental budget FYJ2003
J-12	Autoclave (large)	1	Tomy(Japanese): BS305	Chamber Capacity: 45 litters, Operating Temperature: 105~127degree C, Max Operating pressure: 167kPa	Supplemental budget FYJ2003
J-14	Fluorescent phase contrast microscope	1			
J-15	Fluorescent microscope	1			
J-17	Photo micrographic system	1			
J-19	Ultrapure water system	1	Millipore Corporation: Milli-Q EQE-10L	Elix 10 UV Purification System with Mili-Q Element System: Use for Ultratrace Analysis, Resistivity: 18.2, TOC(ppb): <5, Pyrogens(EU/mL): NA, Bacteria(cfu/mL): <1, Flow Rate(L/min): 1.5	Supplemental budget FYJ2003
J-20	Electronic Balance	1			
J-21	Centrifuge with temp control	1			
J-29	Refrigerator (4_, -20_)	1	SANYO (Japanese): MPR-411FRS	Up right type Pharmaceutical Refrigerator, Refrigerator compartment (2~14 degree C) Capacity: 340 Litter, Freezer compartment (-10~-30 degree C) capacity: 82 Litter	Supplemental budget FYJ2003
J-32	Fume Hood	1	Yamato kagaku (Japanese): RBF-180S-Y	inside dimension: approx. 150x55cm, exhaust air volume: 19m3/min, Air flow rate: approx. 0.5m/s	Yard provided
J-33	Clean bench	1	Yamato kagaku (Japanese): PCV-1305BNG3	inside dimension: approx. W116xH72cm, Air flow rate: approx. 0.3m/s w/HEPA filter, Class 10	FYJ2003
J-34	Gas Chromatograph (TCD,FID)	1			
J-35	Ultrasonic Cleaner	1	Branson: 3510J-DTH	Digital control variable temperature: 200W, 42KHz, Tank: 5.7L	FYJ2003
J-36	Desiccator	1			
J-50	PC(win)	2			
J-51	PC(mac)	2			
J-52	Mobile PC(win)	1			
J-60	Printer (color)	1			
J-61	CATV monitor	1			
	Core Lab./PP (210m2) (Core Processing Deck)				
B-1	Whole Core MSCL	1			
	_Gamma-Ray Attenuation Porosity Evaluator(GRAPE)				
	_Magnet Susceptibility Meter				
	_P-Wave Logger(PWL)				
	_Electric resistibility				
B-24	_Natural Gamma-Ray Spectrometer				
B-2	Digital Image MSCL__________Color line scanner	1			
B-3	Whole/Split Core MSCL	1			
	_P-Wave Logger(PWL)				
	_Magnet Susceptibility Meter				
	_Electric resistibility				
B-25	Color spectrometer	1			
B-4	XRF Core Logger	1	JEOL(Japanese): JSX-3600CA1	non-destructive measurement system, Detection Range: Na~U, Detector resolution: <150eV, X-ray tube: 5~50KV, 0.1~1mA	FYJ2003
B-5	Mini core Drill Press	2	Maruto (Japanese): MGC-10	Similar to JR, exchangeable diamond bits.	Supplemental budget FYJ2003

B-6	Laser Particle Analyzer	1			
B-7	Stereomicroscope	2			
B-8	Polarization Microscope	2			
B-11	Cut-off Saw/Tile Saw	1	Maruto (Japanese): MC-442S	Max. blade size: 300mm, Table size: 290x250mm	Supplemental budget FYJ2003
B-12	Parallel Saw	1	Maruto (Japanese): MC-442SS2	Same as above, Adjustable blades distance	Supplemental budget FYJ2003
B-13	Super Saw/Core Splitter	1			
B-14	X-Ray System (Soft X-ray camera)	1			
B-15	Heat sealer w/ vacuum	5			
B-20	Thermal Conductivity System	1	TeKa Berlin: TK04	same as JR, Use needle probe method, Measuring range: 0.1-1.2 $Wm^{-1}K^{-1}$(VLQ), 0.3-12$Wm^{-1}K^{-1}$(HLQ), Accuracy: better than +/-5% (standard), Reproducibility: better than +/-1.5%, Heater current: better than 0.01%	Supplemental budget FYJ2003
B-21	Penta-Pycnometer	1			
B-22	Electronic Balance(2)	2			
B-23	XRD	1			
B-26	Oven dryer	1	Tokyo rika (Japanese): WFO-601SD	Internal Dimensions: 600mmWx500mmDx500mmH, Temperature control range: 40C~200C +/-1C	FYJ2003
B-50	PC(win)	4			
B-51	PC(mac)	2			
B-52	PC(win)	2			
B-53	PC(mac)	2			
B-54	WS	1			
B-55	WS	1			
	Paleomagnetics Laboratory(28m2) (Core Processing Deck)				
C-1	Cryogenic Magnetometer System	1			
	(Alternating Field Demagnetizer)				
	(ARM Magnetizer)				
	(IRM Coil)				
C-3	Spinner Magnetometer	1	Natsuhara Gikenn (Japanese): SMD-88	Measurement range: 10^{-1}~$10^{-6}$$mAm^2$, Accuracy: below +/-2.5%, Noise level: ~1x$10^{-7}$$mAm^2$(256stacking), magnetic shield: 4 layers of parmaloy, Resodue magnetic field: below 10nT	Supplemental budget FYJ2003
C-4	Thermal Demagnetizer	1			
C-5	3-Axis Fluxgate Magnetometer	1			
C-6	AF Demagnetizer	1	Natsuhara Gikenn (Japanese): DEM-95	Max. demagnetize field: 180mT, Mini. Magnetic field setting: 0.2mT, Demagnetized frequency: ~100Hz, ARM: max 0.4mT(40e), Accuracy: below +/-2.5%, Resodue magnetic field: below 10nT	Supplemental budget FYJ2003
C-7	Pulse Magnetizer	1	Magnetic Measurements Ltd.: MMPM10	Field strength: more than 9Tin 3 ranges, Pulse duration: 3msec	Supplemental budget FYJ2003
C-8	Partial Anhysteric Remanence Magnetizer(PARM)	1	ASC Scientific: Dtech D-2000	AF Peak Field: 0.2T(2000 Gauss), Minimum AF Field Step: 0.0001T(1.0 Gauss), ARM Peak Field: 0.0015T(1.5 Gauss), PARM Peak Field: 0.0015T(1.5 Gauss), AF Decay Rates: Eight discreet rates available, Minimum PARM Step: 0.0001T(1.0 Gauss)	Supplemental budget FYJ2003
C-9	Bartington MS2 Susceptibility Device	1			
C-10	Kappabridge	1	AGICO, Inc.: KLY-3S Kappabridges	Operating Frequency: 875Hz, Field intensity: 300A/m, Field Homogeneity: 0.2%, Measuring range Automatic: Up to 0.1 (SI), Sensitivity (typical): Bulk:2.5x10^{-8}(SI), Aniso:1.2x10^{-8}(SI), Accuracy Within One Range: +/-0.1%, Absolute Accuracy calibration: +/-3%, Pick-up Coil Diameter: 43mm	Supplemental budget FYJ2003
C-11	Hall-Effect Gaussmeter	1	Walker LDJ Scientific: MG-5DP	Range: +/-100.0 gauss, +/-1.000kG and +/-10.00kG with 100% over-range(+/-100 mG to +/-19.99kG), resolution: 0.05%, Peak meter reading Accuracy: +/-1% of full scale, Peak reading Resolution: (10-40 degree C) from DC to 20kHz8sinewave) minimum pulse width 50 microsec(square wave)	Supplemental budget FYJ2003
C-12	Fluxgate Digital Magnetometer	1			
C-14	Magnetic shield room	1		3.5mG shield	Yard Provided
C-50	PC(win)	3			
C-51	PC(mac)	3			
C-60	Printer (color)	1			
C-61	CATV monitor	1			
	OFF-TIME SPACE (Core Processing Deck)				
KK-50	WS	1			
KK-51	PC(win)	1			
KK-52	PC(mac)	1			
KK-60	Printer (color)	1			
KK-61	CATV monitor	1			
	CURATOR OFFICE (Core Processing deck)				

X-60	PC(win)	1			
X-61	CATV monitor	1			
	SAMPLE PREP ROOM(62m2) (Lab. Street Deck)				
E-1	Freeze Dryer	1	Labconco: FZ-4.5CL	FreeZone 4.5 litter Console Freeze Dry System, 10 drying chamber, capable of 4.5 litters of ice, remove over 2 litters of water in 24 hours	Supplemental budget FYJ2003
E-3	Ultrapure Water System	1	Millipore Corporation: Milli-Q EQA-10L	Elix 10 UV Purification System with Mili-Q Academic System: Use for general laboratory applications, Resistivity: 18.2, TOC(ppb): 5-10, Pyrogens(EU/mL): NA, Bacteria(cfu/mL): <1, Flow Rate(L/min): 1.5	Supplemental budget FYJ2003
E-4	Electro balance	2			
E-6	Fume Hood	1	Yamato kagaku (Japanese): RBF-120S-Y	inside dimension: approx. 100x55cm, exhaust air volume: 12m3/min, Air flow rate: approx. 0.5m/s	yard provided
E-9	Tabletop clean bench	1	Yamato kagaku (Japanese): PCV-750APG	Outside dimension: approx. 750mmWx500mmDx1120mmH, Air flow rate: approx. 0.45m/s, Class 100	FYJ2003
E-10	Tabletop cooling centrifuge	1			
E-12	Forced convection constant temperature oven	2	Yamato kagaku (Japanese): DNF400	Internal Dimensions: 400mmWx450mmDx450mmH, Temperature control range: 5C~260C +/-0.5C	FYJ2003
E-14	Glassware Washer	1	SANYO (Japanese): MJW8010	Inside dimension: 500X505x600mm with one rack, shower on top and rotary jet nozzle on bottom.	Supplemental budget FYJ2003
E-16	Ultrasonic Cleaner	2(1)	Branson: 8510J-DTH	Digital control variable temperature: 560W, 44KHz, Tank: 20.1L	FYJ2003
E-17	Ultraviolet Lamp	2	Sanhayato (Japanese): BOX-W9B	Exposed dimension: 160mmx250mm	FYJ2003
E-19	Fume Hood for HF	1	Yamato kagaku (Japanese): RFB-120VZ	inside dimension: approx. 100x55cm, exhaust air volume: 12m3/min, Air flow rate: approx. 0.5m/s	yard provided
E-20	High speed solvent extractor	1			
E-21	Tabletop Centrifuge(2)	1			
E-22	Bead Sampler	1			
E-24	Isotemp Programmable Ashing Furnace	1			
E-25 (37)	Mixer Mill	1			
E-31	Scientific Balance System(2)	2			
E-32	X-Press Motorized Hydraulic Press	1			
E-34	Desiccators Specimen Cabinet for XRF Standards	1			
E-35	Refrigerator (4_, -20_)	1	SANYO (Japanese): MPR-411FRS	Up right type Pharmaceutical Refrigerator, Refrigerator compartment (2~14 degree C) Capacity: 340 Litter, Freezer compartment (-10~-30 degree C) capacity: 82 Litter	Supplemental budget FYJ2003
E-36	Ice maker (flake ice)	1	Hoshizaki (Japanese): FM-230AE-1-SA	Capacity: 120kg, approx. 200kg/day	Supplemental budget FYJ2003
E-37 (25)	Ball Mill	1	Fritsch: P-5/4	Outside dimension: 580mmLx670mmWx570mmH, available pots: 2,4 or 8, Pot RPM: 65~870rpm, final grinding size: 1micron	FYJ2003
E-38	molder and pestle	1			
E-39	Hot plate	2	Advantec: TP-320	Temp control: 50~250C, plate size: 350mmx250mm	FYJ2003
	Hot plate stirrer	2	Advantec: SRS710HA	Temp Control: 50~300C, Stirrer rate: 100~1500rpm, Stirre volume: 100mL~7L	
E-50	PC (win)	1			
E-60	BC printer	1			
E-61	CATV monitor	1			
	PALAEONTOLOGY/ PETROLOGY LAB(47m2) (Lab. Street Deck)				
D-1	Automatic Point Counter	1			
D-2	Polarization Microscope	6			
D-3	TV Camera for microscope	1			
D-5	Camera for microscope	1			
D-7	Video copy processor	1			
D-8	Stereomicroscope _____	3			
D-11	Digital camera for microscope	3			
D-12	Color Video Image Printer	3			
D-13	Microscope camera	1			
D-15	Anti-vibration pad	6			
D-17	Image analysis system _main unit, color processing soft, printer, video printer_	1			
D-18	3CCD color video camera DXC-9000	1			
D-50	PC(win)				
D-51	PC(mac)				
D-60	printer (color)				
D-61	CATV monitor				
	GEOCHEMISTRY LAB(141m2) (Lab. Street deck)				
A-1	ICP-MAS	1			
A-2	ICP-AES	1			
A-5	CHNS/O analyzer	1			

A-7	Alkalinity Titrator System	1	Metrhom: Basic Titrino Model 794	masters all titration methods that are relevant in practice. Two inputs for pH electrodes, ion-selective electrodes, metal electrodes. One input for polarized electrodes. Differential amplifier for low-conductivity (non-aqueous) media.	Supplemental budget FYJ2003
A-8	Other Titrator Systems	2	Metrhom: Basic Titrino Model 794	Same as above, Different Cell	Supplemental budget FYJ2003
A-9	Refrigerated Circulator for Waterbath(2)	2	Shibata (Japanese): CW-301	Temp control: -20~80C, +/-0.5C, water tank size: 5L, Flow rate:16L/min	FYJ2003
A-11	Coulometer	1			
A-12	Ion Chromatograph	1			
A-13	Spectrophotometer	1			
A-14	Gas Chromatograph #1(NGA)	1	Agilent: 6890N	NGA: Wasson-ECE, attached FID and TCD FID detector identifies: C1-C12, TCD detects: isobutene, n-butane, ...so on.	FYJ2003
A-15	Gas Chromatograph #2(MAS)	1	Agilent: 5973N	with Mass Selective Detector, Mass range: 1.6 800u in 0.1 u steps, Scan speed up to: 5200 u/sec with 0.1 u scan step size, with eight sampling rates. Mass axis stability: 0.15 u over 12 hours.	FYJ2003
A-16	Gas Chromatograph #3(FID)	1	Agilent: 6890N	FID detector only	FYJ2003
A-18	Hydrogen Generator	3	Packerd: H2-90	Product purity: 99.9995% pure hydrogen, Reservoir Capacity: 4L, Flow Range: 90cc/min, Delivery Pressure: 0-90psig	FYJ2003
A-19	Rock Eval	1	Vinch Technologies: Rock-Eval 6 "Standard"	Pyrolysis and oxidation ovens, 1 Flame Ionization Detector, 1 infra-red cell. Measurement parameter: S1-S2-Tmax, S3co/S3co2(New Oxygen Index), S4co/S4co2(Residual Organic Carbon), S5(Mineral Carbon)	Supplemental budget FYJ2003
A-25	Ultra pure Water System	1	Millipore Corporation: Milli-Q EQS-10L	Elix 10 UV Purification System with Mili-Q Synthesis System: Use for Molecular biology applications, Resistively: 18.2, TOC(ppb): 2-5, Pyrogens(EU/mL): <0.001, Bacteria(cfu/mL): <1, Flow Rate(L/min): 1.0	Supplemental budget FYJ2003
A-33	Liquid chromatograph	1			
A-34	Ultra-high temperature furnace	1			
A-35	Tabletop clean bench	1	Yamato kagaku (Japanese): PCV-750APG	Outside dimension: approx. 750mmWx500mmDx1120mmH, Air flow rate: approx. 0.45m/s, Class 100	FYJ2003
A-41	Reefer showcase	1	SANYO (Japanese): MPR-513R	internal Dimensions: 800mmWx465mmDx1300mmH, effective capacity: 486L, Temperature control range: 2C~14C,	FYJ2003
A-45	Clean air equipment	1set			
A-48	Trash box	1			
A-50	Compact Isotope ratio MS analyzer	1			
A-51,52	Micro balance	2			
E-7,18	Fume Hood	2	Yamato kagaku (Japanese): RBF-120S-Y	inside dimension: approx. 100x55cm, exhaust air volume: 12m3/min, Air flow rate: approx. 0.5m/s	Yard provided
A-80	PC(win)	3			
A-81	PC(mac)	3			
A-90	printer (color)	1			
A-91	CATV monitor	1			
	THIN SECTION ROOM(18m2) (Lab. Street Deck)				
F-2	Polarization Microscope	1			
F-7	Fume Hood	1	Yamato kagaku (Japanese): RBF-120S-Y	inside dimension: approx. 100x55cm, exhaust air volume: 12m3/min, Air flow rate: approx. 0.5m/s	Yard provided
F-13	cut off saw (small type)	2	Maruto (Japanese): MC-110	Small type of cut off saw	Supplemental budget FYJ2003
F-13	cut off saw	1	Struers: Discotom-5	Automatic and manual cut-off machine	Supplemental budget FYJ2003
F-14	Thin section equip.	1	Struers: Discoplan-TS	precision cutting and grinding machine, Left side, diamond cut-off wheel and holders for initial cutting, right side, diamond cup wheel and vacuum holder for grinding specimens with accuracy of 2micrometer.	Supplemental budget FYJ2003
F-15	Vacuum Impregnation	1	Struers: Epovac	Simultaneous impregnation or embedding of several specimens.	Supplemental budget FYJ2003
F-16	Polishing system	2	Struers: RotoPol-35/Pdm-Force-20	grinding and polishing machine for 300mm dia. Discs. Variable speed from 40-600rpm. Exchangeable specimen mover plate for 4 or 8 specimen	Supplemental budget FYJ2003
F-17	Ultrasonic bath	1	Branson: 8510J-DTH	Digital control variable temperature: 560W, 44KHz, Tank: 20.1L	FYJ2003
F-18	Hot Plate	2	Advantec: TP-320	Temp control: 50~250C, plate size: 350mmx250mm	FYJ2003
F-50	PC(win)	1			
F-51	CATV monitor	1			
	ET SHOP (Lab. Street Deck)				
T-1	Anti electrostatic desk	1	Ship yard		Yard Provided
T-50	PC(win)	1			

	OFF-TIME SPACE (Lab. Street Deck)				
O-50	WS	1			
O-51	PC(win)	1			
O-52	PC(mac)	1			
O-60	printer (color)	1			
O-61	CATV monitor	1			
	STORAGE/ GAS BOTTLE RM (Lab. Street Deck)				
L-1	N2 generator	1	KURASEP (Japanese): MY-9S	99.999% 3m2/hr, 99.99% 6m2/hr	FYJ2003
L-3	Liquid Nitrogen generator	1	Iwatani (Japanese): NL-100A-S	15 litter/day, 80 litter tank	FYJ2003
	COMPUTER/ USER/ LIBRARY (Lab. Management Deck)				
M-50	Servers	1set			
M-51	WS	1			
M-52	PC(win)	1			
M-53	PC(mac)	1			
M-54	Printer (color)	1			
M-60	PC(win)	4			
M-61	PC(mac)	4			
M-62	Printer (mono)	1			
M-63	Printer (color)	1			
M-64	Plotter	1			
M-65	Scanner	1			
M-66	CD-RW	1			
M-67	MO	1			
M-68	ZIP	1			
M-69	DAT	1			
M-70	EXBYTE	1			
M-80	WS(only for data integration software)	1			
M-81	WS	3			
M-82	Plotter (A0)	1			
	LOUNGE (Lab. Management Deck)				
MM-50	CATV monitor	1			
	CONFERENCE ROOM (Lab. Management Deck)				
N-1	Copy machine	1			
N-2	Ceiling projector	1			
N-3	VTR	1			
N-4	Audio system	1			
N-5	White board	1			
N-6	CATV monitor	1			
	LAB OFFICER'S OFFICE (Lab. Management Deck)				
Z-50	PC(win)	1			
Z-51	PC(mac)	1			
Z-52	CATV monitor	1			
	YEOPERSON'S OFFICE (Lab. Management Deck)				
Y-50	PC(win)	2			
Y-51	PC(mac)	2			
Y-52	CATV monitor	1			

Integrated Ocean Drilling Program
Microbiology Working Group

Members

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Ken Takai, JAMSTEC (co-chair)
Peter Wellsbury, University of Bristol

Our Charge:

iPC Consensus 3-17: The iPC requests that iSciMP form a microbiology working group to examine issues related to the conditions and duration of sample storage, to make recommendations about the importance of patent rights, to formulate requirements for data reporting and publications, and to identify ways to attract more microbiologists to the program.

