Executive Summary

Shipboard Measurements Panel
Third Meeting
20-21 March 1990
Ocean Drilling Program, Texas A&M University

SMP reviewed all of the shipboard labs and made specific recommendations for geochemistry, paleomagnetics, XRF, and underway geophysics which require some expenditures. A group of physical properties specialists met prior to the full SMP meeting in order to resolve problems associated with the measurement of index properties. The group is drafting recommended procedures for shipboard determination of index properties. This document will be ready for Leg 133. The panel discussed and drafted a recommendation on the use of stable and radioactive isotopes. Representatives from ODP/TAMU presented some new developments. The panel applauded the development of the new computerized barrel sheets. The panel encourages and recommends acceleration of the new digital image scanner. The upcoming Sedimented Ridges Legs were identified as requiring shipboard lab improvements in order to meet the leg objectives. Further definition of these requirements will be completed during the fall SMP meeting.

SMP Recommendations
20-21 March 1990

The panel recommends the core rack and vicinity be de-magnetized on a regular basis, on the order of every 6 months (90-01).

The panel recommends that as a check on shipboard index property determinations, samples for specific gravity determinations be taken at an interval of 1 sample for each lithology for each site and then tested at an experienced shore-based laboratory (90-02).

The panel recommends that a separate, replaceable tank be installed onboard for neutralized HF acid (90-03).

The panel recommends that the task of incorporating more standards into the XRF procedure be performed by a Staff Scientist and shipboard scientists with considerable XRF experience should also be encouraged to do so during forthcoming legs (90-04). In addition, the panel strongly suggests that TAMU/ODP arrange a course with ARL, the manufacturer of the XRF for training of technical staff in the repair of the equipment. These course are normally only available to ARL employees. However, given the remote location of the XRF, ARL may agree to the course.

The panel recommends that ODP/TAMU continue the development of the digital image scanner for routine data capture. Routine data capture should record windows of 10cm length downcore in order to resolve 0.1mm (90-05).

SMP recommends that ODP/TAMU evaluate the technical feasibility of adding total gamma to the MST and report to the next meeting (90-06).

SMP recommends that additional Titanium squeezers (one normal and two small volume) be constructed for the geochemistry laboratory (90-07).

SMP recommends that the PCS Phase II development be completed for Cascadia Margin drilling and that an early evaluation of possible upgrade of the tool for a high temperature environment be completed in preparation for Sedimented Ridges (90-08).

SMP recommends that a shipboard navigation/data logger system be implemented in two stages: (1) immediate purchase of a suitable commercial navigation system to provide the data needed to position the ship on site; and (2) development of a navigation/data logger with multiple inputs, the ability to process (filter, correct, interpolate, spike detect and delete) these data, and provide plots at various scales and projections (90-09).

The panel recommends that PCOM ban any use of radioactive or enriched stable isotopes onboard the JOIDES RESOLUTION (90-10).

SMP restates for the third time the recommendation (89-20) which states: the evaluation of the smear slides should not be broken down into absolute percentages; rather the percent composition should be represented by descriptive terms which represent ranges of percent compositions.

Shipboard Measurements Panel
20-21 March 1990
Minutes

I Introduction of guests and TAMU representatives. The meeting was attended by the following:

Jack Baldauf (ODP/TAMU)
Ron Chaney (guest)
Andy Fisher (ODP/TAMU)
Ian Gibson (member)
Dennis Graham (ODP/TAMU)
John King (member)
Margaret Leinen (PCOM representative)
Kate Moran (chair)
Mike Mottl (member)
John Mutter (guest)
Adrian Richards (member)
Mike Rhodes (member)
Ellen Thomas (member)
Piotr Tucholka (member representative)
Bob Whitmarsh (member)

II Minutes from the second meeting were approved. Changes to the agenda were made. A revised agenda was approved.

III Business arising from the second meeting:

Paleomagnetics (J. King)

At the last meeting, a recommendation was made to purchase temperature dependent susceptibility equipment for the paleomagnetics laboratory. The acquisition of this equipment is underway. The acquisition of an ARM coil was also recommended. TAMU was going to build the coil based on a design used by J. King. However, the original designer is now an independent company. The paleomagnetics staff scientist will pursue the acquisition of the equipment. **Action: TAMU to report on the status of the ARM coil at the next meeting.**

J. King also reported on the status of the core contamination studies he is undertaking. Spikes in magnetic susceptibility occur regularly at the tops of XCB cores, indicating the possibility of core contamination. J. King will analyze samples from the top of the these sections. **Action: J. King to report on the status of the core contamination studies at the next meeting.**

J. Baldauf reported on comments from last week's annual co-chief's meeting. Both a steel beam, located in the vicinity of the magnetometer and the metal core rack are interfering with the measurements in the lab. Shielding of the magnetometer is still a problem. **The panel recommends that the steel beam and the core rack be de-magnetized on a regular basis, on the order of every 6 months (90-01).** The magnetometer shielding cannot be improved. In relative terms, the ship is a "hostile" environment for the cryogenic magnetometer. Consequently, it should be clearly stated in both the Paleomagnetics Handbook and posted in the paleomagnetics laboratory that the instrument is very sensitive; objects should never be placed on the device and personnel should not lean against the device. **Action: TAMU should upgrade the Paleomagnetics handbook and post signs in the**

paleomagnetics laboratory.