Note from Microbiology Working Group co-chairs: Prior to assembling the Microbiology Working Group, a Memorandum of Cooperation between the U.S. (NSF) and Japan (MEXT) was signed. The memorandum addresses issues concerning intellectual property and data rights and therefore discussions of these topics were not considered by this working group. The relevant sections of the memorandum signed on 22 April 2003 are below.

> **Section VII. Data, Information, Intellectual Property Rights**
> The Agencies take necessary measures to assure that all data, samples, and scientific and technical results of the Program's scientific and engineering activities are made widely available to the international scientific community and to the public through customary channels and in accordance with the normal procedures of the Agencies, or an identified by the SAS. Such measures should be taken in accordance with the respective laws and regulations of Japan and the United States.
>
> Information transmitted by one Agency to the other under this Memorandum is expected to be accurate to the best knowledge and belief of the transmitting Agency which may not be liable for the content or issue of such information.
>
> Protection of intellectual property and rights thereto resulting from

scientific research activities conducted under the auspices of this Memorandum will be addressed as set forth in Annex IV to the Agreement between the Government of Japan and the Government of the United States of America on Cooperation in Research and Development in Science and Technology, signed at Toronto on June 20, 1988, and extended by the Protocols done at Washington on June 16, 1993, on June 16, 1998, on March 19, 1999, and on May 19, 1999, and extended and amended by the Protocol done at Washington on July 16, 1999.

ANNEX IV—Annual Member Contributions and Rights (final two paragraphs)

An IODP member with at least one participation unit may maintain the same rights in data as the Agencies for activities conducted using the IODP science operations funds.

An IODP member with at least one participation unit is to have the right to a royalty free license for all patents resulting from developments supported by the IODP science operations funds.

1) Introduction

Interest in microbes inhabiting the marine deep subsurface has increased dramatically towards the end of the Ocean Drilling Program. As a result of this interest, microbiology became better integrated into the program. This culminated in the establishment of a well equipped microbiology laboratory onboard the JOIDES Resolution and the participation of more and more microbiologists. The purpose of this document is to lay out how IODP can capitalize on the knowledge gained during ODP and further integrate microbiology into the new program.

In response to iPC Consensus Statement 3-17, a Working Group of microbiologists was formed. This group is co-chaired by the two microbiologists that serve on iSciMP (Smith and Takai). The other members are expert in various aspects of environmental microbiology and have previous experience with the Ocean Drilling Program. The working group did not meet in person but rather worked on this document via email. Many of the issues described in the request from iPC have evolved independently, and this WG Report helps consolidate and formalize these practices, as well as make new recommendations to help ensure that the scientific goals articulated in the Initial Science Plan of the IODP ("Earth, Oceans, and Life") are able to be realized.

While the WG appreciates the significant progress the ODP has made in microbiological studies, they also feel that it is the IODP's responsibility to ensure that the microbiological measurements are continually made, and not on an ad hoc basis. Tremendous amounts of knowledge have been gained in other shipboard laboratories (e.g., the interstitial water program) even on legs for which those measurements are not fully associated with the leg objectives. It will only be after 5-10 years of continual and routine microbiological sampling and analysis that benefits will begin to become apparent. The implementation of the following recommendations will help us to reach this goal.

2) Sample Collection

A wide variety of analyses in support of the study of microbes in the deep subsurface have been employed on subsamples of recovered cores. Specific handling procedures are required for the various downstream procedures. In all cases, avoiding contamination of the cores with non-indigenous microbes, either during the drilling process or the subsequent subsampling is of paramount importance. Subsamples used for DNA and biomarker analyses should be frozen (preferably in liquid nitrogen, -196°C) as soon as possible after their isolation from the core. Subsamples that are used for subculturing must be protected from dramatic increases in temperature or from exposure to oxygen.

Subsampling Strategies:

- Subcore with sterile syringe. Ideally, a subcore is taken directly from the end of a core section on the catwalk. To reduce the potential for introducing contamination, the core is broken after the core liner is cut. If the core is cut with a blade or wire, the exposed end of the core must be scraped with a sterile blade prior to inserting the syringe. The ends of syringes (1, 3, 5, 10, or 50 mL) are cut off and used to take mini-cores from the uncontaminated interior of the cores. For indurated sediments, the syringes are pounded in to the center of the core using an adaptor developed at Bristol University. This method has been used extensively for the direct cell count samples. It is also very useful for samples for subculturing or molecular biology. This method yields an uncontaminated subcore that can be assayed directly or stored for later analysis.

- Whole round cores. Whole round samples (typically 5 or 10 cm in length) are cut on the catwalk, in the lab or in a cold room. The core liner is cut using the standard cutter and the core itself is broken or cut using a spatula or a wire. The whole rounds require additional work to remove the outer edge which is contaminated by drilling fluid.

- Hard rock samples. Individual rock pieces are sampled by paring away the contaminated outer edge using sterilized (flame or autoclave) chisels. The clean interior can be further processed by crushing using a stainless steel percussion mortar.

2) Sample Storage

Requirements for sample storage conditions are dependent upon the downstream assay. The following considerations are pertinent to samples that will be used in a more immediate manner (i.e. shipboard sample request) as well as those that will be shipped to shore-based laboratories or repositories for future analyses. It must be noted that even samples that are stored properly are not useful indefinitely and these samples are not a long term archive.

a. Frozen samples. Frozen samples are used for nucleic acids, lipid biomarkers, amino acids etc. These samples should be collected as soon as possible and immediately frozen, ideally in liquid nitrogen. This works best with subsamples taken in syringes as the core liners crack during freezing and increase the potential for contamination. The samples can be stored in liquid nitrogen or transferred to ultra low freezers (- 80°C). It is critical that the samples remain frozen until analysis. This includes shipping on dry ice (- 78°C). It is essential that the materials not thaw during transport, even briefly. Samples stored in ultra-low freezers can be maintained in an anaerobic environment by adapting the method of Cragg, *et al*., 1992).

b. Anaerobic samples. Samples that will be used for subculturing should be stored in an anaerobic environment until used. This can be achieved using oxygen scrubbers and gas impermeable trilaminate bags (Cragg, *et al*., 1992).

c. Chemically fixed samples. Samples used for microscopy (e.g. direct cell counts, fluorescent in situ hybridization, microautoradiography) are chemically stabilized in aldehyde solutions (formaldehyde, glutaraldehyde) and stored at 4 °C. Again, the particular downstream assay dictates the particular details necessary in the fixation process.

Because maintaining the proper temperature for the particular downstream analysis is essential, a temperature logger included in the shipping container can provide the researcher with the thermal history of the samples during transit.

The above discussion leads to the following Recommendation addressing the routine collection and storage of samples for microbiological analyses.

Recommendation 1: IODP should establish a repository for samples routinely collected and stored appropriately for subsequent microbiological analysis. The samples should be taken in sterile syringes (50 cm^3 capacity) as soon as the core arrives and stored as described below depending on the subsequent analysis.

a. Samples for nucleic acid analysis should be placed immediately in liquid nitrogen and transferred to ultra-low freezer or liquid nitrogen on board for storage. Alternatively, whole round samples used for this purpose should be placed directly in an ultra-low as soon a possible.

b. Samples taken for culturing work should be transferred to gas-tight trilaminate bags containing an oxygen scrubber, heat-sealed and stored at 4 °C.

c. Samples for microscopy should be preserved with an aldehyde solution (electron microscopy grade glutaraldehyde or paraformaldehyde) and stored at 4 °C.

3) Drilling Methods

Some analyses are most likely compromised by the depressurization upon ascent. To date, all microbiological samples have undergone depressurization prior to subsampling. Therefore, by default, all microorganisms that have been cultured from recovered cores can withstand exposure to a pressure of 1 atmosphere. The currently unavoidable depressurization precludes us from culturing microorganisms that are sensitive to the reduced pressure. The continued development of pressure retaining core barrels, with the ability to subsample at the in situ pressure (e.g. HYACE/HYACINTH) is extremely valuable for microbiological studies and should be supported.

Even more critical than changes in pressure are increases in temperature. This can be minimized by expediting the removal of the core from the core barrel and giving high priority to subsampling for microbiological samples. Core processing on board should be optimized to recover the core as quickly as possible in order to minimize increases in temperature. IODP should also explore the methods for insulating the core after removal from the core barrel. Because all temperature considerations are relative to the in situ temperature, better measurements of the downhole temperatures are essential.

Quality control issues have been addressed by introducing methods for quantifying the intrusion of drilling fluid (Smith*, et al*., 2000a). The judicious use of these methods are essential to maintaining scientific integrity of our observations. Overuse of the perfluorocarbon tracer results in yielding excessively high background levels in the laboratories which results in lowering the sensitivity of the method. As with interstitial waters samples, experience has shown that the use of the extended core barrel (XCB) produces cores of inferior quality (Smith*, et al*., 2000b) for microbiological study. Extending the range of the more desirable hydraulic piston core (APC) by "drilling over" should be used whenever possible. While this comes at the expense of time and equipment, it yields samples that are of sufficiently high quality for microbiological analyses. Hard rock samples collected with the rotary core barrel (RCB) are more problematic with respect to contamination issues. In practice, the fluorescent microspheres appear to be a more appropriate tracer for hard rock samples. The single test using the diamond core barrel system (DCB) yielded a clean sample. To date, the motor driven core barrel (MDCB) has not been tested. In general, for all drilling tools, larger diameter cores will yield more uncontaminated material for a given length of core and is more desirable. This will also yield more material from a specific horizon and allow for more the analysis of samples at higher vertical resolution.

Recommendation 2: Drilling methods that yield cores of optimal quality for microbiological studies should become standard.

a. Optimization of core processing with the goal of minimizing increases in temperature and exposure to oxygen should be implemented.

b. Continued performance, and further improvements to the methods for contamination testing (House*, et al*., 2003) while coring.

c. Routine use of the drill over method extends the useful range of the APC method and provides superior results for microbiological studies and should be implemented.

d. The continued development of the pressure retaining core barrel, and subsequent handing under in situ pressures is highly valuable to the microbiology research and must be given highest priority.

4) Data Reporting and Publications

Microbiologists are required to follow the IODP Sample and Data Policy as any other group. Because microbiologists generate some types of samples and data that are unique to their field, however, some additional issues need to be addressed.

a. Sequence data. The sequencing of nucleic acids has become the standard method for identifying microorganisms. The usefulness of the data resides in the ability to compare sequences. This is accomplished by submission of sequences to internationally recognized, publicly accessible, databases (below). In general, microbiological journals require submission of sequence data to one of these databases prior to publication. These requirements are specifically stated in the 'advice to authors'. These statements from FEMS Microbiology Ecology[1] and Applied and Environmental Microbiology[2], two pertinent journals, are included in the footnotes.

DDBJ
Center for Information Biology and DNA Data Bank of Japan
National Institute of Genetics
111 Yata, Mishima, Shizuoka 411-8540, Japan;
telephone, 81-559-81-6853
fax, 81-559-81-6849
e-mail, ddbj@ddbj.nig.ac.jp
URL, http://www.ddbj.nig.ac.jp

EMBL
EMBL Nucleotide Sequence Submissions, European Bioinformatics Institute
Wellcome Trust Genome Campus
Hinxton, Cambridge CB10 1SD, United Kingdom
telephone, 44-1223-494499
fax, 44-1223-494472

e-mail, datasubs@ebi.ac.uk
URL, http://www.ebi.ac.uk.

GenBank
National Center for Biotechnology Information
National Library of Medicine, Bldg. 38A, Rm. 8N- 803
Bethesda, MD 20894
telephone, 301-496-2475
fax 301-480-9241
e-mail, info@ncbi.nlm.nih.gov
URL, http://www.ncbi.nlm.nih.gov.

b) Culture isolates. A common goal for many microbiologists is to obtain pure cultures of microorganisms in order to perform detailed studies on their physiological capabilities, produce specific enzymes or metabolic byproducts etc. It is common practice to place subsamples of the cultures into publicly accessible culture collections. The leading journals in the field advocate this practice[2]. In keeping with the open, international cooperation established during the previous decades of scientific ocean drilling, IODP should require that cultures of microorganisms isolated from cores be deposited in a publicly accessible culture collection (e.g. Takai, *et al.*, 2003).

American Type Culture Collection
P.O. Box 1549
Manassas, VA 20108 USA
(703) 365-2700
E-mail news@atcc.org
http://www.atcc.org

Japan Collection of Microorganisms
RIKEN (The Institute of Physical and Chemical Research)
2-1 Hirosawa, Wako, Saitama 351-0198, Japan
Phone: +81 48 467 9560
Fax: +81 48 462 4617
E-mail: curator@jcm.riken.go.jp
http://www.jcm.riken.go.jp/

German Collection of Microorganisms and Cell Cultures (DSMZ)
Mascheroder Weg 1b
38124 Braunschweig
GERMANY
Phone:+49 (0) 531-2616-0
Fax:+49 (0) 531-2616-418
http://www.dsmz.de

Recommendation 3: IODP should adopt policies to those that are already firmly established within the international community of microbiologists for the exchange of culture and sequence data.

a. Unique nucleic acid sequence data derived from cores and published in IODP publications or scientific journals must be submitted to an internationally recognized, publicly accessible database (e.g. DDBJ, EMBL and GenBank).

b. Subcultures of organisms derived from cores and published in IODP publications or scientific journals must be deposited in at least two internationally recognized, publicly accessible culture collections (e.g. ATCC, JCM and DSMZ).

5. Increasing Participation

Microbiologists increased their participation towards the end of ODP. Further increasing the participation of microbiologists in IODP will lead to a more rapid understanding of the role of microorganisms in the marine subseafloor. Efforts to recruit microbiologists should therefore be emphasized. In order to reach this goal it is necessary to:

- Firmly establish that microbiologists working within IODP operate within the same general guidelines as the larger community of microbiologists with respect to common practices. (e.g. sequence submission, culture collections etc.).
- Expand scope of biological research in IODP by incorporating fields not traditionally related to ocean drilling (e.g. biotechnology, evolutionary science, bioremediation, astrobiology etc.).
- Sponsor sessions on ocean drilling at international microbiology meetings
- Establish a microbiological core repository for post-expedition sampling

6. Routine Measurements

A great strength of the scientific drilling program is the database of routine measurements that is openly accessible. This allows for continued analysis of the data using whether it is using new techniques or global syntheses of data (e.g. Parkes*, et al*., 2000; D'Hondt*, et al*., 2002). Therefore, it is necessary to institute routine measurements that can be realistically obtained during IODP drilling projects and provide useful data to assist in the study of subsurface microbiology.

a. Biomass. There are many methods for determining biomass, each with strengths and weaknesses. After comparing the methods on samples from cores, one should be instituted as a routine measurement. The possible candidates are:

i. *Direct cell counts*. By far, the largest microbiological dataset is biomass estimated by direct cell counts of microorganisms fluorescently labeled with acridine orange (Fry, 1988). Newer fluorochromes (e.g. SYBR Green) and flow cytometry should be examined for use within the program.

ii. *Vital stains*. There are several reagents available that indicate the level of metabolic activity by generating a fluorescent product (e.g. 5-cyano-2,3-ditolyl tetrazolium chloride; Proctor and Souza, 2001) that have been applied to sediments.

iii. *Phospholipids*. Intact phospholipids can be used to estimate the total microbial biomass in sediment samples (White*, et al*., 1979; Zink*, et al*., 2003).

iv. *ATP*. Adenosine-5'-triphosphate if found in a relatively constant proportion in all living cells. Quantification of this molecule to estimate total biomass has been used successfully in cores (Egeberg, 2000).

b. <u>Metabolic Rates</u>. The addition of the radioisotope isolation van into the program greatly extends the capabilities of the microbiologists. Because these measurements should be considered in the category of 'ephemeral properties' they must be initiated on board. While labor intensive, measurements that yield rates of metabolic processes (e.g. sulfate reduction, anaerobic methane oxidation, methanogensis, DNA and protein synthesis) can substantially change our view of the activities of microorganisms in the marine subsurface. These facilities should be available and the assays should be encouraged.

7) Additional Assays

a. <u>Nucleic Acids.</u> The analysis of nucleic acids has matured to the point where they can become routine. Initially, work has been focused on genes useful for phylogenetic analysis (e.g. small subunit ribosomal RNA), it has now expanded to include metabolic genes (e.g. dissimilatory sulfite reductase (dsr), Teske*, et al*., 2003). These analyses can be conducted in shore-based laboratories so emphasis should be placed on routinely collecting and preserving samples on board the drilling platforms to later analysis.

b. <u>Biomarkers.</u> Similar to nucleic acid analysis, lipid biomarkers, especially when coupled to stable isotope analysis (e.g. Hinrichs*, et al*., 1999) are extremely useful for characterizing the subsurface community. Samples for these analyses should be routinely collected onboard and preserved for shore-based analysis.

Recommendation 4. IODP institute a routine measurement program that will be performed in support of an ongoing study of microorganisms in the marine subsurface. The data produced from these assays will be submitted to the general

IODP database and be subject to the same stipulations as other data. IODP should routinely sail a technician dedicated to the microbiology laboratory. This technician will be responsible for training sailing microbiologists in the sampling procedures and sample analysis, maintaining the equipment in the microbiology laboratory, and ensuring that an adequate inventory of supplies are on hand prior to sailing. The technician should be specifically trained in microbiological techniques and procedures, including the use of radioisotopes, for the microbiology laboratory.

Summary

Through the efforts of the Ocean Drilling Program, much has been learned about microorganisms inhabiting the marine subsurface. In order to capitalize on this knowledge and advance the field during the Integrated Ocean Drilling Program, this working group provides the following recommendations.

Recommendation 1: IODP should establish a repository for samples routinely collected and stored appropriately for subsequent microbiological analysis. The samples should be taken in sterile syringes (50 cm^3 capacity) as soon as the core arrives and stored as described below depending on the subsequent analysis.

a. Samples for nucleic acid analysis should be placed immediately in liquid nitrogen and transferred to ultra-low freezer or liquid nitrogen on board for storage. Alternatively, whole round samples used for this purpose should be placed directly in an ultra-low freezer or liquid nitrogen as soon a possible. Because these samples are not useful for nucleic acid analysis after long term storage (> 1 year) they should be made available for other types of analyses (e.g. chemical) if appropriate.

b. Samples taken for culturing work should be transferred to gas-tight trilaminate bags containing an oxygen scrubber, heat-sealed and stored at 4 °C.

c. Samples for microscopy should be preserved with an aldehyde solution (electron microscopy grade glutaraldehyde or paraformaldehyde) and stored at 4 °C.

Recommendation 2: Drilling methods that yield cores of optimal quality for microbiological studies should become standard.

a. Routine use of the drill over method extends the useful range of the APC method and provides superior results for microbiological studies and should be implemented.

b. The continued development of the pressure retaining core barrel, and subsequent handing under in situ pressures is highly valuable to the microbiology research and must be given highest priority.

c. Optimization of core processing with the goal of minimizing increases in temperature and exposure to oxygen should be implemented.

d. Continued performance, and further improvements to the methods for contamination testing (House*, et al*., 2003) while coring.

Recommendation 3: IODP should adopt similar policies that are established within the international community of microbiologists for the exchange of culture and sequence data

a. Unique nucleic acid sequence data derived from cores and published in IODP publications or scientific journals must be submitted to one of the internationally recognized, publicly accessible databases (e.g. DDBJ, EMBL and GenBank).

b. Subcultures of organisms derived from cores and published in IODP publications or scientific journals must be deposited in at least two internationally recognized, publicly accessible culture collections (e.g. ATCC, JCM, DSMZ, and CCUG).

Recommendation 4. IODP institute routine measurements that will be performed in support of an ongoing study of microorganisms in the marine subsurface. The data produced from these assays will be submitted to the general IODP database and be subject to the same stipulations as other data. IODP should routinely sail a technician in the microbiology laboratory. This technician will be responsible for training sailing microbiologists in the sampling procedures and sample analysis, maintaining the equipment in the microbiology laboratory, and ensuring that an adequate inventory of supplies are on hand prior to sailing. The technician should be specifically trained in microbiological techniques and procedures, including the use of radioisotopes, for the microbiology laboratory.

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[1]Journal statements on submission of sequence data:

FEMS Microbiology Ecology
Nucleotide sequences should be fully determined in both senses of the DNA. Sequence information will be accepted for publication only if: (a) it is relevant to a question of more general interest, (b) there is additional, complementary information, or (c) there is some particular, explicit reason for publication. All nucleotide and amino acid sequences must be deposited in an appropriate data bank. An accession number must be obtained before submission to the Editors and this fact should be mentioned in the covering letter. Authors are encouraged to use the EMBL Data Library but can also use other archives, such as GenBank. Authors should include the accession number in the appropriate Figure legend.

Applied Environmental Microbiology
It is expected that newly determined nucleotide and/or amino acid sequence data will be deposited and GenBank/EMBL/DDBJ accession numbers will be included in the manuscript no later than the modification stage of the review process. It is also expected that the sequence data will be released to the public no later than the publication date of the article. The accession number should be included in a separate paragraph at the end of the Materials and Methods section for long-form papers or at the end of the text for short-form papers. If conclusions in a manuscript are based on the analysis of sequences and a GenBank/EMBL/DDBJ accession number is not provided at the time of the review, authors may be required to provide the sequence data as a file on a floppy disk.
It is expected that when previously published sequence accession numbers are cited in a manuscript, the original citations (e.g., journal articles) will be included in the References section when possible or reasonable. Authors are also expected to do elementary searches and comparisons of nucleotide and amino acid sequences against the sequences in standard databases (e.g., GenBank) immediately before manuscripts are submitted and again at the proof stage.

[2]Journal statements on deposition of cultures in culture collections:

FEMS Microbiology Ecology. The editors expect that new and variant organisms, viruses and vectors described in FEMS journals will be made available, under written request and for their own use, to all qualified members of the scientific community. If delays in strain or vector distribution are anticipated or if they are available from sources other than the authors this should be indicated. The Editors encourage authors to deposit important strains in publicly accessible culture collections and to refer to the collections and strain numbers in the text. In the case of materials that have been distributed by individuals, authors should indicate the laboratory strain designations and name and address of the donor as well as the original culture collection identification number, if any.

Applied Environmental Microbiology. AEM encourages authors to deposit important strains in publicly accessible culture collections and to refer to the collections and strain numbers in the text. Since the authenticity of subcultures of culture collection specimens that are distributed by individuals cannot be ensured, authors should indicate laboratory strain designations and donor sources as well as original culture collection identification numbers.

Report of the iSciMP DatabaseWorking Group

2-3 June 2003

Introduction

As the Ocean Drilling Program comes to an end and a new era of ocean drilling begins with the Integrated Ocean Drilling Program (IODP) new opportunities to explore our Earth will arise. The "I" in IODP will present the most challenges especially for the data management and the integration of database services throughout the new program. The task of the interim Scientific Measurements Panel's (iSciMP) Database Working Group (DBWG, hereafter called the Group) was to present a possible model for database services, which the Group refers to as the IODP Information Services (IIS). The model comprises the management of the data collected onboard the various platforms (including downhole logging, site survey information), legacy data from DSDP and ODP, and "landborn" data, derived from post-cruise research and publications. The model includes the integration of those data and other IODP relevant information types into a common, program-wide IODP information system accessible by IODP researchers and the public. This report presents the results of a meeting held 2-3 June at which the Group discussed future IODP database and data management activities. We begin the report with a preliminary "Mission Statement", or "Mandate", for an envisioned IODP Information Services Center (ISC), which will play a key role in the successful function of the IIS. This is followed by a set of recommendations for the functions and structure of the proposed ISC, including expectations for each of the IODP Implementing Organizations (IOs), their relation to the ISC, and a number of database management issues.

The DBWG Report makes specific recommendations, however it does not specify exactly how the recommendations should be implemented. This is done intentionally. There are many possible configurations and designs that will include all of the Group's recommendations, but the Group felt it was not its charge to define the specifics. Rather, the Group would present concepts that it believes will make for a successful IODP database management structure.

The proposed model for database management for IODP is highly flexible. This report encompasses the data collected by the various operational platforms with respect to cores (e.g. data currently collected by ODP), ODP and DSDP legacy data, post-cruise data, publications information, downhole measurements, seismic images, engineering data, and much more. However, the system is versatile and should include links to the Site Survey Data Bank and downhole logging database

Participants in DBWG meeting (members of Working Group unless otherwise indicated):
Jennifer Anziano (JOI), David Becker, Michael Diepenbroek, David Divins, Colin Graham, Hisao Ito (iPC), Shin'ichi Kuramoto, Kate Moran, Saneatsu Saito, and Kyoma Takahashi.

IODP Information Services Center Mandate

The IODP Information Services Center provides for the ready access of all IODP data to IODP researchers, the international science community, industry, educators, media, and the public in a timely manner. This is achieved through the coordinated actions of the Center and the Implementing Organizations in the development and implementation of common program policies, standards, and effective mechanisms for the collection and distribution of IODP data.

Recommendations:

1) Structure of IODP Information Services

The Group recommends that an IODP Information Services Center (ISC) be established to provide database services within a distributed networked system and not within a centralized system. The system, termed the IODP Information Services, is composed of the database management activities of each of the IOs, a database of legacy data (DSDP and ODP, where these data will be maintained is not specified), and, at its heart, the Information Services Center operating directly under the IMI (Figure 1).

The primary functions of the ISC should include:

- *a **clearinghouse function** provided by ISC management, technical, and communications staff with appropriate network and computer infrastructure to provide integrated access to the program-wide information; and*
- *a **coordination function** provided by an assemblage of information services staff from each of the IOs as well as the ISC, site survey data bank services staff, and scientific drilling legacy data staff.*

Discussion:

The Group envisions two major challenges to the new ISC. First, providing integrated access to all IODP data, ODP legacy data and DSDP legacy data. Second, working with the information services staffs of the IOs and those of other data providers to ensure that data structure and access standards are in place and followed.

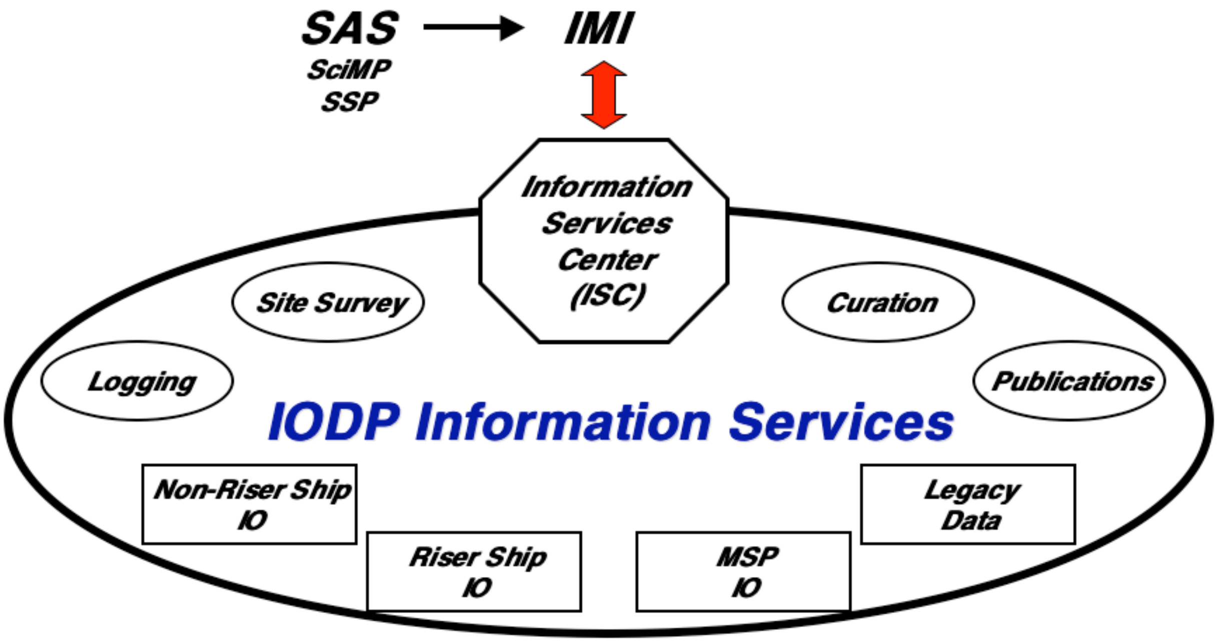

Figure 1. Proposed structure of IODP Information Services (IIS).

In a distributed environment, data resides on multiple computer systems in multiple formats at multiple locations. The challenge to the ISC will be to provide any data user a single point of entry into the myriad of IODP databases, text libraries, and catalogs (one stop shopping). In such a situation, the user relies on the **clearinghouse** to provide the access using simple point and click routines and a minimum of passwords. Thus, special computer programs (routines) need to be in place in order to access files, databases, catalogs, text libraries, etc. located on disparate computers around the world. This is a nontrivial task, to say the least. The Group felt that by identifying a **clearinghouse function** for the ISC specific tasks could be identified that would be the sole responsibility of the ISC, to which audits and performance measures could be made.

Since no contractual arrangements are envisioned between the ISC and IOs, the success of the ISC would rest, in part, on its ability to work in a cooperative sense with the IOs in order to successfully deliver information services to the scientific community. As such, the Group felt that a "dictatorial" (top down) management approach between the ISC and the IOs would not succeed. Rather, a **coordination function** for the ISC was envisioned as having a higher probability of success. To that end, the Group recommends the ISC take a proactive approach to establish data collection, storage, retrieval, and access standards with the complete involvement of the IOs. A SciMP subcommittee could be used to oversee this interaction.

2) IODP Information Services Center Responsibilities

The Group recommends that the ISC have the following specific responsibilities:

- *provide integrated access to all IODP data (e.g. shipboard and shore-based)*
- *develop & maintain:*

- *the central program-wide web-based portal to stakeholders (scientists, educators, industry, policy-makers, public). Note: this portal should be dynamic & open to other international information systems & communities (e.g. physical oceanograph)*
  - *portal user interfaces that are scalable for different stakeholders*
- *following SAS advice, adopt & maintain standards to:*
  - *capture, storage, and distribution of data and metadata on each platform and of shore-based data. Required developments and implementations should be largely based on ISO, OGC, W3C standards and recommendations (for more information see http://www.fgdc.gov/standards/related_activities.html)*
  - *foster publication of data within IODP information services, e.g., using Digital Object Identifiers (DOI, http://www.doi.org)*
- *perform regular (360 degree) evaluations of the performance of the clearinghouse and the IOs in the delivery of IODP information services*
- *oversee the archiving of IODP legacy data (e.g, in partnership with recognized data centers)*
- *maintain and provide access to the program's publications database and integrate IODP information/data with IODP publications, e.g., using DOIs*
- *provide access to IODP curatorial information*
- *coordinate the development of data capture interfaces for specific platforms on an as-needed basis*
- *coordinate communications among the platform operator's IT/IS managers to share new ideas, resolve problems, and to adopt new information technologies.*
- *maintain links with other data groups (e.g. WDC, NGDC, ICDP, DEOS) and disseminate relevant information among IOs.*

Discussion:

The ISC should be the central location through which all publicly available IODP data and information are made available to IODP stakeholders. This is best accomplished through a portal that is both flexible and dynamic. The user interface should be scalable, that is, it should be able to accommodate both the novice and the experienced users, and most importantly, the user should always be able to find something related to their search. The portal will be based on levels of metadata, middleware, and user interface hardware and software. Implementation should be based on international standards (such as the ISO/TC 211 family of standards - http://www.isotc211.org/), which specify all necessary components for an effective geospatial data infrastructure, including "discovery", access, and exchange of IODP related data. Construction and maintenance of an IODP thesaurus, derived from metadata contents and related information inventories, will be one of the key elements to facilitate data and information access for the different stakeholders. By implementing such a design for its database management system IODP will be consistent with other oceanographic information systems, thus increasing the versatility and usefulness of IODP data for our understanding of the earth's systems and history.

The ISC should be tasked to follow the advice of the Science Advisory Structure (SAS) for the approval and adoption of metadata and data capture formats to be used on each of the operational platforms, as well as those formats used for upload of data sets into the IOs systems and distribution via the ISC portal. This The ISC will maintain these standards and make sure that all data are accessible in the proper format. It is the adherence to agreed-to-standards that makes a distributed database management system work.

Regular performance evaluations should be carried out to determine how well the clearinghouse is meeting the needs of the IODP stakeholders and responding to their requests. The Group believes that this is an extremely important responsibility of the ISC. The ISC is a service organization and as such is responsible for providing information and data to the public in a form and manner that meets the needs of the public. Regular evaluations and reviews are essential to providing the best service possible.

IODP has spent time preparing for the beginning of drilling operations. The Group believes that now is the time to begin thinking about the end of drilling operations and providing for the legacy of IODP. There are many lessons to be learned regarding the preservation of legacy materials from the previous ocean drilling activities. Regular transfer of data to the appropriate archiving agencies during IODP should be the practice of the ISC in cooperation with the archiving agencies.

The data generated by IODP will include more than the data collected on the operational platforms. The data include "prime data" to be collected by IODP and then processed on shore, data published in the scientific literature, and publications that will be based on IODP data. The ISC should be charged with the responsibility to implement an information service that includes links to the publication information as well as access to the actual data. The Group recommends including Digital Object Identifiers to reference all IODP-related data publications. The DOI system would make data publications citable and thus provide credit to both IODP and the individual researcher, which would be mutually beneficial (The International DOI Foundation (IDF) and ISCU World Data Centers are currently piloting a project to investigate the premises for this procedure).