Physical Properties (K. Moran)

A meeting of a physical properties subgroup was held on 19 March at ODP/TAMU. The group convened in order to resolve problems associated with discrepancies between independent measurements of saturated bulk density and to review the methods used in the determination of all shipboard index property measurements. The group is preparing a document which defines standard procedures for the shipboard measurement of index properties. A draft document will be prepared prior to Leg 133. A summary of the meeting was presented as follows:

1. Index Properties

There is a discrepancy in test results of bulk density between the methods of 2 minute GRAPE and the 'direct' method for materials of low porosity. The group is preparing a Procedures Document for determinations of index properties for the shipboard physical properties laboratory. The procedures for water content and grain density were agreed upon by the group. The procedures for bulk density require more study, specifically:

(a) Review the results from recent Legs. **Action: Moran and Taylor to review the recent index property test results from Legs 129, 130 and 131.**

(b) Run tests on Leg 129 samples to determine the 'ground truth' specific gravity. **Action: TAMU to sample Leg 129 cores at intervals specified by A. Fisher, seal the samples in water-tight containers and ship to the Atlantic Geoscience Centre Geomechanics laboratory for testing.**

(c) Errors associated with possible pycnometer procedures require calculation and summing to determine total errors and provide limits for reasonable accuracies over the range of porosities normally encountered in the program. **Action: Moran calculate errors for review by the members.**

In addition, the group agreed that the routine determination of grain density using the standard practice should be supplemented by measurement of specific gravity at each lithology and measured at a shore-based laboratory. This supplementary measurement will serve as a check on the routine, less accurate measurement and will be incorporated into Volume A at the discretion of the physical properties specialist. The measurement can also be used with the water content as a check on the saturated bulk density measurement. **The panel recommends that as a check on shipboard index property determinations, samples for specific gravity determinations be taken at an interval of 1 sample for each lithology for each site and then tested at an experienced shore-based laboratory under subcontract to the Program (90-02).** It is estimated that the number of tests required for each leg would vary from 5 to 50. An approximate commercial cost for this test is $40.00, so the cost per leg would range from $200 to $1000.

2. Resistivity

Resistivity equipment onboard the ship requires evaluation. The equipment must be checked to see if it is working properly. After the equipment is checked out, procedures for running tests need to be documented. **Action: Leg 131 participants will make an effort to evaluate the**

resistivity equipment and document resistivity procedures. If they cannot be completed on Leg 131, the equipment should be taken off the ship for evaluation and documentation by an expert in the field. The equipment should not return to the ship until these tasks are completed.

3. Thermal Conductivity

The thermal conductivity equipment and software was recently upgraded. The equipment is very much improved and is well documented.

4. Physical Properties Workshop

Objectives were discussed, a workshop agenda is presently being drafted. The objectives are as follows:

a. Define the present physical property data requirements and accuracies for the program and user community;
b. Review current procedures/methods and identify problem areas;
c. Discuss and identify solutions to the problem areas by looking at immediate and longer term solutions;
d. Prepare an implementation plan for each problem area.

The meeting should be attended by past physical properties specialists and by invited experts in specific fields (e.g. CATSCAN, gamma core logging). The workshop should be held following the joint SMP/DMP meeting in order to incorporate identified needs for logging/sample correlations. The group recommended that the workshop be held during the spring of 1991. **Action: Moran prepare a letter of request to JOI for funding for the workshop.**

Micropalaeontology (E. Thomas/J. Baldauf)

Two recommendations were made at the second meeting with respect to micropalaeontology. The first recommendation (89-29) was to index the taxonomic literature onboard the ship. J. Baldauf reported that this task is very labour intensive. **The panel encourages TAMU/ODP to make every possible effort to begin this task, preferably beginning on Leg 133.**

The second recommendation (89-30) was the implementation of a documented reference slide collection. Since the last SMP meeting, E. Thomas and J. Baldauf have been organizing this effort. The most efficient way to accomplish this task is for micropaleontologists to meet and prepare the reference slides. This can be accomplished with two to three groups of scientists meeting at different times. One group should consist of specialists in high, mid and low latitude benthic foraminifera. This group should meet at the Smithsonian. One or two other groups are required for preparation of slides for diatoms, radiolaria and for calcareous nannofossils. These reference slides are not the same as the reference centers. This collection is required for stratigraphic purposes specific to the ODP representing primary zonation of microfossils. **Action: E. Thomas and J. Baldauf prepare a proposal for submission to JOI/USSAC for funds to complete this task.**

J. Baldauf reported on hydrofluoric acid (HF) safety onboard the ship. ODP has prepared guidelines for the use and storage of HF (Attachment #1). Concern was raised and discussed regarding the use of the tank onboard for disposal of the neutralized HF acid. After long storage periods, the HF can cause degradation of the storage tank and potential failure. **The panel recommends that a separate, replaceable tank be installed onboard for neutralized HF acid (90-03).** The tank should be routinely checked and

replaced as recommended by the manufacturer.

Petrology (M. Rhodes)

1. Standards

At our last meeting, there was a concern that geochemical reference standards were not available onboard. M. Rhodes and J. Baldauf reviewed the available standards onboard and found that there are far more standards available than are routinely used at other XRF laboratories. The problem of standards is not their availability, but their use. It is apparent that standards are not currently in use. Possible reasons for this non-use are:

(a) not all standards have reliable, well accepted preferred values;
(b) preferred values for some standards and some elements are better known than for others;
(c) for certain elements there is poor agreement among laboratories and varying analytical techniques for some standards; and
(d) most technicians do not have sufficient experience to evaluate the reliability and value of these standards.

The panel recommends that the task of incorporating more standards into the XRF procedure be performed by a Staff Scientist and shipboard scientists with considerable XRF experience should also be encouraged to do so during forthcoming legs (90-04). In addition, the panel strongly suggests that TAMU/ODP arrange a course with ARL, the manufacturer of the XRF for training of technical staff in the repair of the equipment. These course are normally only available to ARL employees. However, given the remote location of the XRF, ARL may agree to the course.