In addition to information describing the core material and the downhole environment, curatorial information should also be included in the information services system. Information regarding who has what samples, where those samples are from, and other similar information need to be included. The ISC could also be tasked to provide database support services to the IODP core repositories as would be appropriate.

Another specific ISC responsibility should be to coordinate database management activities of the ISC and the IOs. This coordination should include routine meetings between the IOs and the ISC to discuss system operation issues, new technologies, and new ideas. The ISC will also be responsible for interacting with the IOs to assure that all the necessary metadata are generated according to the agreed upon standards.

3) IODP Information Services Standard Practice

The Group recommends that IODP Information Services include the following standard practices:

- *The ISC should be regularly evaluated following IODP project management standards to ensure that it meets the data and information needs of the IODP stakeholders as defined by the SAS*
- *An annual review of the ISC by external IT/IS experts to ensure that IODP is utilizing the best technology possible (e.g. in terms of cost, applicability or efficiency)*
- *IOs should ensure that the standard (as defined by SAS) shipboard IODP data are captured electronically by the end of the moratorium period for each project*
- *IOs will work together with the ISC to provide consistent data collected on all platforms with particular attention given to common units, calibration information, and standardization of measurements (e. g. depth, age models, etc.)*
- *IOs are responsible for performing quality control and consistency checks on all data and metadata generated on their platform for each project*
- *The ISC will provide feedback to the IOs on the quality and consistency of the metadata supplied*

Discussion:

The ISC is, as its name implies, a service organization. Its primary function is to be the public image of IODP. It is where the public will go to receive information about the program, data from the program, and publications related to the program. These are very significant responsibilities. To maintain the high standards required to make IODP a premier science and world class research program, the ISC must successfully carry out its mission. In order to meet these responsibilities a minimum set of standard practices is recommended.

The Group's recommended standard practices involve both the ISC and the IOs. IODP will only be as successful as each of its individual components. The key is to measure or monitor the level of service to the public and the stakeholders. Regular evaluation of the service provided by the ISC should be performed by the IMI, with input from the SAS. This is essential to maintain high standards and expectations for the ISC. Additionally, a review of the ISC's technical capabilities by non-IODP technical experts is recommended. This review will address issues related to efficiency and technical operations of the Center. Both of these reviews will provide the ISC with the feedback it will need to assure that IODP is represented to its stakeholders in the best manner possible.

4) IODP Information Services Standards

Standards are essential to the success of the ISC clearinghouse. The Group recommends that:

- *Based on advice from the SAS, the ISC will adopt data standards for IODP consistent with international and emerging standards such as ISO and FGDC*

- *IOs provide the ISC with access to IODP data using consistent, standard metadata catalogues (e.g. in XML following adopted IODP standards)*

Discussion:

The SAS has a very important role in the design and operation of the ISC. The distributed system design should be built on accepted standards. This is valuable for two reasons; first, IODP is more likely to be interoperable with other large global oceanographic programs, and second and more importantly, legacy data are more likely to be compliant with search mechanisms and national archiving requirements. Adoption of standards thus fosters integration, widespread dissemination, and usage of IODP related data.

5) IODP Information Services Definition of Information

Information includes, but is not limited to:

- Shipboard and shore based collected data (ODP Janus data and microbiology, drilling parameters, downhole measurements, site-specific survey, paleontology, visual core description, XRF, CT data)
- Engineering data
- Citations that include IODP information
- Curation information
- Observatory data links
- Ship schedules
- Applications
- Project description information
- Policies
- Publications…..

Report of the Paleomagnetism WG for the iSciMP meeting of July 14-16, 2003

Leonardo Sagnotti, Eiichi Kikawa, Christian Bücker, Mike Lovell

Samples

It is recommended that u-channels will constitute the standard paleomagnetic sample in all cases when it will be feasible to perform u-channel sampling of the cores (i.e in favourable lithologies, like unconsolidated fine-grained sediments), and they should be routinely collected both on the riser and non-riser vessels to be employed in IODP. U-channels have become increasingly popular since the advent of narrow-access long-core superconducting rock magnetometers, in 1991, because of the large amount of detailed data that can be obtained in a minimum amount of time at highest resolution. In the framework of ODP, u-channels were first used during Leg 138 and more than 4800 u-channel samples have been collected since. U-channels are sampled by pushing rigid U-shaped plastic liners (2 x 2 cm cross section, up to 1.5 m in length) into the split core sections. The high resolution data essential for several paleomagnetic study require that u-channel will be collected as a continuous strip from the centre of the cores, since this will ensure the minimum physical disturbance and will minimize the effect of drilling-induced remagnetization (see the recent specific publication by Acton et al., JGR, 107, 10.1029/2001JB000518, 2002). Since (paleo)magnetic measurements are typically not-destructive (apart from paleomagnetic properties themselves), after the paleomagnetic study the u-channels can be either stored as undisturbed permanent archives of the cores or made available for further scientific sampling.
In all cases where u-channel sampling will not be feasible (i.e. hard rock cores), continuous paleomagnetic measurements should be carried out on split cores (archive halves of cores).
For both soft sediment and hard rock cores it is also recommended to perform additional paleomagnetic measurements on discrete samples (i.e. standard paleomagnetic plastic boxes in the case of soft sediments or drilled cylinders in the case of lithified rocks), that will ensure independent checks for short-lived paleomagnetic features and will greatly help in the evaluation of deconvolution techniques applied to data from continuous measurements of u-channels or split cores.
Drilling facilities (drill press, drill bits, rock saws) should be provided in all IODP legs.

Measurements and instrumentation

All paleomagnetic and rock magnetic measurements should be carried out in dedicated, specific, paleomagnetic laboratories, with an appropriate number of scientists and supporting technicians.
Measurements and analysis should be carried out during drilling in the large oceanographic vessels (riser and non-riser ships). Measurements and analysis should be carried out in shore-based paleomagnetic laboratories for Mission Specific Platforms (MSP), as soon as possible during the Leg. For MSP, in which paleomagnetic properties are very important, a "basic" dedicated paleomagnetic van/lab may be considered for measurement and analyses directly "at sea" (i.e. on the model adopted for the Cape Roberts Project in Antarctica, where a temporary paleomagnetic lab was installed during all the three drilling seasons).
The software running the instruments should be continuously updated, possibly taking into account comments and suggestions by IODP users. A sort of active interaction between users and the software designers by instrument companies is highly advisable.

Basic magnetic properties (required)

1- Magnetic susceptibility

Magnetic susceptibility of all paleomagnetic samples should be routinely measured soon after collection of the samples and, during progressive thermal demagnetization of discrete paleomagnetic samples (see below), as an indicator of thermal alteration.
Instruments recommended are the Kappabridges manufactured by AGICO (KLY-3 or KLY-4) for discrete samples and the magnetic susceptibility system MS2 manufactured by Bartington with the loop (MS2 C) of point (MS2 F) sensors for continuous measurements on u-channels or half cores.

2- Natural remanent magnetization

The natural remanent magnetization (NRM) of all paleomagnetic samples should be routinely measured soon after collection of the samples.
Instruments recommended are the 2G Enterprises pass-through rock magnetometer with DC SQUID sensors and in-line alternating field (AF) coils with anhysteretic remanent magnetization capability and pulse magnetizer.
The diameter of the instrument is critical, but sample-dependent. The small diameter will ensure the high-resolution required for u-channel measurements, but half-cores will not fit in it. On the other hand, the large diameter will allow the passage of half-cores through the magnetometer but will significantly decrease the resolution (i.e. it will be poorly suited for u-channels and discrete samples). The 2G Enterprises pass-through superconducting rock magnetometer installed on the Joides Resolution is a large diameter instrument (standard access diameter of 7.6 cm), whose SQUID's response functions, with half-peak widths of ca. 8 cm, span nearly 20 cm. Each measurement averages the signal of a region of 100-150 cm^3. Conversely, the small diameter (standard access diameter of 4.2 cm) version of the same instrument, designed for u-channels and discrete samples, has half-peak widths of the pick up coils response functions comprised between 4 and 6 cm (referred to the two transverse and the axial coils, respectively). Each measurement averages the signal of a region of 15-25 cm^3.
Ideal configuration for IODP paleomagnetic labs will be to have two pass-through rock magnetometer systems, one with small access – high resolution, the other with large access – low resolution. Practical consideration concerning space limitations on board of IODP vessels may prevent the installation of two pass-through rock magnetometer systems, moreover time constraints will also prevent the routine detailed measurement and stepwise demagnetisation of u-channels on board. Such limitations will not apply to shore-based paleomagnetic laboratories (i.e. like those that could operate for MSPs). A practical solution could be to measure split cores onboard, and to measure u-channels in shore-based laboratories. Under such setting, a safe transportation system to shore-based laboratories should be established to prevent magnetic alteration of paleomagnetic samples.
An additional spinner magnetometer for discrete samples (i.e the DSPIN spinner magnetometer manufactured by Natsuhara-Giken Inc., or the JR6 spinner magnetometer manufactured by AGICO) may be useful in several cases (i.e. in all cases when the magnetization of samples is too high for the dynamics of the SQUID sensors).

Magnetic cleaning and Paleomagnetism (required)

A paleomagnetic study relies on the stepwise demagnetization of the NRM for all samples, to be carried out soon after the collection of the samples. Stepwise demagnetization is needed to identify the NRM components, to define their stability and orientation and to isolate a characteristic remanent magnetization (ChRM). Demagnetization treatment can only be by AF for continuous

samples (u-channel or half cores), while it could either AF or thermal for discrete samples. It is recommended to carry out a complete stepwise demagnetization for u-channels and discrete samples, whereas the stepwise demagnetization treatment should be limited to low AF (i.e. AF peak values up to 20 mT) for half cores.
Instruments required are an AF demagnetizer for continuous samples, installed in-line with the pass-through rock magnetometer, and a paleomagnetic oven (i.e. like the ASC Scientific TD48 thermal demagnetizer). It is recommended to have an additional AF demagnetizer for discrete samples, with ARM capabilities, like the D-2000 DTech Inc. or the AGICO LDA-3A AF demagnetizer and AMU-1A anhysteretic magnetizer.
It is advisable to have in each IODP paleomagnetic lab a Three-Axis Fluxgate Magnetometer for the measurement of small ambient magnetic fields (of the order of a few nT) in the sensing/demagnetizing regions of each instrument.

Rock Magnetic Measurements (highly recommended)

The characterization of the magnetic particles in paleomagnetic samples is necessary for a proper interpretation of the paleomagnetic signal and is the main target for studies on environmental magnetism. For such studies it is essential to measure the stepwise acquisition and demagnetization of artificial remanence (ARM and IRM), the hysteresis properties and the thermomagnetic behaviour of selected samples and powders. Such measurements are time consuming and practical considerations imply that during the Legs such measurements should be limited to selected representative samples only. It is recommended that such measurements will be extended to larger sample collections in the post-cruise measurements, whenever they could be important for the scientific objectives of the Leg. In some cases it could be also important to study the magnetic anisotropy (either of the magnetic susceptibility or of the remanence) of the paleomagnetic samples.
Instruments required are, partly, those used for the paleomagnetic study (i.e AF demagnetizer with ARM capabilities and pulse magnetizers, kappabridges), with the addition of a vibrating sample magnetometer for hysteresis measurements (i.e. the VSM manufactured by the Princeton Measurement Corporation), and some additional devices for the AGICO kappabridge (i.e. the CS-3 for the KLY-3 or KLY-4).

Sequence for the measurements

The order of measurements on discrete samples and/or u-channels is as follows:
1) Magnetic susceptibility
2) Natural Remanent Magnetization (NRM)
3) Stepwise demagnetization of the NRM
4) (Stepwise) Acquisition and demagnetization of an ARM
5) (Stepwise) Acquisition and demagnetization of an IRM

Hysteresis loops and thermomagnetic curves should be measured on powders or chips, independently from the cycle of measurements listed above.
Magnetic anisotropy can also be studied on selected discrete standard paleomagnetic specimens.

Calibration and Units

It is necessary to indicate:
- Description of the instruments (system specifications, i.e. in terms of response functions, resolution, range, accuracy….) and calibration standards/procedures.

Paramagnetic Rare Earth oxides (i.e. Gd_2O_3), are recommended for calibration of susceptibility meters, permanent magnets for calibration of magnetometers. Calibration standards should be measured before the routine work to produce reliable data. The results of standard measurement should be saved into JANUS.
- SI units for each parameter. Paleomagnetic data need to be expressed by declination, inclination and intensity at each demagnetization step.
It is also recommended to produce a web based equipment history sheet for all the equipment in each P-Mag lab. The idea being that anyone having problems with a particular piece of equipment could look in the history of that tool to see if it has happened before and how to fix it. It should be a sort of dynamic online manual that would be continuously updated.

Summary Table

Data	Riser	Non-riser	MSPs	Notes
Magnetic susceptibility	b, d	b, d	b, d	
Natural Remanent Magnetization (NRM)	b	b	b	Practical considerations imply NRM to be measured as soon as possible in shore-based laboratories for MSPs
Stepwise demagnetization of the NRM	b, c, d	b, c, d	b, c, d	Practical considerations imply NRM to be measured as soon as possible in shore-based laboratories for MSPs
Stepwise acquisition and demagnetization of artificial remanences (ARM, IRM)	d	d	d	Practical considerations imply rock magnetic properties to be analyzed on representative selected samples only during the Leg
Hysteresis properties	d	d	d	Practical considerations imply rock magnetic properties to be analyzed on representative selected samples only during the Leg
Thermomagnetic runs	d	d	d	Practical considerations imply rock magnetic properties to be analyzed on representative selected samples only during the Leg
Magnetic anisotropy	d	d	d	Practical considerations imply rock magnetic properties to be analyzed on representative selected samples only during the Leg
Magnetic ambient field				Necessary to monitor small ambient magnetic fields in each paleomag lab

Codes:
a. needed for safety,
b. needed to be made on the ship because it is an ephemeral property,

c. needed because it can affect drilling decisions on the cruise or expedition,
d. needed because making the measurements on the ship results in the best science overall (for example, if not made on the ship, it is unlikely that the measurements will ever get made at all, or, having the capabiliity on the ships will deliver better science more rapidly).

Standardization of procedures in IODP:

Guidelines for routine procedures in paleontology

June 3, 2003

Summarized by Paleontology Working Group[*1] under iSciMP

and Japanese Paleontology Database Subworking Group[*2]

Summary

Routine paleontological procedures during IODP drilling cruises will have most of the same goals and utilize many of the same procedures as have been used on ODP cruises. Thus, most guidelines for "shipboard" paleontology are similar to those currently employed. However, the broader scope of drilling anticipated with IODP require some additions. We suggest 1) that higher biostratigraphic resolution than has previously been attempted will often be needed and achieving this goal will require additional personnel in the paleontology lab, 2) that on the riser vessel there will need to be an ability to recover paleolontological data from cuttings, and 3) that new protocols must be developed to efficiently process highly indurated samples anticipated from very deep holes.

Introduction

Currently, shipboard procedures are based on the guidelines in the "*Handbook for shipboard paleontologists*" (*ODP Technical Note* No. 12, 1989). According to this handbook, paleontologists are responsible for making biostratigraphic age and general paleoenvironmental interpretations of each core. Descriptions/outlines of sampling schemes, microscope study and data handling procedures are included in the handbook. According to the handbook, routine shipboard paleontological observations are usually based on core-catcher (CC) samples, although they may be supplemented by additional samples. In the case of nannofossils, commonly toothpick samples are added.

We believe that the ODP guidelines are generally appropriate for IODP cruises, regardless of the type of drilling vessel (i.e. riser drilling and non-riser drilling and mission-specific platform). However, the ODP guidelines require some modification to accommodate some types of mission-specific drilling and the new instruments that will be developed for the riser-drilling vessel. The following proposals include procedures for common non-Leg-specific cases and for special cases. In recognition that it is very difficult to write general guidelines for mission-specific platforms, we recommend that chief scientists of mission specific legs review paleontology sampling policies.

Proposal 1: Core sampling

1-1. Overview

During current ODP cruises with emphasis on biostratigraphy/paleoceanography, routine micropaleontological observations on non- or little indurated sediments are mainly based on core-catcher samples for some fossil groups, and for second and higher-numbered APC holes. For calcareous nannofossils in non- or little indurated sediments additional toothpick samples are studied from the first (or deepest) APC hole, with the highest resolution (at least 1 sample/section) around critical intervals. For planktonic foraminifera, diatoms and radiolarians, usually samples from within cores are studied in addition to core catcher samples in the first (or deepest) APC hole at a site; in most cases between 1 and 6 additional samples are studied around critical intervals. For benthic foraminifera in non- or little indurated sediments, usually the core catcher samples from the first (or deepest) APC hole only are studied, with additional samples from within the cores and core catcher samples from additional holes around critical intervals. In more indurated sediments the number of samples studied depends on the degree to which samples can be processed in the limited time available.

Legs with an emphasis on biostratigraphy/paleoceanography commonly have two micropaleontologists per common fossil group, and the sample resolution obtained in recent ODP legs is possible only if work proceeds 24 hour per day. On legs which are not primarily aimed at paleoceanographic/stratigraphic objectives, there usually is only one micropaleontologist per fossil group staffed, and a much lower resolution is possible.

We recommend that shipboard paleontologists be required to discuss shipboard study policies at the beginning of each leg, and that they consider taking at least two samples per core, at least in critical intervals.

1-2. Circumstances

As a general rule for every sediment core, we recommend that at least two samples be taken per core for paleontological analysis: a CC sample and a sample near the middle of each core. If deemed necessary after consultation with staff scientists and paleontologists, Co-chief scientists may permit (or request) additional paleontological sampling.

1-3. Methods

The general procedures are based on "*Handbook for shipboard paleontologists*".

1-4. Requirements

It will take more time and effort for paleontologists to analyze two samples per core . We recommend that the paleontology team consist of two paleontologists for each key fossil group, one paleontologist for other groups (importance varying according to the nature of the leg or mission), and at least two paleontology technicians, i.e,at least one per shift. Given past difficulties in obtaining funding or suitably trained personnel for technical support, it is recommended that on legs where sediments requiring intensive processing are expected, the chief scientists make a formal request for paleontology technical support at an early stage in planning.