2. A Crushing Matter

Recently, there has been considerable pressure from some shipboard scientists to incorporate crushing agate grinding vessels as a routine component of XRF sample preparation. This stems from the concern that samples will be contaminated with critical, petrologically useful, trace elements by the tungsten carbide (WC) vessels that are routinely used. In an attempt to respond to this request, two agate grinding vessels were purchased for use on the Spex Shatterbox. Such an arrangement has used successfully by F. Frey at MIT. This did not work on the ship; both agate vessels rapidly developed cracks. A variety of reasons have been proposed: (1) improper manufacture of the agate grinding vessels; (2) different motor speeds used on the ship versus that used at MIT; (3) samples were not sufficiently reduced in size prior to crushing in the grinding vessels; and (4) insufficient sample was crushed. Of these, M. Rhodes reported that the insufficient sample is the most likely culprit. Apparently, a 10g sample is typically taken for XRF analysis. This amount is <u>too small</u>, even for the more robust WC grinding vessels. Typical sample sizes for these vessels are between 20 and 100 grams. For smaller sample sizes (4-30g), it is recommended that smaller vessels should be used. These are available in WC, but may not be available in agate. These smaller vessels have the added advantage that three samples can be crushed simultaneously. Possible solutions are: (1) replace the Spex Shatterbox with one from Siebteknik, so that both WC and agate grinding vessels are readily interchangeable; and (2) purchase several sizes of grinding vessels (both WC and agate, if possible) so that a variety of sample sizes can be accommodated.

Significant sample contamination through grinding in WC is restricted to W, C, Co, and Ta. None of these elements are determined during shipboard XRF analyses. There has been some concern that Nb contamination may be a problem, particularly as Nb is a critical element, present in low concentrations, in arc-related samples. Tests by M. Rhodes and F. Frey, comparing samples ground in agate and WC, show that grinding in WC introduces at most only 0.5 ppm Nb. This is the detection limit for XRF Nb measurements and therefore hardly significant. Consequently, there is no serious contamination problem for shipboard XRF analyses. It is only a problem when sample powders, prepared onboard are taken away for shore-based analyses. In addition, crushing in agate is much less efficient that in WC, which places a greater demand of time on the XRF technician. Based on these comments, an even simpler solution is to limit shipboard grinding vessels to WC and suggest to shipboard scientists that either additional samples are taken for grinding in their shorebased labs or that they supply their own grinding vessels for specific analytical shorebased requirements.

Computers

1. Standard Plot Templates

At the last SMP meeting, the panel recommended (89-32) that software plot templates be generated for standard plots for each laboratory. Templates are currently available using PICSURE. TAMU/ODP are currently generating templates for the PC/Mac environments onboard. A list of recommended plots were passed on to ODP for micropalaeontology, petrology and physical properties.

2. PC/Mac Software

J. Baldauf reported on the available PC/Mac software onboard the Resolution. The panel reviewed the software and suggested additional software packages which would be useful for data manipulation/display by shipboard scientists. For the MacIntosh computer, additional software includes: Kaleidagraph; Fortran; and C. The PC computer software library should be upgraded to include graphics packages. Harvard Graphics and Sigmaplot would be appropriate choices.

3. Micropaleontological Data Entry

J. Baldauf reported that efforts are currently underway to computerize the paleontological database. Major steps in this direction include modifications to the software package, CHECKLIST. Modifications to this program include the capability of producing "camera-ready" species occurrence tables and the ability to check, verify and enter data into the ODP database. The modified CHECKLIST will be used onshore to generate the paleontological range chart data for the Scientific Results volumes. BUGIT is presently under evaluation by ODP/TAMU as a software package which will be used onboard to directly enter paleontological data into the database and eliminate the current practice of using duplicate, hand-written forms. In addition, the program can be used to provide a data diskette for the shipboard scientist to take back to shore for faster production of post-leg manuscripts. **Action: ODP/TAMU prepare a report on the status of BUGIT for the next meeting.**

4. VMS XRD/XRF Data Transfer

D. Graham reported that the XRD/XRF system, which utilizes a PDP11 is not linked into the shipboard network. Consequently, the transfer of XRD/XRF data to the PC/MAC systems can

only be done using a "jury-rigged" procedure, not easily performed by a shipboard scientist. The cost of networking the PDP11 is too high relative to the age of the computer. The panel suggest that ODP/TAMU pursue improvements to the "jury-rigged" procedure so that shipboard scientists will be able to transfer the data without the assistance of the systems manager.

Sedimentology/Visual Core Description

1. Barrel Sheets

M. VonBreyman and P. Brown presented the new computerized Barrel sheet and visual core description (VCD) prototype to the panel. The prototype is implemented on a Macintosh using hypercard. The system allows the user to directly input barrel sheet and VCD information on the computer screen. The system is very user friendly, flexible and relatively fast. The system will communicate with the shipboard VAX through network protocol transparent to the user. Hard copies can be generated using postscript language. A postscript file can also be generated which can be edited with any text editor or using the ADOBE illustrator software. **The panel congratulates ODP/TAMU on this development. When this software is implemented for shipboard use, the preparation of barrel sheets and the process of VCD will be significantly improved.** Action: SMP to discuss procedures for integration of core and log data on the barrel sheets at the next meeting.