Proposal 2: Utilization of core cuttings

2-1. Overview

The study of core cuttings obtained from riser-drilling will potentially support that of CC samples. We propose new routine analysis using cuttings for medium-resolution paleontological studies of low recovery or fossil-poor cores.

2-2. Circumstances

Collection of core cuttings is recommended where recovery of sediments is expected to be less than 50% and lithofacies of the important sections are expected to yield poorly preserved fossils (*e.g.*, chert, diamictite). If these situations are expected, chief scientists should decide to use core cuttings at the beginning of a leg. If these or similar situations arise during drilling, the chief scientists should decide on the collection of cuttings after discussion with staff scientists.

2-3. Methods

1) At sites where core cuttings are to be used, mud-logging technicians or other qualified persons should collect cuttings at each 10 m drilling depth interval.
2) Cutting materials should be water-washed through the adequate size mesh (63-125 μm) to prevent contamination with recycled drilling mud.
3) Washed cuttings are stored in labeled 1000 cc resin cases.
4) The general procedures for the study of cutting materials are based on those of core materials.
5) Cuttings samples should have a unique label (as in "H" for piston core) so that the data from cuttings can be clearly distinguished from those of core samples.

2-4. Requirements

1) Specialist personnel and facilities are required for collection of core cuttings, i.e., there must be a protected cuttings collections area.
2) Special resin cases and storage areas are needed for handling cuttings. Before a leg, co-chief scientists should discuss how many of the cuttings containers they expect to fill.

3) The new paleontological database system (PAL system) should require the new data type for cuttings independent of that of core samples.
4) Testing the procedures for routine collecting and processing of cuttings should be conductive during the training cruise.
5) We recommend that IODP consider sponsoring a workshop (at ISCIMP?) for ODP-experienced paleontologists to meet with oil-well paleontologists to discuss the specific opportunities and problems of dealing with cuttings, with the aim to produce a white paper in which the expertise of those who have worked with core cuttings is made available.

Proposal 3: New Preparation routines for indurated sedimentary rocks

3-1. Overview

The initial science plan of the riser-drilling vessel operations forecasts extra-deep drilling of accretionary complexes. In such cases, extremely hard rocks that have been rarely encountered in previous conventional ocean drilling will be penetrated. It will take more time and effort to process such hard rocks for paleontological study, especially so with the increasing demand for high-resolution analysis.

Here we propose two strategies to improve efficiency and routines to process sediment samples including extremely hard rocks:

1) The sodium tetraphenylborate method for breakdown of very hard shale be introduced to complement existing methods for the disaggregation of indurated rocks.
2) Integrated processing of two or more microfossil groups, i.e. foraminifera, radiolarians, diatoms, and palynomorphs.

An integrated method will reduce risks associated with use of hazardous chemicals and promote consistent quality of slide samples. In addition, it will enable paleontologists to spend more time examining fossil assemblages and less time processing samples.

We recommend a workshop to outline and discuss methods for paleontological processing of highly indurated sedimentary rocks, and to explore opportunities for integrated processing. The end result should be a handbook containing descriptions of recommended methods of sample processing.

3-2. Circumstances

These processing methods will be useful for a many drilling operations where indurated lithologies are encountered and have particular value for foraminifera, radiolarians and palynomorphs. Chief scientists can make a decision in the leg-specific strategy about whether the leg would use these new methods.

3-3. Methods

1) Paleontologists and technical support personnel should consult the handbook on new processing methods prior to a cruise and discuss methods and modifications to methods as appropriate for the lithologies expected to be recovered.
2) Paleontologists and technical support personnel will need to work together to determine best processing methods for recovered lithologies
3) Integrated processing may be aided by development of a processing flow chart (e.g. Fig. 1).

3-4. Requirements

1) These new procedures reinforce the need for paleontology technicians, at least one per 12 hours shift. These technicians should be knowledgeable in the use of different chemicals for sample processing of a variety of sediment types.
2) Detailed description of the sodium tetraphenylborate method is given by Hanken (1979, *Journal of Paleontology*, vol. 53, 738-740).

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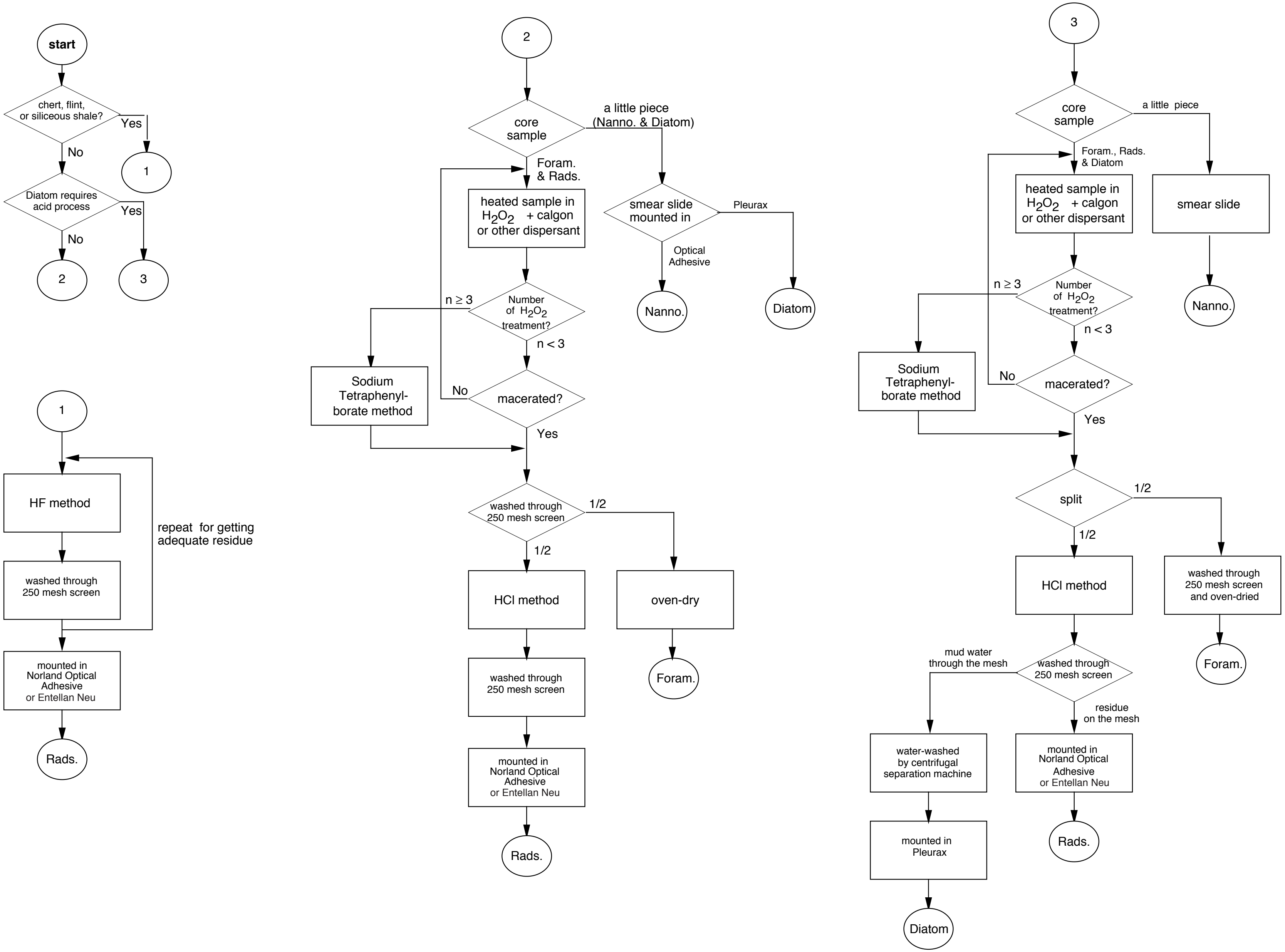
start
chert, flint, or siliceous shale?
Yes
No
1
Diatom requires acid process
Yes
No
2
3
1
HF method
washed through 250 mesh screen
repeat for getting adequate residue
mounted in Norland Optical Adhesive or Entellan Neu
Rads.
2
core sample
a little piece (Nanno. & Diatom)
Foram. & Rads.
heated sample in H_2O_2 + calgon or other dispersant
smear slide mounted in
Pleurax
Optical Adhesive
Nanno.
Diatom
Number of H_2O_2 treatment?
n ≥ 3
n < 3
Sodium Tetraphenyl-borate method
No
macerated?
Yes
washed through 250 mesh screen
1/2
1/2
HCl method
oven-dry
Foram.
washed through 250 mesh screen
mounted in Norland Optical Adhesive or Entellan Neu
Rads.
3
core sample
a little piece
Foram., Rads. & Diatom
heated sample in H_2O_2 + calgon or other dispersant
smear slide
Nanno.
Number of H_2O_2 treatment?
n ≥ 3
n < 3
Sodium Tetraphenyl-borate method
No
macerated?
Yes
split
1/2
1/2
HCl method
washed through 250 mesh screen and oven-dried
Foram.
washed through 250 mesh screen
mud water through the mesh
residue on the mesh
water-washed by centrifugal separation machine
mounted in Norland Optical Adhesive or Entellan Neu
mounted in Pleurax
Rads.
Diatom

Underway Geophysics WG Report

David Divins, Sean Gulick, Mike Lovell

Platform Considerations:

- MSPs: Moving target in terms of logistics so recommendations should include little in the "must have" category and most in the "nice to have" category.
- Chikyu: Little underway time and far more time spent on station. Some time will still be spent in the non-riser mode and therefore transiting between sites. An underway geophysics program therefore should be included in the Chikyu plans. However, deck height suggests towed geophysical equipment may be unrealistic and the geophysics may be limited to sources for VSPs, GPS, and bathymetric data.
- Non-riser Platform: Need to consider what worked well and what did not work well in ODP and revise for IODP. Quite a bit of underway time occurs and certain measurements/equipment are important wheras other measurements are too expensive in terms of personnel and time to warrant use on a platform that is first and foremost a drilling vessel.

Measurements (in order of priority):

- Bathymetric Data: All platforms should routinely collect bathymetric data. It is expected this will usually be accomplished with 12 kHz echosounders and should be collected both at a drill site as well as underway.
- Navigation Data: All platforms should routinely collect GPS navigation data to determine exact drill site position and to plot trackline positions during transits in order to render the underway geophysics data useful.

Note: Effectively on all platforms we need to know where we are and how deep the water is!

- Seismic capabilities:
  - Non-riser Platform: While it may be important for non-riser ship to have the capability to shoot small single channel to low fold seismic surveys, these surveys should only be done in the case of very shallow target depths or for "at sea" requirements. The non-riser ship is in no way a seismic vessel and for all but the most basic situations a bonified seismic survey should be collected using multichannel seismic acquisition systems. The airgun capability for a single or low-fold seismic system for the non-riser platform should be capable of serving as the source for zero offset VSPs as well.
  - Chikyu: Very unlikely to need seismic capabilities at sea. Further, the deck height of the Chikyu may make all underway geophysics that require towed instruments untenable. However, VSPs are of greater importantance for riser legs due to greater target depths. Therefore, airgun/GI gun capability for the Chikyu should exist that is suitable to collect VSPs/checkshots to the maximum drilling depth of the Chikyu.
  - MSPs: No routine seismic capabilities can reasonably be discussed. The operator will have had to commission any specific site requirements,

including geophysics, before the operation. This means for full approval to use a particular platform the geophysical survey(s) would have to already be collected. The only time that any site specific work is likely to be conducted from the drilling vessel is if a jack-up is used. In that case it is quite common to do the geotechnical evaluation for the spud cans from the jack-up itself and this is purely for insurance regarding the stability of the jack-up. If VSPs are required for the science plan then either the MSP ship will need to have the capabilities to be the source or a separate ship will be required.

- Additional Underway Geophysics Data:
  - Non-riser Platform: In order to maximize the science done at sea it is recommended that the non-riser ship collect magnetics data while underway. This is seen as important due to the non-riser drillship venturing into waters that are not frequently traversed by other research vessels but should never be placed in priority over drilling objectives.
  - Chikyu: The deck height and infrequent transits of the Chikyu suggest that it would be unnecessary for the Chikyu to have an underway geophysics facility beyond the capabilities of bathymetric measurements, navigation, and seismic sources.
  - MSPs: When MSPs are completed using drilling ships of opportunity or modified research vessels we would recommend the collection of whatever suite of underway geophysics data is available on the platform during transits. Clearly in some cases such as jack-up rigs there will be no underway component.
  - Gravity Data: Due to the difficulties of maintaining a high-quality gravimeter on board the non-riser platform or other vessels, it is not recommended that an underway capability in gravity be continued in IODP.
  - Swath Mapping Data: Due to the expense of acquiring and maintaining swath mapping systems we not recommend the use of the riser or non-riser platforms for swath mapping (ie SeaBeam). For MSPs, in the unfortunate case where drilling is unable to continue and the platform being used has swath mapping capabilities then the use of such a system is of course warranted.

MRC report 2002-2003

See also MRC homepage at
http://www-odp.tamu.edu/mrc/mrcpage.HTML

Summary

The initial mission of the MRCs is to preserve prime micropaleontological material, that has been raised by the DSDP and the ODP drilling activity, and hold it ready for research and scientific reference to the many described microfossil species and assemblages in the Initial and Scientific volumes of the DSDP and ODP. The organization of the MRCs is unique as identical splits of washed residues or microscopic slides containing microfossils can be studied all over the world, i.e. in one of the sixteen MRCs and satellite MRCs. This allows scientists to prepare themselves for future oceanographic cruises, to make themselves familiar with the stratigraphy at almost any location in the oceans, to study biogeographic and evolutionary patterns or for teaching purposes. The set of MRC collections is truly global, ranging from Jurassic to Quaternary sediments, including prime microfossil materials from the first Legs of the DSDP up to the latest legs of the ODP (at present sampling has advanced to ODP Leg 189).

MRCs are a useful research tool

The MRC collections are equally valuable for preparing proposals for micropaleontological and paleoceanographic projects. In more recent time MRCs have also put considerable effort in compiling, updating and standardizing the stratigraphic information, that is scattered in the numerous range charts of the Initial and scientific reports of the DSDP and ODP, and so help in synthesizing integrated biogeochronologies.

The first MRC was set up in 1975 at the Natural History Museum in Basel, Switzerland, in the succeeding 15 years four additional MRCs were created in the in Texas, at Scripps, Japan and New Zealand. The remaining 11 MRCs and MRC satellite MRCs were chosen at carefully selected institutions around the world in order to guarantee best access for the worldwide scientific community to marine micropaleontological materials.

MRCs are an investment for future scientists

Through its contributions to select, prepare, and curate micropaleontological samples and to maintain an infrastructure for visiting scientists over more than 20 years, considerable funding and manpower went into the development of the MRCs from each of the involved countries. This effort has produced one of the prime permanent legacies of the DSDP and ODP programs, which will become a lasting resource for both teaching and research.

Vision for the future

In this context it is nothing more than logical that the organization of the MRCs should be maintained. The Integrated Ocean Drilling Program should therefore consider include the MRCs as a continuing component of IODP

The MRCs wish to continue their effort within IODP. Next to building on micropaleontological reference collections the iMRCs bear the potential to act as a coordination platform for micropaleontological database projects that require extended stratigraphic and taxonomic expertise. First advances towards such directions have already been made in creating the Neptune database (http://www.neptune.ethz.ch). With the Chronos database program being recently approved by U.S. funding agencies there is now the potential to integrate earlier database efforts by various paleontological research groups and the iMRCs, and to build worldwide stratigraphic and taxonomic networks to compensate for general trends of declining taxonomic expertise.

Basic needs for a functioning network among MRCs:

In order to be able to continue the MRC facility the MRCs need some basic level of support, also from the IODP programme, which we suggest in the following:

• MRCs should be able to routinely access, under normal IODP usage guidelines, future iODP core material for selection of micropaleontological/ paleoceanographic/ stratigraphic reference samples to be represented in the MRC collections.

• All MRCs should receive sets of initial and scientific publications, that will be produced in the suite of a (paleoceanographic) expedition, as was the case with the IRs and SRs of the DSDP and ODP. Also, MRCs should have full access to other published data (paper or electronic) from iODP.

• MRCs should have a liaison person that regularly reports to iSciMP. This liaison person, which is selected by iSciMP, should be a *paleontologist* or a *micropaleontologist*, and - as has been successfully practiced in the past with SciMP and ODP - should maintain regular contact to the MRC curatorial party.

• There should be sufficient support to allow a limited number of MRC curators to organize/attend one MRC sampling or strategic/database workshop per
year. Sampling and database workshops may, for example, alternate from one year to the next.

We suggest that travel support supports 6 MRC curators to attend an annual MRC meeting (usually an MRC meeting extends over 2 or 3 days): 2 MRC curators from the MRCs in the USA or Brazil, 2 MRC curators from the Far Eastern MRCs (Japan, New Zealand), 2 MRC curators from Europe, in total a maximum amount of U.S. $ 12'000.- per year.

During sampling meetings MRC curators meet to concerted microfossil samplings.
During strategic/database meetings, MRC curators will meet to ccordinate MRC related database efforts.

micropaleontological reference collections can also be maintained for future core materials, that will be recovered within the framework of the integrated Ocean Drilling Program. This will both enhance the scientific value of the MRCs, and make integration of MRC information into iODP operations and decision making more effective.

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Reports from individual MRCs:

MRC in Basel

(Curator: Dr. Michael Knappertsbusch, michael.knappertsbusch@unibas.ch)

A major success for all MRCs was the last regular MRC Curatorial and Sampling Meeting, held from October 7-10, 2002 at the Natural History Museum in London.

This meeting allowed us to reflect about future directions and opportunities of the MRCs within the Integrated Ocean Drilling Program, and to prepare a new, extended MRC sample list for nannofossil-, foraminiferal, diatom-, and radiolarian MRC samples. A report of this meeting is available at the URL http://www-odp.tamu.edu/mrc/London_2002/London_MRC_Report.html.

Curators agreed, that next to the extension, completion and improvement of MRC microfossil collections, micropaleontological, stratigraphic and taxonomic database projects would be a great potential of MRCs to serve the international paleoceanic community. In this context iSCIMP's Recommendation 02-1-4 *(e.g. "To improve the stratigraphic quality and consistency of shipboard biostratigraphy of IODP, iSCIMP recommends that shipboard reference collections of Mesozoic and Cenozoic microfossils as well as digital image atlases and stratigraphic databases are needed and should be available for all IODP platforms and laboratories ")* directs our general pathway for future collaboration among MRCs and with the ocean drilling community.

Activities in Basel:

- Progress about MRC sample preparations.

At the Basel MRC a small remainder of foraminiferal samples (from Leg 188) have been processed and sent to the other MRCs from the penultimate MRC request to ODP. From the MRC request to ODP from London Meeting we have just recently received from the ODP core repositories all sediment samples for processing (a total of 234 samples). This material is scheduled for preparation as soon as our preparator is set free from his other current museum duties.

In the period from 2002 to 2003 we have received from the MRC in Tokyo diatom slides from Legs 119, 120,113,114,115,117,171,177,178; radiolarian slides were received from the MRCs in Berlin and Utsunomiya from Legs 113,114,171,177, and 181; and nannofossil smearslides were sent from Legs 73,107,120,160,181,188 from the London/Italy and Florida satellite MRCs.

- Progress on MRC database work (sample database, MRC related stratigraphic database work).
Per September 2002 our SNF research project entitled "Establishment of a microfossil database at the Basel MRC as a tool for evolutionary research" has ended. This project lasted for a total of 7 years and was a follow-up project to the previous Neptune database project of the micropaleontology group at ETH in Zurich from 1990 to about 1995/6.
The results of this effort are available on the Neptune-online server, under the URL http://www.neptune.ethz.ch. It includes the micropaleontological relational database called Neptune, with an initial limited on-line query functionality. It also includes an extended collection of First and Last appearance datums (all following the Berggren et al. 1995 integrated geochronology) compiled from hundreds of DSDP and ODP holes, core-depth information, numerical age models, software to generate them, and other related information. The age models and age-depth plot tools are available for Mac and PC and can be downloaded from that site.

- Planned/ongoing MRC work in the framework of Chronos.
The Neptune database efforts at the Basel MRC can only be continued with additional help by a technician (our technician who made data entries has retired with the end of the project). The MRCs are currently evaluating ways of how they could find funding for a continuation of such work, especially in the framework of the recently funded U.S. Chronos initiative.

- Research being done using MRC materials:
The MRC Basel was recently successful in receiving a three years grant from Swiss NF for a new research project entitled "S*peciation of marine calcareous planktonic microfossils during the Cenozoic*", where we also include MRC materials for study

- visitation/usage of the Basel MRC by others:

- Blair Steel (Royal Holloway & Bedford New College, Univ. London visited our MRC for a week.
- The dissertation of Daniela Schmidt (ETHZ), who used a large amount of foraminiferal samples from the Basel MRC, was published.
- I myself use the MRC collections for classes in micropaleontology and stratigraphy at nearby University of Basel
- Our current PhD student Kevin Brown (see research above) uses MRC materials for his studies.

- Proposals and/or questions concerning the continuation of the MRC in Basel and Questions/proposals to iSciMP: See introductory text of this report.
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Report Radiolarian satellite MRC in Berlin

(Curator Dr. Dave Lazarus)

From: "David.Lazarus" <david.lazarus@rz.hu-berlin.de>
Subject: MRC activity since London (oct 02)

Since London, I can report the following:

The MRC database software is fully functional, and has reasonably complete data for all rads and diatoms. The database is available for download, together with the Mac / PC software to run it, from my ftp server. At least some (or all?) of the MRC curators were informed by email of its availability some months ago.

A Poster was presented on the MRC effort at a recent German ODP meeting (Mainz, March 2003). It was based on the summary of radiolarian data in the MRC database I presented at the London meeting.

My students and I continue to use MRC materials in our own research. I have one ms with Chris Hollis (soon to be submitted) that cites use of MRC samples.

Two rad slides were sent on loan to John Gregory at the British Museum, London, for use in imaging rads for a commercial paleontology teaching CD.

We are nearly done with another batch of 100 rad samples - will probably ship this summer.

cheers, dave

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Report Utsunomiya radiolarian satellite MRC
(Curator Dr. Yoshiaki Aita)

Annual MRC Reports for the year 2002-2003

Utsunomiya Radiolarian satellite MRC, Japan
(Curators:Yoshiaki Aita and Toyosaburo Sakai)

A report for the duration from January 2002 to May 2003

(1) Progress about MRC sample preparations.
Processing samples;
A part-time MRC preparator, Mrs Yuko Haga works 10 days/month and

continues to process samples and make a strewn slide of Radiolarian MRC slides. We make 12 identical strewn slides from a single sample and send a set of 100 radiolarian slides to the 8 other MRCs and keep one for our MRC. The rest 3 set will be kept for any breakage or missing of slides.
Total of 179 core samples have been processed for radiolarian slides since January 2002. R10601-10629 (29 samples), Leg 181(42 samples), Leg 171(27 samples), Leg 164(2 samples), Leg 164(19 samples), and Leg 162(60 samples).

Making radiolarian strewn slides;
- 12 set of 29 Radiolarian MRC slides (R10601-10629) completed.
- 12 set of 69 Radiolarian MRC slides (R12215-12283) completed.

- 100 Radiolarian MRC slides (R10501-10600) have been sent to 8 MRCs and one set kept in our satellite MRC.
- 29 Radiolarian MRC slides (R10601-10629) and 69 Radiolarian MRC slides (R12215-12283) of Leg 171 & Leg 181 have been sent to 8 MRCs, respectively, and two sets kept in our satellite MRC.

Receiving and sending samples;
42 ODP core samples of Leg 181 from ODP Core Repository (TAMU) have been received (18/01/2002) and the sample list was made associated with samples examined.
- We Utsunomiya MRC sent 200 core samples of Leg 114 to the Berlin radiolarian satellite MRC on March 2002.
- We made a sample list for the 27 core samples of Leg 177 and sent to the Berlin satellite MRC.
- We made a sample list(R12284-12334) for the 51 core samples of Leg 177 and sent to the Berlin satellite MRC.

(2) Progress on MRC database work (sample database, MRC related stratigraphic database work).
A new computer with several useful softwares has been installed for the Utsunomiya satellite MRC and radiolarian MRC database which has been developed in the Berlin satellite MRC is available for research.
Radiolarian image database activity from MRC slides has started to retrieve radiolarian images from Leg 181 in order to reconstruct a new image database here.

(3) Planned/ongoing MRC work in the framework of Chronos
None

(4) Your research being done using MRC materials.
Some work is going on progress by using Leg 181 MRC radiolarian slides

(5) visitation/usage of your MRC by others.
the number of MRC visitors: 33 Visits for MRC collections.

Open Campus of our University, August 6, 2002. Observed radiolarian slides under optical microscope.

- Kano a graduate student and Noritoshi Suzuki of Tohoku University, Sendai visited MRC. Working on radiolarian slides before on-board the Joides Resolution.

- Atsushi Takemura, Hyogo University of Teachers Education visited. Examined MRC radiolarian slides.

- Satoshi Funakawa, radiolarian specialist, postdoctoral fellow, Kyushu University visited. February 2003. Looking at the Paleogene radiolarians from Leg 181.

-Prof. K.B. Sporli visited our Geology Department for three weeks in August-September 2003.

- Satoshi Funakawa moved to stay at Utsunomiya from April 2003 and he regularly used MRC radiolarian slides for his study.

The publicity and other activity:
- An introductory article on the over view of the Utsunomiya satellite MRC has been published on the Utsunomiya University Newsletter, U.U. Now No. 28, October 2002.

- A lecture titled "Micropaleontology database activity for the last 200m.y.----DSDP/ODP/IODP-MRC "by Y. Aita has made on the Earth Evolution New Year School at Tsukuba, January 7-8, 2003

- Attended the MRC London meeting which was held in London, October 8-10, 2002.

- Reported the London MRC report at the domestic iSciMP meeting on November 2002 and circulated the report to Japanese ODP communities.

- Tokyo MRC (National Science Museum) and the Utsunomiya satellite MRC as a MRC association gains a membership in the Japan IODP consortium, which is newly created domestic organization to assist IODP activity since April 2003.

(6) Proposals and/or questions concerning the continuation of your MRCCurrently, the international workshop on the IODP paleontology database will be planned to hold in Kochi University, 2004. The proposal has just submitted to the Japan Society of Promotion of Science (JSPS). If this plan will be sucessful, this workshop will enable to discuss the further incorporation of MRC with IODP activity. We hope the MRC make an effort to support this workshop.

(7) Questions/proposals to iSciMP.
None

Small funds were available last year for the Utsunomiya satellite MRC to help curation of DSDP core materials and radiolarian slides from the Ministry of Education, Science, Culture and Technology and also from the special project money of our university to set up a new computer.

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Report for the MRC Tokyo

(Tokyo Center, Curator: Yoshihiro Tanimura)

1. GENERAL

As one of the MRCs, we have been preparing diatom slides, distributing them to the other six MRCs, curating the collection of four microfossil groups, building a database for the collection and assisting visitors in their research work at the center.

2. PREPARATION OF DIATOM SLIDES, THEIR DISTRIBUTION AND RAW SEDIMENT SAMPLE
SELECTION

2-1. Progress about MRC sample preparation

Two part-time preparators are assisting preparation and curation work. Sixteen diatom slides (eight sets of two slides) are prepared from each raw sediment material. In the last 17 months (Jan. 2002-May 2003) we have prepared about 4,000 slides from 250 raw sediment samples.

2-2. Sending diatom samples

On April 17, 2002, we sent 1,122 diatom slides from 561 core levels (Legs 113, 114, 115, 117, 171, 177 and 178) to each of the other six MRCs (ODP atTAMU, Basel NM, SIO, USNM, IGNS and Univ. Nebraska). One set of the slides for Russian MRC has been kept in Tokyo center.

2-3. Raw sediment sample selection

In London, October 2002, 343 sediment samples from 10 Legs (21, 24, 28, 29, 38, 39, 182, 183, 184 and 189) were selected for diatom slide preparation, of which we received 48 samples, and we have not received 295 samples yet.

3. CURATION OF THE COLLECTION
The washed foraminifera residues received from Basel NM are each divided in glass topped faunal slides and plastic storage vials. All the slides making up the collection (foraminifera, radiolaria, calcareous nannoplankton and diatoms) have been stored in 5 wooden cabinets in a humidity-controlled room (around 60 %).

4. DATABASE MANAGEMENT
4-1. Sample database work
Available information on the four fossil groups was entered into a Macintosh-based program "File Maker Pro", and the information has also been saved as "4th Dimension" style. Abundance of diatoms and state of preservation of diatom valves in each of the MRC diatom samples are being determined under LM.

4-2. MRC related stratigraphic database work
We have not begun "stratigraphic database work" yet.

5. VISITATION
Dr. Hiroyuki Takata of Shimane University observed 34 foraminifera samples (Leg 149) for his sample request to an ODP core repository. Mr. Itsuki Suto, a graduate student of Tsukuba University, studied 73 diatom samples (Legs 41, 177 and 181) for his studies on spores of a neritic diatom *Chaetoceros*.

6. FUND
A necessary fund to run the center is a special fund of our museum.

7. OTHERS
Proposals and/or questions concerning the continuation of your MRC//Questions/proposals to iSciMP
None
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Report Satellite MRC Rio de Janeiro
(Curator: Dr. Aristoteles Rios-Nettos)

ODP SATELLITE MICROPALEONTOLOGICAL REFERENCE CENTER ON FORAMINIFERA AT FEDERAL UNIVERSITY OF RIO DE JANEIRO (UFRJ)

2002 ANNUAL REPORT

1. RESEARCHERS/STUDENTS OUT UFRJ:

a) Rosa José Miguel Samuel and Margarida Soares de Brito Vinhas, geologists from SONANGOL (Angola Petroleum Company), Angola, visited the MRC/UFRJ the know the ODP opportunities to develop research using material from some ODP sites drilled on the eastern Atlantic floor and to use the DSDP/ODP bibliography concerned to that area.

USE OF THE MRC LabMicro/UFRJ FACILITIES BY UFRJ RESEARCHERS/STUDENTS :

a) Dr. Valesca Portilla Eilert, has used MRC UFRJ facilities to her studies on Paleocene radiolaria from the DSDP/ODP sites in the South Atlantic.

b) Dr. Maria Dolores Wanderley, has used MRC UFRJ facilities to her studies on Cretaceous – Paleocene calcareous nannofossils from the DSDP site 354, 355, 356, 357 e 358.

c) Cleber Fernandes, a graduate student at the Geology Dept/UFRJ, has used MRC UFRJ facilities to her studies on Cretaceous – Paleocene calcareous nannofossils from the DSDP site 354, 355, 356, 357 e 358 (MSc dissertation and DSc thesis).

2. Routine tasks necessary to maintain the sample collection clean, preserved and ordered, have been done.

3. W No work on sample database was achieved.

4. No sample was received to be prepared in the UFRJ SatMRC.

5. MRC UFRJ INFRA-STRUCTURE IMPROVEMENT

The Micropaleontology sector in the Dept. of Geology was : the earlier Laboratory of Micropaleontology (LabMicro) now is named “Laboratory of Biostratigraphy and Paleoenvironments”. It`s coordinated by me, and it house the MRC. The Laboratory was moved to a new space and a room was dedicated to house micropaleontological collections, including the ODP one. With financial support from the Studies and Projects Supporting Agency (FINEP) and the Brazilian Petroleum Company (PETROBRAS) a new laboratory to processing samples was constructed.

a) Aristóteles de Moraes Rios-Netto, UFRJ Researcher (Tertiary/Cretaceous Foraminifera).
b) Claudia Gutterres Vilela, Researcher (Quaternary Foraminifera).
c) Maria Dolores Wanderley, Researcher (Calcareous Nannofossils).
d) Valesca Maria Portilla Eilert, Visiting Researcher (Mesozoic/Cenozoic Radiolaria).
e) João Graciano Mendonÿa Filho, Researcher (Palynofacies/Organic Petrography).
f) Ortrud Monika Barth, Research Associate (Quaternary Palynology).
g) Márcia Aguiar de Barros, Research Associate (Quaternary Palynology).

Aristoteles de Moraes Rios-Netto
ODP SatMRC / UFRJ Curator

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Report of the Radiolarian MRC at Scripps

(Curator: Dr. Annika Sanfilippo)

U.S. West Coast: Scripps Institution of Oceanography Radiolarian MRC Collection (Curator: Annika Sanfilippo)

GENERAL

This year only three visitors have used the MRC Radiolarian Collection. All three visitors acknowledged the benefit of the existence of the MRC Collection to their work. There is no other collection with such a geographic coverage available for paleoceanographic overview investigations. A few students have shown interest in using the collections to explore sediment accumulation in various ocean basins, changes of the fauna in latitudinal transects, and the evolution of microfossils through time. Most of the interest and questions regarding the coverage of the MRC collections is centered on using the collections to illustrate various depositional regimes.

VISITATION

Mark Ohman, Scripps Institution of Oceanography, used MRC radiolarian sequences from Cenozoic Atlantic and Pacific cores to illustrate examples of biogeographic diversity and environmental preferences of radiolarians and diatoms for a paleoceanography class.

Catherine Nigrini, Micropaleontolgical Consultant, Canmore, Canada, used MRC radiolarian slides for taxonomic purposes to compare and verify taxa described from earlier DSDP legs with those she collected on ODP Leg 199.

Ted Moore, University of Michigan, Ann Arbor, used MRC radiolarian slides to examine and calculate sedimentation rates to calculate more accurate age determinations for Cenozoic radiolarian events in the Pacific Ocean.

SIO Curatorial Staff (Paula Worstell and Warren Smith) consult the MRC lithological smear slide collection periodically to compare DSDP/ODP sediments with those collected on Scripps' cruises, to develop reference materials, and in conjunction with educational presentations.
Together with visiting radiolarian specialists I often consult the MRC radiolarian collection to investigate biogeographic distribution and dissolution problems as they pertain to radiolarian taxa in different geographic settings.

RESEARCH ACTIVITY - For my own research I quite often depend on radiolarian preparations from the MRC collection to extend the geographic coverage or the sample resolution to gain additional taxonomic or stratigraphic information for comparison.
The best prospects for improving use of the MRCs come from new research projects involving students and/or thesis projects.

DATABASE WORK - None

CURATION ACTIVITIES ñ Received, checked and accessioned radiolarian slide collections from Drs. Lazarus and Tanimura.

SAMPLE PREPARATION ñ None

CONCERNS FOR IMPROVING THE OPERATION OF THE MRCís ñ None

- -
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(858) 822-3310 (FAX)
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Report of the Gulf Coast MRC
(Curator: Dr. John Firth)

Date: Tue, 03 Jun 2003 11:45:54 -0500
From: John Firth <firth@odpemail.tamu.edu>

I have had no activity with my collection this year, and I have received all shipments of processed samples sent so far.
The last MRC sample request (234 samples) was just finished this last week so you should be receiving them soon.

regards,

John

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Report of the MRC in New Zealand

(Curator: Dr. Percy Strong)

MICROPALEONTOLOGICAL REFERENCE CENTER
Lower Hutt, New Zealand
2002-03 Report

1. Progress about MRC sample preparations: None undertaken at Lower Hutt, however considerable preparation of Leg 181 samples for local study.

2. Progress on MRC database work (sample database, MRC related stratigraphic database work): None under way here.

3. Planned/ongoing MRC work in the framework of Chronos: None

4. Your research being done using MRC materials: Use of comparative material for study of modern Radiolaria by V. Lueer, graduate student from Bremen, Germany.