2. Digital Image Scanner

Russ Merrill presented the prototype digital image scanner (DISC). The system has been under development for two related applications. The first application is digital image analysis for single images, such as smear slides. DISC can presently be used for this application. The second application is for routine data capture of all split cores. Both applications were presented to the panel. The system not only replaces the current core photography, but can be used to measure core colour, to analy structure, measure bed thickness, and potentially for the measurement of core texture. The panel agreed that DISC is a very valuable tool and should be further developed for routine shipboard data capture. The major constraint to routine data capture is the amount of data generated. ODP/TAMU should investigate the option of storing the data on videotape in order to minimize cost. **The panel recommends that ODP/TAMU continue the development of the digital image scanner for routine data capture. Routine data capture should record windows of 10cm length downcore in order to resolve 0.1mm (90-05).**

3. Image analysis of smear slides (A. Richards)

A. Richards suggested that instead of using smear slides, other methods should be investigated for compositional analysis. For example, imaging systems for particles falling in a suspension may result in higher data quality. M. Leinen reported that these types of systems are currently used by biological oceanographers. A system is in use at the University of South Florida. Other researchers in the US have developed software for the identification of microfossils. **Action: A. Richards to continue the investigation of alternative methods and report at the next SMP meeting.**

J. Baldauf reported IHP's recommendation that numbers should continue to be used when recording smear slide data into the database. SMP does not agree with this recommendation. The smear slide analysis is qualitative and not quantitative. By storing these data in the database as values

implies a level of accuracy far greater than the current analysis yields. **SMP restates for the third time the recommendation (89-20) which states: the evaluation of the smear slides should not be broken down into absolute percentages; rather the percent composition should be represented by descriptive terms which represent ranges of percent compositions.**

4. Infrared for bulk mineralogy (M. Rhodes)

M. Rhodes investigated the application of this technique and could find no users of infrared for this purpose. **Action: M. Rhodes to contact R. Jarrard/P. Worthington to request additional information and report at the next SMP.**

5. Colour Scanner (K. Moran)

The colour scanner demonstrated at the October meeting is currently onboard the Resolution. The device is onboard to measure colour at discrete core intervals. The data will be analyzed in order to correlate colour cycles with climate cycles. This exercise should provide additional insight into the best method of presenting colour data on the barrel sheets. **Action: K. Moran to present colour data from Legs 130 and 131 at next SMP meeting.**

6. Other whole core analyses (all members)

During the meeting, a number of ideas were presented which relate to whole core analysis. Some of the techniques are specific to compositional measurements, while others are related to stucture and fabric. These ideas represent cases where technological advances 'drive' the science rather than vice versa. Further investigation of these techniques is required for discussion at the joint DMP/SMP meeting. **Action: the following members should investigate and prepare a report on the following for the joint DMP/SMP meeting: J. King - CATSCAN; I. Gibson - X-ray (spectral); M. Rhodes - NMR.**

Downhole logging/correlation

At the October meeting, SMP discussed supplementary core logging measurements as well as downhole measurements for log/core correlations. The most obvious additions were researched for this meeting and discussed.

1. Natural gamma spectrometry (K. Moran)

Harbert Engineering Inc. manufactures two different products which measure total gamma and spectral gamma. The total gamma can be used on the MST. This device costs approximately $14k. **SMP recommends that ODP/TAMU evaluate the technical feasibility of adding total gamma to the MST and report to the next meeting (90-06). The spectral gamma device requires a controlled temperature environment and can take up to 1 hour for each measurement. These restrictions are not compatible with the MST. Any further consideration of the addition of this device to the shipboard laboratory depends upon the priority of this measurement. These priorities will be discussed at the joint SMP/DMP meeting in October.** Action: K. Moran to present spectral gamma options at the joint SMP/DMP.

2. Induced gamma (I. Gibson)

Discussion of this option ended after I. Gibson reported that radioactive samples would result from this method.

3. Downhole magnetometer/magnetic susceptibility (P. Tucholka)

A downhole magnetometer and a susceptibility tool have been developed and used in France. The development was supported by CFP and CEA-LETI in collaboration with CNRS-ENS. Schlumberger is currently working on putting these two tools together with Leg 134 for the target field test. SMP's interests in these logging tools is specifically for core-log correlations. Consequently, the susceptibility tool is of greater interest than the magnetometer to the panel. The vertical resolution of this susceptibility tool is 10 cm and the measurement resolution is 10^{-5}SI. KTB also uses a tool, but the measurement resolution is too low for core-log correlation in sediment. J. King reported that LDGO-BRG are preparing a proposal to develop a high resolution magnetic susceptibility tool. The proposed development is joint with Bartington, the same company which manufactures the shipboard core susceptibility meter. The proposal is for a tool with a vertical resolution of 5 cm and a measurement resolution of 10^{-7} SI. **Action: J. King report on status of this tool development to the joint SMP/DMP meeting.**

Geochemistry (M. Mottl)

A normal capacity Titanium squeezer was loaned to the shipboard geochemistry laboratory by F. Froelich. In addition J. Gieskes has constructed small volume Titanium squeezers which have 20 cm^3 capacity. He will use these on Leg 131. **SMP recommends that an additional Titanium squeezers (one normal and two small volume) be constructed for the geochemistry laboratory (90-07). Although Ti has many advantages over stainless steel (less contamination, harder surface, and lighter weight),** it has a lower thermal mass. This means that during the squeezing process, samples initially cooled to 2°C could detrimentally warm. **Action: ODP/TAMU evaluate the amount of warming using the Ti squeezer compared with the stainless steel squeezers.**

IV PCOM Report (M. Leinen)

M. Leinen presented the current status of the ship's track (Attachment #2). At the previous PCOM meeting, only 6 legs were scheduled. The remaining legs will be scheduled during the next PCOM meeting. It was also recommended that SMP review the upcoming legs for laboratory requirements in order to provide PCOM with any potential constraint issues.

V Pressure Core Barrel Report

Jim Brooks (TAMU) reported on their previous work with the pressure core barrel. The tool was used on four different legs during DSDP and ODP (Legs 76, 84, 96 and 112). The tool was most successful on Leg 76 and had major technical problems on the other legs. The tool was successful in recovering massive hydrates. The samples recovered were kept at 0° while the gases were bled off and analyzed. In general, the same isotopic compositions were measured from the pressurized sample when compared with the normal gas samples. Their research effort in this area has declined with the general decrease in funding from oil companies.

Tom Pettigrew (ODP/TAMU) presented the status of the new pressure core sampler (PCS) and a comparison of this tool with the DSDP pressure core barrel (Attachment #3). The PCS was re-designed to take a shorter pressure core sampler and was made compatible with the APC/XCB bottom hole assembly. The PCS development plan is broken into two phases. The first phase (now complete) is the basic tool

which samples at near in situ pressure. The second phase is the addition of a pressurized transfer chamber for the testing and sampling of the core at near in situ pressure.

The tool was deployed three times on Leg 124. The first deployment recovered a water sample; the second deployment recovered a mudstone sample, but pressure was lost due to a malfunctioning accumulator; and the third deployment was successful in recovering a pressurized sample. Two modifications of the tool were made for Leg 131: an additional port was added for sampling gases and an internal tube was fitted into the pressured sample in order to recover a contamination-free inner sample. The PCS is currently limited to 100-125°C due to the seals.

The most important applications for this tool in upcoming legs are Sedimented Ridges and Cascadia Prism. Sedimented Ridges may have very high temperatures which would presently limit the tool. However, given the high priority for characterization of geochemical fluxes in this environment, the possibility of upgrading the tool for higher temperatures should be evaluated. For the Cascadia Prism, the tool can be deployed in its present configuration. However, the Phase II development of the PCS should be scheduled so that it is available for use on this Leg. The Phase II development should follow the priorities outlined in the October SMP minutes. **SMP recommends that the PCS Phase II development be completed for Cascadia Margin drilling and that an early evaluation of possible upgrade of the tool for a high temperature environment be completed in preparation for Sedimented Ridges (90-08).**

VI Underway Geophysics (J. Mutter)

1. Navigation

The RFP for a navigation system was reviewed by B. Whitmarsh and J. Mutter in light of the bid responses which ranged in cost from $250k to $350k - considerably in excess of the anticipated costs. The specifications outlined in the RFP are not demanding. However, they could not be satisfied by any known off-the-shelf system. In particular, the requirement to produce an on-line plot over an existing track at a variety of map projections could require considerable software development leading to high costs for academic bidders. In addition, the requirement to supply four essentially similar systems also leads to high bids.

Many readily available commercial systems can provide the essential navigation function, include screen plots of real-time position and allow the input of critical site selection data as pseudo way points. These cost less than $50k. **SMP recommends that a shipboard navigation/data logger system be implemented in two stages: (1) immediate purchase of a suitable commercial navigation system to provide the data needed to position the ship on site; and (2) development of a navigation/data logger with multiple inputs, the ability to process (filter, correct, interpolate, spike detect and delete) these data, and provide plots at various scales and projections (90-09).**

2. Real-time and post-processing (D. Graham/ J. Mutter)

Real-time processing consists of AGC only so that the data recorded on tape has a limited amount of filtering. The SIOSEIS package is available for use for post-processing onboard. This processing package replaced the original UTIG package PROCESS. While substantially superior to the original system, it is cumbersome to use and is somewhat limited in capability. The SierraSEIS package available at a discount cost to all IRIS institutions includes "extended" processing options and would be a further improvement over SIOSEIS. However, this upgrade is not essential, but should be considered in future.

3. Seismic reflection data quality (J. Mutter)

The tests using the AMF high speed streamer borrowed from LDGO proved to be very brief and not very informative. At 9.8 knots, the present Teledyne and AMF streamers appeared quite similar, with the AMF streamer somewhat less noisy. Only a few hours of data were obtained at higher speeds; not enough to assess whether the AMF streamer is capable of producing satisfactory records while the RESOLUTION is underway between sites. LDGO will not be using its AMF streamer for a fairly extended period after June '90 and an arrangement could be made to have LDGO loan the streamer to ODP again for an extended period. **Action: Panel review additional data acquired at high speed at the next meeting.**

VII Upcoming Legs

In order to meet the objectives of Sedimented Ridges Legs, some changes to current shipboard procedures are required. The pore water sampling equipment available with the PCS and the WSTP should be upgraded to Ti in addition to the squeezer changes (90-07). Moreover, the sampling of sulphide deposits will require that sulphur be measured and that it be removed prior to any XRF analyses. Sulphur analysis could potentially be achieved by acquisition of a sulphur colorimeter. Methods of removal of sulphur for other element analyses using the XRF require review and further recommendation. **Action: M. Mottl to review methods of sulphide analyses and report to the next meeting. M. Rhodes to review sample preparation of sulphides for XRF and report to the next meeting.**

VII Guidelines for enriched stable and radioactive isotopes

The panel recommends that PCOM ban any use of radioactive or enriched stable isotopes onboard the JOIDES RESOLUTION (90-10). Use of radio- and stable isotopes onboard the JOIDES RESOLUTION should only be considered if absolutely no other possible method can be used to meet the scientific objective. After extensive discussion, the panel could not conceive of any cases where this exception would apply. However, the panel agrees that any requests where the proponent feels this exception applies can be evaluated by the SMP panel chair in concert with TAMU.