5. Visitation/usage of your MRC by others: See 4 above. Also, a large suite of Leg 181 samples (bulk and prepared) lodged with MRC by B.W. Hayward for local use.

6. Proposals and/or questions concerning the continuation of your MRC: As this is written, MRC is in process of being shifted [about 10 m] to a slightly larger room, which will also serve as accommodation for visiting scientists at GNS.

7. Questions/proposals to iSciMP: None.

Percy Strong,
Curator
4 June 2003
P.Strong@gns.cri.nz

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Report of the MRC in Bremen

(Curator: Dr. Walter Hale and Dr. Barbara Donner)

Nothing special to add here

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Report of the MRC in Moscow

(Curator: Dr. Ivan Basov)
basov@ilran.ru

Date: Sat, 07 Jun 2003 13:06:27 +0400
From: basov@ilran.ru
Subject: MRC Report
To: Michael Knappertsbusch <Michael.Knappertsbusch@unibas.ch>

GENERAL AND VISITATION

The economic situation in the Russian Academy of Sciences remains unfavorable for visiting the Russian MRC (by scientists from regions) and its full-scale functioning although there is the interest from the scientific community in using stored foraminiferal and diatom collections, as well as in ODP Initial and Scientific Reports.

In this connection, all visitors were from the Moscow institutions:

1.. Andrey B. Gladenkov (Institute of the Lithosphere of Marginal Seas, Russian Academy of Sciences) who used diatom slides from Upper Cenozoic sediments of the North Pacific when preparing for his Doctoral Dissertation.

2.. Eleonora P. Radionova (Geological Institute, Russian Academy of Sciences) - Paleogene diatoms of the North Pacific and North Atlantic for more accurate age determination and correlation with coeval assemblages from marine sections of the Russian Platform and West Siberia.

3.. Marina E. Bylinskaya (Geological Institute, Russian Academy of

Atlantic (for correlation of foraminifeal and nannofossil zonal strtatigraphy)

4.. Galina Kh. Kazarina (Shirshov Institute of Oceanology, Russian Academy of Sciences) - diatoms from Quaternary cores of the North Pacific to compare with those in the coeval sediments of the Sea of Okhotsk.

DATABASE WORK - None

SAMPLE PREPARATION - None

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Report of the MRC at the Smithsonian Natural History Museum

SMITHSONIAN NATURAL HISTORY MUSEUM MRC REPORT FOR 2003
Brian T. Huber, Curator

MRC related activities: I have been building a digital taxonomic dictionary for Cretaceous planktonic foraminifera during the past year and on occasion have selected specimens from the DSDP/ODP MRC collection to obtain SEM images. No sample preparation for MRC collections has been done at the Smithsonian.

Visitors and Research Projects: During the past year only the foraminiferal MRC collection was studied. The following individuals looked at one or more samples from the collection: Heather McCarren (Ohio State University) looked through some mid- to Late Cretaceous samples in her undergraduate intern research project; Dr. Bridget Wade (University of Edinburgh) looked at several samples from the collection for a Paleogene planktonic foraminifer biogeography/biostratigraphy study. I have consulted the MRC foraminifer collection in biostratigraphic and biogeographic surveys of Paleogene and Cretaceous planktonic foraminifera.

Curation activity: This has been limited to checking, accessioning, and assimilating radiolarian, calcareous nannofossil and MRC sample sets received from the MRC production labs and updating slide box, sample container and drawer labels for the collections.

Chronos-related activities: I will be consulting the MRC foraminifer samples and, on occasion, I may select additional specimens to obtain SEM images to be used in the Cretaceous Planktonic Foraminiferal Digital Atlas and the Atlas of Eocene Planktonic Foraminifera. I plan to host a Cretaceous planktonic foraminifer attendees will consult the MRC collection while they are here.

X-ray Scanner for ODP Leg 204: Drilling Gas Hydrates On Hydrate Ridge, Cascadia Continental Margin

July 31, 2002 Progress Report

Barry Freifeld, Tim Kneafsey, Jacob Pruess, Paul Reiter, Liviu Tomutsa

Abstract

An x-ray scanner was designed and fabricated at Lawrence Berkeley National Laboratory to provide high speed acquisition of x-ray images of sediment cores collected on the Ocean Drilling Program (ODP) Leg 204: Drilling Gas Hydrates On Hydrate Ridge, Cascadia Continental Margin. This report discusses the design and fabrication of the instrument, detailing novel features that help reduce the weight and increase the portability of the instrument. Sample x-ray images are included. The x-ray scanner was transferred to scientific drilling vessel, the JOIDES Resolution, by the resupply ship Mauna Loa, out of Coos Bay, Oregon on July 25. ODP technicians were trained in the instruments operation. The availability of the x-ray scanner at the drilling site allows real-time imaging of cores containing methane hydrate immediately after retrieval. Thus, imaging experiments on cores can yield information on the distribution and quantity of methane hydrates. Performing these measurements at the location of core collection eliminates the need for high pressures or low temperature core handling while the cores are stored and transported to a remote imaging laboratory.

1. Introduction

Calibrating estimates of hydrate and underlying free gas concentrations in submarine formations determined with geophysical remote sensing techniques is one of the major objectives of the Ocean Drilling Program (ODP) Leg 204: Drilling Gas Hydrates On Hydrate Ridge, Cascadia Continental Margin [ODP, 2002]. The ODP has deployed the JOIDES Resolution, a 143-meter long scientific drilling vessel owned by Overseas Drilling Limited to drill a transect of sites through the gas hydrate stability zone on the southern part of Hydrate Ridge on the Cascadia accretionary margin, offshore Oregon. To assist in the quantification of hydrates and determine hydrate-bearing sediment textural properties in recovered core, a shipboard x-ray imaging system was developed at Lawrence Berkeley National Laboratory (LBNL). The basis for using x-ray imaging to quantify methane hydrate abundance and distribution has been previously established by Tomutsa et al. [2002] and Freifeld et al [2002]. The x-ray core scanner provides state-of-the-art x-ray imaging capability in a field-deployable package. The system was designed to be light and compact, operating within the space constraints of the core laboratory on the JOIDES Resolution, Bridge Deck/Level 6.

2. Instrument Details

Our goal in fabricating a transportable x-ray imaging system was to match the capabilities of laboratory based systems in a portable package that is practical to operate at remote locations. The x-ray scanner occupies a rectangular box, 1.37 m wide, 0.61 m deep, and 2.03 m high. Figures 1 and 2 show a schematic and a photograph of the x-ray system, respectively. The total weight of the x-ray core scanner, excluding the remote personal computer and x-ray power supply, is approximately 170 kg. The scanner has two axes of motion: a linear axis that moves the x-ray imaging gantry along the vertical core axis, and a rotary axis that controls the core angle to the x-ray optical path. Motion on both axes is actuated by computer-controlled servo motors operating through reduction planetary gears to achieve high torque and positioning accuracy. The maximum core length that can be inserted into the x-ray scanner is 165 cm, although only 150 cm of available linear travel exists. As currently configured, the maximum core diameter is fixed at 7.5 cm. The core size can be easily changed by installing appropriately sized shielding.

The x-ray source is a Picker Hot-Shot 110 KV x-ray source with a 0.3 mm focal spot size. The imaging unit consists of a monochrome CCD mounted behind a Precise Optics cesium iodide image intensifier with a 6-inch input window. The CCD is a Sony XC-75 with a resolution of 768 × 494 pixels and a signal to noise ratio of 56 dB. A high-resolution monochrome monitor provides real-time viewing of the x-ray images. Any camera or VCR that has an NTSC format input can be used to record the output for later review although resolution equal to the CCD is required to avoid image degradation. Digital processing of the images is performed with a National Instruments PCI-1409 10-bit frame grabber installed on a personal computer.

Because x-rays passing through the center of the core are more attenuated than those passing through the edges (a consequence of the circular cross section), an aluminum compensator (Figure 3) designed to flatten the image intensity was installed in front of the image intensifier. The compensator permits better use of the dynamic range available in the x-ray imaging system. On the sides of the compensator are areas of constant thickness that serve as calibration points to permit normalization of the image intensity between images.

Figure 4 presents a view of the x-ray source, imager, and shielding. The three-piece shielding represents a novel arrangement that provides flexibility in the optical path, as well as a high degree of radiation safety. The shielding consists of a fixed half clamshell mounted on the x-ray imager, and concentric telescoping pieces mounted between the core barrel and the x-ray source. The shielding is fabricated from a sandwich of two 1.6 mm thick stainless steel layers encapsulating a 1.6 mm thick layer of lead. The stainless steel layers protect the user from touching the lead and maintain the structural integrity of the lead. The 1.6 mm lead provides sufficient attenuation of scattered x-ray radiation to eliminate the need for additional shielding away from the x-ray path. This arrangement of shielding has significantly reduced the amount of lead that is typically used to encapsulate x-ray imaging systems. The reduced shielding affords the operator a clear view of the x-ray system through a polycarbonate door, permitting viewing of the core angle and gantry position.

The ability to change the distance between the x-ray source and the image intensifier permits the system to accommodate different diameter cores. This flexibility in the x-ray path arises from the telescoping nature of the shielding mounted between the x-ray source and the core, permitting changes in the x-ray path length. The path length change is easily performed in the field by loosening mounting screws on the gantry track and sliding either the x-ray source, imager, or both. Similarly, changing the compensator to one optimized for a new diameter core is performed by removing the six set screws that attach it to the front of the image intensifier and replacing it.

The clamshell shielding arrangement uses alignment pins and two safety interlock switches that prevent operation of the x-ray source if the shielding is not properly closed. Each of the two interlock switches opens independent circuits, providing for redundancy in the event of a single component failure. The first interlock switch prevents the computer control system from turning on the x-ray source. The second interlock switch prevents the x-ray power supply from energizing the high voltage windings in the x-ray power supply. To further prevent users from getting near the shielding when the x-ray unit is activated, the shielding interlock switches are wired in series with interlock switches mounted on the polycarbonate door. This arrangement prevents the x-ray source from being energized when either the door is open or when the shielding is not properly closed.

The linear and rotary axes of motion provide flexibility in core imaging. The scanning software operates in two distinct modes: a linear scanning mode and a computed tomography (CT) mode. The linear scanning mode starts imaging at the top of the core. An initial image is acquired and then the core is rotated 90 degrees and a second image is acquired. The gantry holding the x-ray optics is then lowered 10 cm and two more images are acquired with a 90-degree separation between images. This process is repeated until a total of 24 images of the core are collected. The entire process takes about two minutes. A CT scan can be conducted to acquire images for later 3-D reconstruction. The user enters into the computer the linear location along the core at which a series of x-ray images is desired and the number of partial rotations that a full rotation of the core is to be subdivided into. A typical number of images would be 360, yielding an image for every degree of rotation. Implementation of the 3-D reconstruction of the images in real time is being planned.

3. Instrument Deployment

The x-ray scanner was packed for shipment on July 22, and was trucked to Coos Bay, Oregon, for transfer to the JOIDES Resolution. The tugboat Mauna Loa, carrying the x-ray scanner and personnel, departed Coos Bay at 6 PM, July 23, and arrived at the JOIDES Resolution at daybreak on July 24. Barry Freifeld and Jacob Pruess from LBNL with assistance from Frank Rack (Staff Scientist, Joint Oceanographic Institutions), Brad Julson (Supervisor of Shipboard Laboratories), as well as several staff ODP technicians installed and set up the instrument, with these activities concluded by 11 AM on the same day. Figure 5 shows a picture of the x-ray scanner as installed in the JOIDES Resolution core laboratory. At 1 PM a training session was held to teach the ODP technicians how to use the instrument, with time for several technicians to perform scans on sample core. At 6 PM Barry Freifeld and Jacob Pruess were transferred to the Mauna Loa for transportation back to Coos Bay.

4. Sample Images

Sample images collected using the x-ray scanner include miscellaneous metallic objects, a core holder containing coarse sand and a test core containing oceanic sediments. Figure 6 shows a cross section of ¼-20 bolts and washers in a core holder surrounded by water-saturated Ottawa sand. The lower detail image in Figure 6 reveals the 1.27 mm pitch threads of a ¼-20 bolt. A very close inspection of the threads shows that each thread face is sub-divided into four or five distinct pixels with strong contrast into the surrounding media. This image shows that the instrument is achieving the 0.3 mm resolution spot size, as specified by the x-ray source manufacturer.

Figure 7 is an image taken of the PVC coreholder (originally shown in Figure 6) at a location containing water-saturated sand. Two fine fractures are revealed, highlighting the ability of the core scanner to discern structural details that represent minute changes in sample density. These fractures represent planar features with similar orientation likely due to the orientation of the coreholder as it was loaded with small batches of loosely poured sand and water. Apparently, the moderate shaking applied by hand to the cylinder did not fully compact the sand into a uniform mass.

Figure 8 shows a test core used aboard the JOIDES Resolution that consists of a silty-clay oceanic sediment containing open fractures. Although the three dimensional topology of the fracture is not clearly shown by viewing a single two dimensional image, by watching the x-ray image of the core as it is scanned and rotated on the monitor, one can get a very good sense of the fractures 3-D features. Similarly, a digital 3-D CT reconstruction made from a series of rotational images can provide an accurate representation of the features morphology.

5. Discussion

The x-ray core scanner has met the objective of implementing a transportable imaging system for the ODP Leg 204 Drilling Gas Hydrates On Hydrate Ridge, Cascadia Continental Margin. The x-ray scanner imaging system has achieved the 0.3 mm limiting resolution of the x-ray source. The motion control system has proven to operate reliably with excellent repeatability. Initial operation of the system indicates that performance can meet or exceed that of much larger laboratory based x-ray systems. Since the x-ray scanner is optimized to image geologic core, fine-tuning of the system is expected to provide sensitivity superior to that of large medical imaging systems.

Since preservation of the core for later study requires elevated pressure or reduced temperature during transit and storage and thus poses a formidable challenge, establishing a drill-site-based laboratory is crucial for measuring representative properties of sediments containing methane hydrates. On-site analysis thereby eliminates the concerns associated with sample degradation and alteration that accompany transportation and preservation. An on-site x-ray scanner will permit a range of both passive and active imaging studies on hydrate-bearing cores. Passive studies include textural characterization and phase saturation estimation. Active core testing represents a wide open area of research, and may include relative permeability measurements, progressive dissociation studies and hydrate/sediment mixture phase stability in relationship to controlled parameters, such as temperature, pressure, and inhibitor concentration.

The x-ray scanner as described herein was constrained in the amount of initial testing by the fixed deliverable date required for fielding the instrument on ODP Leg 204 on the JOIDES Resolution. A complete investigation of the instruments sensitivity and resolution through its entire dynamic range of operation will be carried out when it returns to LBNL. Initial testing has shown that the compensator design that was implemented can be further improved. The tight schedule required for system production precluded complete engineering of x-ray beam path lengths and material attenuations. A compensator optimized for the anticipated geologic samples would improve image quality and system sensitivity. It is expected that by adding software for real-time 3D CT image reconstruction, the value of the system will be further increased for on-site core characterization and active testing.

6. Acknowledgments

This work was supported by the Assistant Secretary for Fossil Energy, Office of Natural Gas and Petroleum Technology, through the National Energy Technology Laboratory, under the U.S. Department of Energy, Contract No. DE-AC03-76SF00098. The authors acknowledge the careful reviews of this report by George Moridis and Curt Oldenburg.

7. References

Freifeld, B.M., Kneafsey, T.J., Tomutsa, L., Stern, L.A., and Kirby, S.H., 2002, Use of Computed X-Ray Tomographic Data for Analyzing the Thermodynamics of a Dissociating Porous Sand/Hydrate Mixture, *4th International Conference of Gas Hydrates*, Yokohama, Japan.

ODP, 2002. Leg 204 Scientific Prospectus, Drilling Gas Hydrates On Hydrate Ridge, Cascadia Continental Margin.

Tomutsa, L., Freifeld, B.M., Kneafsey, T.J., & Stern, L.A., 2002. X-ray computed tomography observation of methane hydrate dissociation, *Proceedings of the SPE 2002 Gas Technology Symposium*, Calgary, Alberta, Canada.

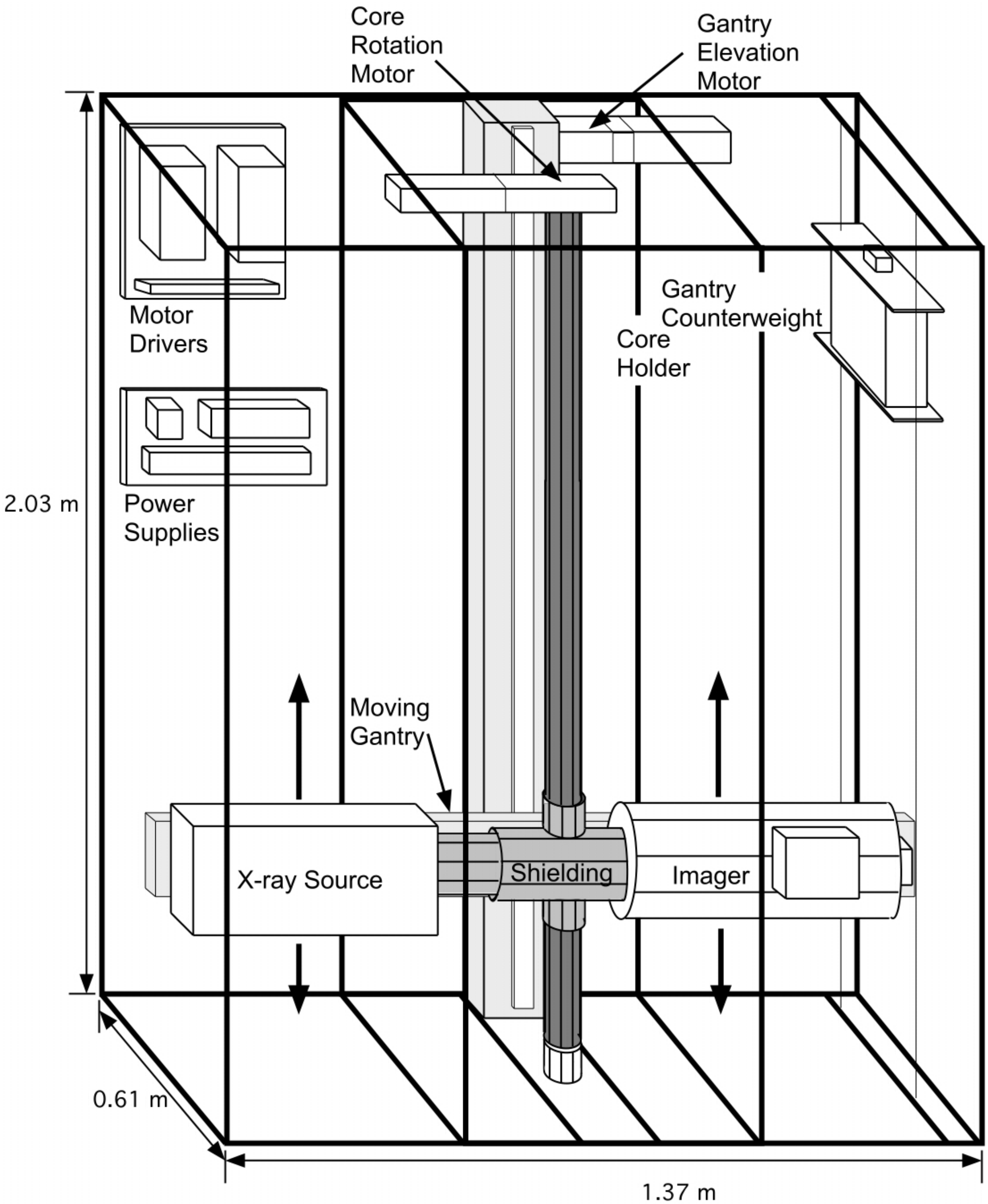

Figure 1. Schematic of the x-ray scanner showing the placement of major system components.