It was reported that the ship will be tested for radioactive cleanliness during its upcoming port call in Guam. **Action: J. Baldauf to report on the results of this SWAB at the next meeting.**

IX Report on ODP Sampling/Downhole Tools (ODP/TAMU)

T. Pettigrew reported the status of all of the ODP tools (Attachment #4). Of highest priority to the panel were the new options for hardrock core orientation using the scribe, multishot and the new sonic core monitor; the APC temperature tool which will be ready for Leg 133; and the APC break-away piston. The panel once again discussed sample handling and encouraged TAMU to act on an earlier SMP recommendation for upgrading core liner handling between the drill deck and the catwalk. **Action: J. Baldauf to report on the status of hardrock core orientation, APC temperature tool, the breakaway piston, and plans for core liner handling at the next meeting.**

A. Fisher reported on the status of the GEOPROPS tool. The tool will be ready for field testing this summer and will be tested on an upcoming leg.

K. Moran briefly summarized the lateral stress tool developments (LAST-I and II).

X JOI Geochemistry Workshop

No members of the panel were able to attend the workshop. **Action: M. Mottl and I. Gibson review workshop proceedings and prepare a summary report of relevant panel discussion items for the next meeting.**

XI SGPP Report

A SGPP representative was unable to attend.

XII Next Meetings

1. Joint DMP/SMP meeting to be held in Townsville. The proposed schedule is:
   9-10 October.....SMP meeting
   11 October.....Joint SMP/DMP meeting
   12 October.....Ship tour in AM/continue joint meeting in PM
   13 October.....Member shipboard lab visits
   14-15 October....Field trip (Great Barrier Reef)

2. March 5-6 1991 College Station

3. October 22-23 1991 Halifax

XIII The meeting was adjourned at 1500, 21 March. AOB items were held for the next meeting: co-chief review which includes comments on technical support; electronic mail; membership; and x-ray equipment.

#1

GUIDELINES FOR THE USE AND STORAGE OF HYDROFLUORIC ACID ABOARD THE JOIDES RESOLUTION

HF is a strong acid that palynologists and paleontologists use to dissolve material in sediment and rock samples. The following procedures have been adopted and will be used whenever hydrofluoric acid (HF) is used aboard the ship.

HF will be stored in clearly labeled plastic containers, as supplied by the vendor, in an approved acid storage area. Approximately ten liters of concentrated acid will be stocked aboard the vessel. The acid storage cabinets in the Second Look Lab and under the HF fume hood in the Paleo Prep Lab are approved HF storage areas. Used HF will be stored in clearly labeled plastic containers. When a container (20 liter) contains 7 liters of used acid, the Lab Officer/or delegate will neutralize the used acid to a 1% concentration by adding it (with stirring) to cold water and aqueous sodium hydroxide. Caution should be taken not to store discarded HF for extended periods of time since HF will embrittle all plastic materials. Polyethylene is the preferred plastic due to its unusual resistance to HF. Neutralized HF will be taken off the ship during scheduled port calls and turned over to local authorities for disposal.

HF will not be used on the JOIDES Resolution unless burn treatment medical supplies and acid spill clean up chemicals are available in sufficient quantities. ODP should be notified in advance of anticipated HF use on a Leg. ODP will coordinate with the Sedco Medical Officer to ensure medical supplies are available.

Prior to anyone using HF they must sign a copy of this policy stating they have read, understand and will abide by this policy. The signed statement will be filed by the Laboratory Officer. Samples should be processed in groups (10 - 20 samples) to minimize safety risks. HF will not be used when ship motion limits normal handling. The scientist using HF will wear safety gloves, apron, and a full face shield.

In the event of a failure of the normal operation of the HF fume hood ventilation system, all HF containers will be immediately capped and the hood sash will be closed.

In the event that HF acid (even dilute concentrations) contacts skin or clothing, immediately immerse the affected area with cold water; remove contaminated clothing as rapidly as possible. Summon the Shipboard Physician, preferably without interrupting the cold water wash.

In the event of an HF acid spill, the labstack deck should be vacated by all except the emergency cleanup crew. Crew members responding to the spill will wear chemical protective suits and breathing apparatuses. Spill kits are located in the stair well at the hold level and in the Paleo Prep Lab.

attachment: **Hydrofluoric Acid Burn Treatment** extracted from "The Handbook of Laboratory Safety"

3/23/90

Hydrofluoric Acid Burn Treatment

INTRODUCTION

The treatment of hydrofluoric acid (HF) burns has been in a state of flux in the past, with numerous remedies being tried. The treatment recommended in this chapter is based upon that initiated in 1954 by E. E. Evans, M.D., who was the plant medical director at the Du Pont Chambers Works at that time. It is felt that this method of treatment is more satisfactory than that in prior use.

The approach given here centers around the use of certain high-molecular-weight quaternary ammonium compounds. The treatment consists basically in thorough and immediate flushing with water, followed by soaking in an iced solution of benzalkonium chloride (U.S.P., in a concentration of 0.1 to 0.133%). It is imperative to treat HF burns immediately; any delay may greatly increase the severity of the burn.

The mechanism by which quaternary ammonium compounds alleviate the destructive action of HF has not been studied, but several routes of action have been postulated:

1. The quaternary ammonium nitrogen may exchange ionized chloride for fluoride ion to produce a nonionized fluoride complex in a manner similar to the sequestering action exerted by Versene for calcium and heavy metal ions.
2. The quaternary ammonium compound may directly alter the permeability of tissue cell membranes.
3. As a secondary effect, the compound may control invasive microorganism infection.
4. By reduction of surface tensions, better contact may be promoted between aqueous fluids and tissue components.

The use of cold makes a contribution by constricting lymph and blood vessels so as to delay or retard the passage of fluoride ion.

TREATMENT

Individuals who have had contact with HF should be showered immediately under a drenching spray of water. Contaminated clothing should be removed as rapidly as possible, even while the victim is in the shower. These things should be done at the site of the accident. It is essential that the exposed area be washed with a copious quantity of water for a sufficient period to remove all the HF from the skin or eyes. Speed in removing the patient from a contaminated atmosphere or removing HF from the affected area is of critical importance. After the initial shower, medical assistance should be obtained immediately.

On arrival at the medical facility, the patient is rapidly assessed for shock, and, if it is present, he is treated accordingly. If the patient's over-all condition does not contraindicate, he is given another shower. The affected areas are then soaked in iced aqueous or alcoholic benzalkonium chloride solution in a concentration of 0.1 to 0.133%. If there is a significant delay in securing this solution, ice water or cold tap water may be used temporarily. Aqueous solutions are, of course, preferred in the vicinity of the eyes and mucous membranes; even then, care should be exercised, since benzalkonium chloride may be an eye irritant at the recommended concentration.

When the part to be treated can be positioned in an open vessel, the solution is brought to a depth sufficient to cover the part, and ice cubes are added. It should be

stated that immersion of a part of the body in an ice bath over a prolonged period of time may cause discomfort. Relief is readily obtained by removing the part from the solution every 10 minutes, waiting a few minutes, and then immersing it again.

If immersion is not practical, ice cubes are inserted between layers of gauze to form a compress which is then continually soaked with benzalkonium chloride solution. Towels are placed over the gauze to conserve cold and solution when possible. Experience indicates that these benzalkonium chloride soaks should be used for intervals varying from one to four hours, depending on the appearance and extent of the burn. A precaution for the use of these compresses should be mentioned. The ice should be cubed, not crushed, and should not be under any significant pressure to avoid a reaction similar to freezing or frostbite.

Should blisters form, complete debridement is necessary; all the white raised tissue should be cut away. The use of Elase ointment (fibrinolysin and deoxyribonuclease, combined [Bovine], Parke-Davis & Company) has proved quite effective in keeping the blistered areas free of debris.

After the soaks, HF ointment is applied to the burned area and a compression dressing is applied. The formula for the HF ointment is: 3 ounces of magnesium oxide powder, 4 ounces of heavy mineral oil, and 11 ounces of white petrolatum. Recently A&D ointment (a well-known vitamin ointment) or a topical steroid has frequently been used rather than the HF ointment because HF ointment hardens and is difficult to remove. Whichever ointment is used, it should be applied daily for several days, the exact time depending on the appearance of the burn.

Burns around the fingernails are extremely painful. They may require special treatment, to relieve the pain as well as to prevent infiltration of the HF into the deeper structures with the resulting destruction of tissues which may proceed to bone involvement. The nails may be split from the distal end of the nail bed to allow free drainage. Burns in this area should be soaked in iced benzalkonium chloride solution, as recommended above.

Eye Contact

If liquid HF has entered the eyes or if the eyes have been exposed to high concentrations of the vapor, they should be flushed with large quantities of clean water for 15 minutes. Repeated flushing may be required two or three times at intervals of 15 minutes.

The eyelids should be held apart during the irrigation to ensure contact of the water with all the tissues of the surface of the eyes and lids. Ice compresses should be applied intermittently for at least an hour when not irrigating. Pain can be relieved with two or three drops of 0.5% Pontocaine® solution or ointment. Further treatment can be instituted with one of the many eye solutions containing cortisone. The liquid is preferable to the ointment. If there is much blepharitis, a small amount of an ointment may be spread on the edge of the lid and into both angles. After local treatment, protection of the eye is secured with a compression patch until the inflammation has subsided. Specialist consultation should be obtained immediately if there is any doubt as to the degree of injury or of the professional skill available.

Fume Inhalation

High concentrations of fumes in the respiratory tract may cause burns more critical than those on exposed parts. Immediate removal to an uncontaminated atmosphere and prompt medical attention are required. To prevent the development of severe lung congestion (pulmonary edema), 100% oxygen inhalation should be started as soon as possible. Unpressurized inhalation with a respirator-type mask

may be satisfactory. The use of positive pressure types of apparatus is predicated on the clinical findings.

Oxygen inhalation must be continued as necessary to maintain the normal color of the skin and mucous membranes. It may be advisable, even in borderline cases, to continue oxygen at half-hour intervals for three to four hours. If at the end of this period there are no signs of pulmonary edema, breathing is easy, and the color is good, oxygen may be discontinued.

These patients should be kept under observation for at least 24 to 48 hours. They should be kept warm and at complete rest throughout the treatment. Auxiliary treatment with bronchodilators and systemic steroids may be used as required.

Inflammatory reaction in the mouth, nose, and pharynx is difficult to treat; and, although ice applications may aid in reducing edema, specialized consultation may be necessary. Acute laryngeal edema is a complication which could be disastrous if not recognized. Adequate arrangements for tracheotomy should be incorporated in the treatment procedure, as laryngeal edema is an acute condition which cannot tolerate delay.