Figure 2. Picture of the x-ray scanner during testing at the LBNL.

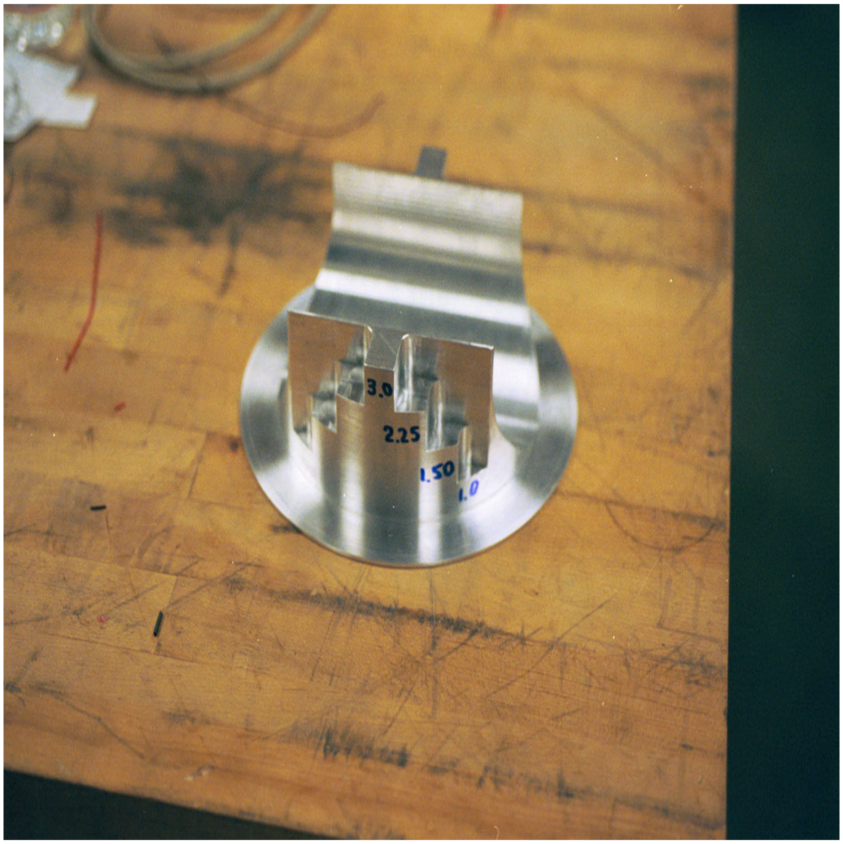

Figure 3. Aluminum x-ray compensator mounted in the front of the image intensifier. The curvature flattens the image intensity to account for the circular core cross section. The outer machined flats provide for calibration and normalization of x-ray beam intensity.

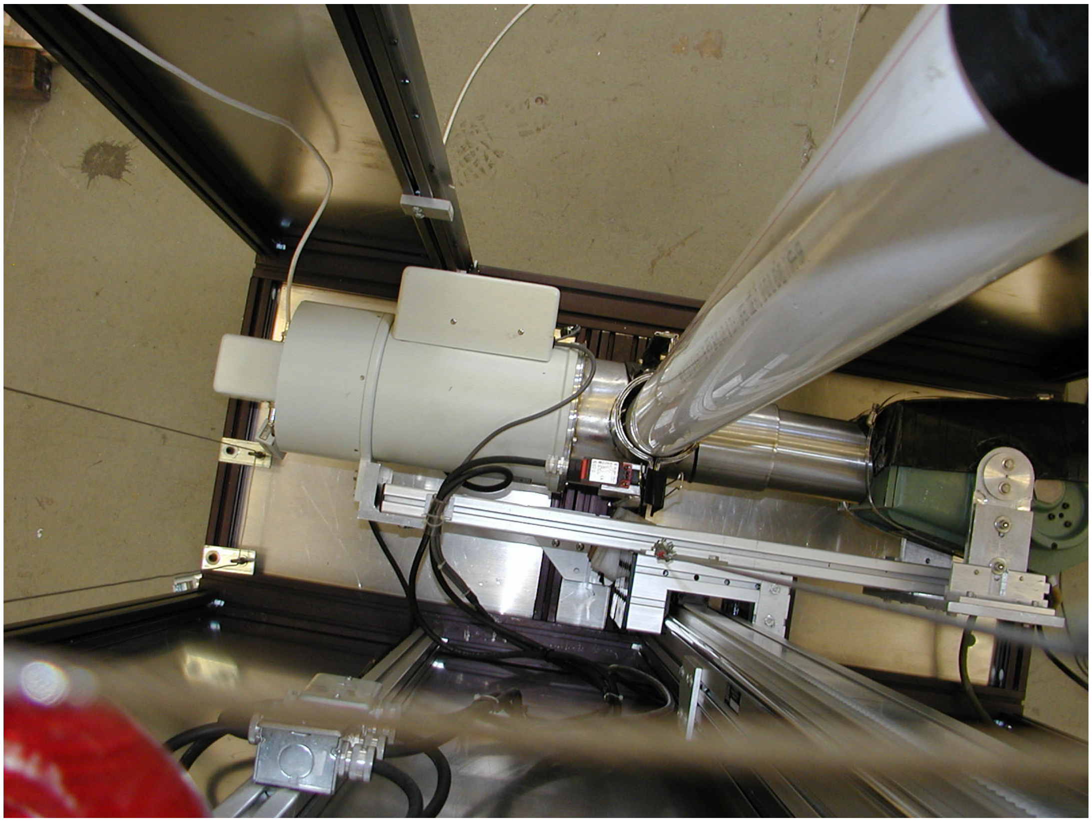

Figure 4. The x-ray beam path showing from left to right: CCD and image intensifier, x-ray shielding surrounding a PVC core holder, and the x-ray source. This picture was taken from the top of the x-ray scanner.

Figure 5. X-ray scanner being installed in the JOIDES Resolution core laboratory. From left to right is Jacob Pruess of LBNL and Brad Julson of ODP.

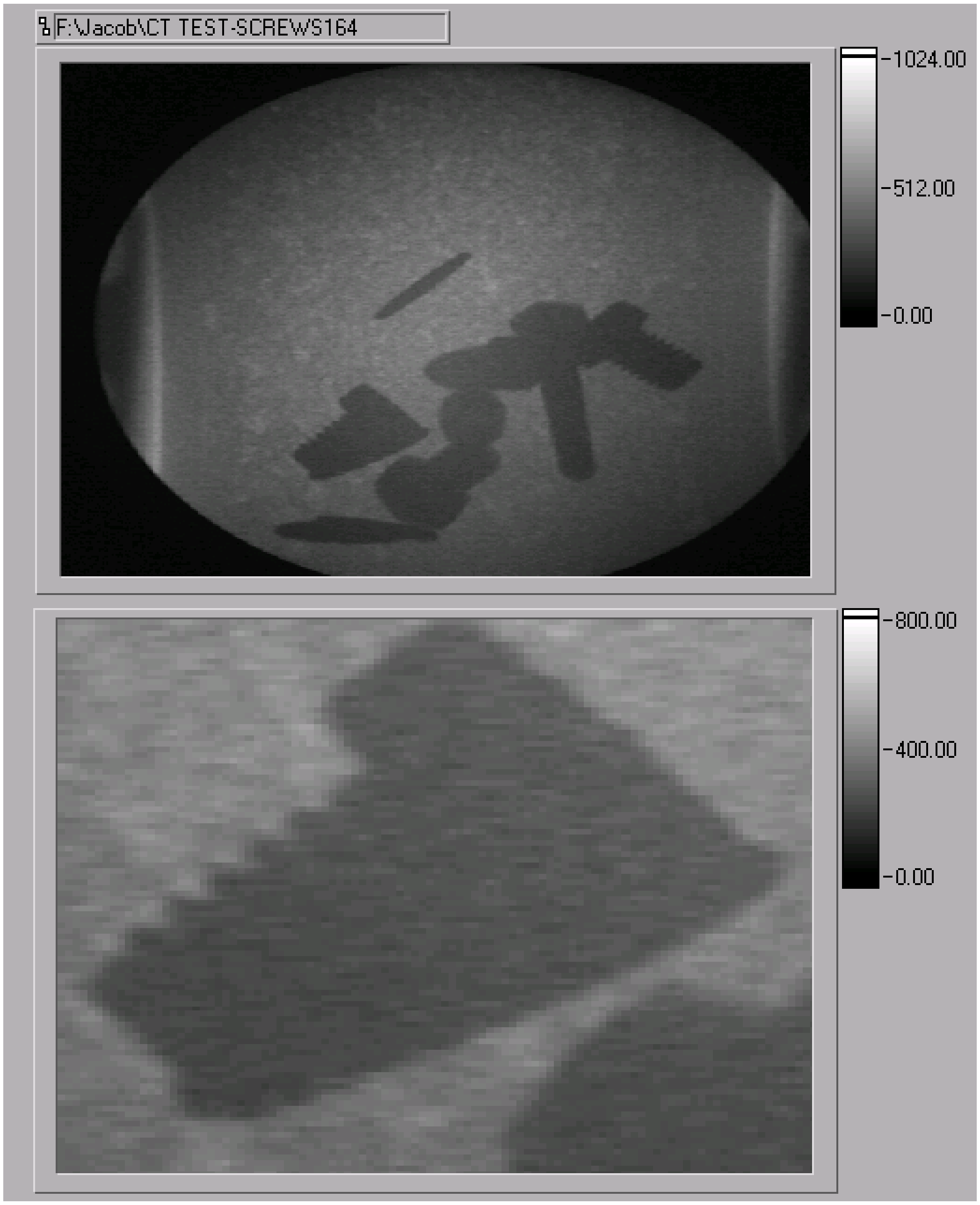

Figure 6. X-ray image of metallic screws and washers in a water saturated sand filled PVC core holder. The lower image has a close-up of a ¼-20 bolt (1.27 mm pitch). The clarity of the threads indicate that the x-ray system attains a resolution equal to the 0.3mm focal spot size of the x-ray source.

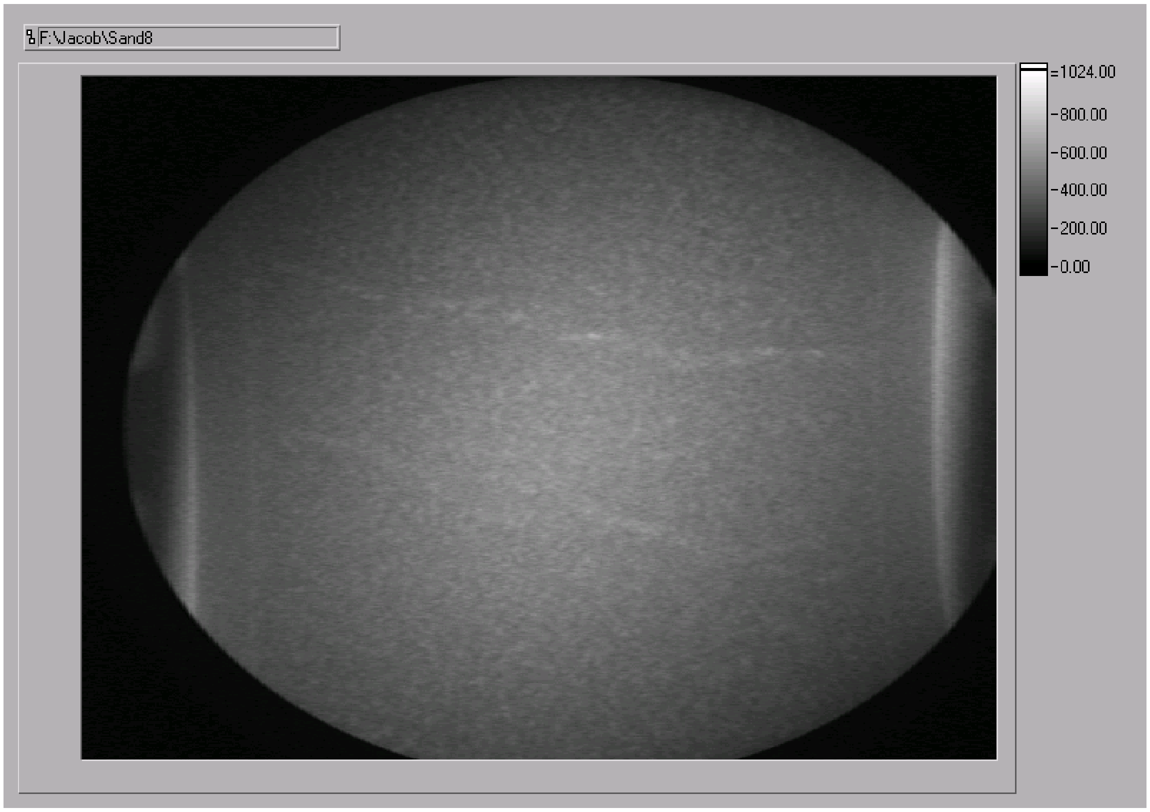

Figure 7. X-ray image of a core holder containing water-saturated Ottawa sand. The light sub-horizontal features are fractures in the otherwise homogeneous column.

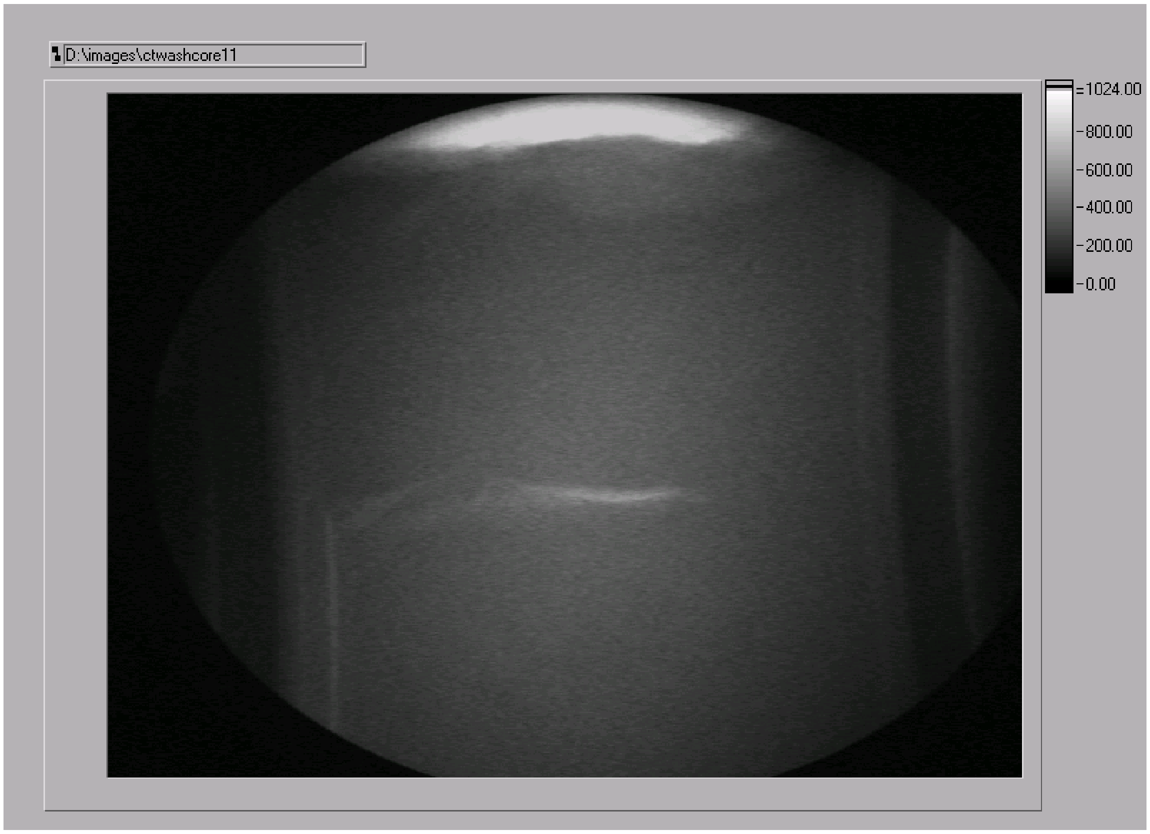

Figure 8. X-ray image taken aboard the JOIDES Resolution of silty-clay oceanic sediment showing a distinct horizontal fracture.