ACKNOWLEDGEMENT: This chapter is based on the article "Hydrofluoric Acid Burn Treatment," by C. F. Reinhardt, M.D., W. G. Hume, M.D., A. L. Linch, and J. M. Wetherhold, M.D., which was published in the *American Industrial Hygiene Association Journal, Vol. 27*, pp. 166-171, March-April, 1966. In that article Hyamine®, which is also a quaternary ammonium compound, was recommended for the treatment of HF burns. Because Hyamine® can no longer be obtained for the purpose of treating HF burns, it is now recommended that benzalkonium chloride be used.

This condensed and revised version of the original article is presented through the courtesy of C. F. Reinhardt, M.D., and A. L. Linch.

#2

ODP OPERATIONS SCHEDULE

#2

Leg		Departs Location	Departs Date	Arrives Destination	Arrives Date	Days at Sea *	In Port
130	Ontong Java	Guam	1/24/89	Guam III	3/27/90	62	3/27- 3/31/90
131	Nankai	Guam	4/ 1/90	Pusan S. Korea	6/ 2/90	62	6/ 2- 6/ 6/90
132	Engineering 2	Pusan S. Korea	6/ 7/90	Guam IV	8/ 5/90	59	8/ 5- 8/ 9/90
133	N. E. Australia	Guam	8/10/90	Brisbane	10/11/90	62	10/11-10/15/90
134	Vanuatu	Brisbane	10/16/90	Suva	12/11/90	56	12/11-12/15/90
135	Lau Basin	Suva	12/16/90	Papeete	2/16/91	62	2/16- 2/20/91
136	Engineering 3A*	Papeete	2/21/91	Panama	3/30/91	37	3/30- 4/ 3/91
	Engineering 3B*	Panama	4/ 4/91	San Diego	5/16/91	42	5/16- 5/21/91
137	Sed. Ridges 1	San Diego	5/21/91	Victoria B.C.	7/22/91	62	7/22- 7/26/91
138	E. Equat. Pacific	Victoria	7/27/91	Panama	9/25/91	60	9/25- 9/29/91
139	504B or EPR -1	Panama	9/30/91	Panama	11/29/91	60	11/29-12/ 3/91

* 3A - Hole 504B
* 3B - East Pacific Rise

Revised 1/ 8/90

Leg 136
Engineering IIIA and IIIB
IIIA: 21 February-30 March, 1991; IIIB: 4 April-16 May, 1991

The third engineering test leg will be divided into two parts. Operational objectives of the first part (Engineering IIIA; Leg 136A) are to clear the junk left in Hole 504B during Leg 111. If successful, Hole 504B will then be deepened on Leg 139 (see below); if unsuccessful, the JOIDES Lithosphere Panel has stated it will no longer include deeper drilling at Hole 504B as its highest priority objective for the present round of Pacific drilling. The second part of the third engineering test leg (Engineering IIIB; Leg 136B) will be dedicated to setting bare-rock guidebases at two sites planned for drilling on the East Pacific Rise. The specific locations of these sites have yet to be determined; this decision should be made before the end of 1990, and will be based on recommendations of the East Pacific Rise Detailed Planning Group (EPR-DPG). There will be opportunities for testing developments in drilling and logging during these engineering activities.

Leg 137
Sedimented Ridges I
21 May-22 July, 1991

Sedimented ridges provide an unparalleled opportunity for quantitative studies of the fundamental physical and chemical processes associated with submarine hydrothermal systems. A regionally continuous, relatively impermeable sediment cover over zero-age crust limits the recharge and discharge of hydrothermal fluids, and conductively insulates the underlying crust. Where discharge of fluids does occur, very large hydrothermal sulfide deposits can be produced. The sediments may also preserve a relatively continuous stratigraphic record of magmatic, tectonic, and thermal events, providing clues to the spatial and temporal variability of these processes. The two-leg ODP drilling program (Leg 137 and, tentatively, Leg 144; see below) planned for sedimented ridges will provide information on all of these processes; however, it is aimed primarily at investigating hydrothermal problems. Specifically, the two highest priority objectives are: characterizing the fluid flow and geochemical fluxes within a sediment-dominated hydrothermal system in three dimensions, and investigating the processes involved in the formation of sediment-hosted massive sulfide deposits.

The Sedimented Ridges Detailed Planning Group (SR-DPG) has selected the Middle Valley on the Northern Juan de Fuca Ridge and the Escanaba Trough along the Southern Gorda Ridge as the best locations to study these processes. Leg 137 will drill seven sites in the Middle Valley (MV1-MV7), where regional structure and hydrothermal characteristics are particularly simple, crustal temperatures are high, and massive sulfide deposits are present that are not in direct contact with intrusive or extrusive volcanic rocks. Leg 144 is tentatively scheduled to continue drilling in the Middle Valley as well as occupy sites in the Escanaba Trough (see below). Extensive downhole measurements and fluid sampling programs will be carried out on both cruises.

Leg 138
Eastern Equatorial Pacific
27 July-25 September, 1991

Leg 138 will drill two transects of APC/XCB-cored sites to obtain continuous undisturbed sedimentary sections to study the late Cenozoic paleoceanography of the eastern equatorial Pacific Ocean, an important complement to the transects already drilled in the equatorial Atlantic and the Indian Ocean monsoon region. The proposed sites focus on the evolution of climates when the

earth changed from an essentially non-glacial world to one dominated by extensive glaciation in the high latitudes. The sites will sample sediments under each of the major oceanographic features of the equatorial region: the North Equatorial Current, the South Equatorial Current, North Equatorial Counter Current, the Peru Current extension, the equatorial divergence, and the Costa Rica Dome. The proposed western transect, at 110°W, spans the equatorial current system where it is fully developed, but is far enough east to have relatively high sedimentation rates (1 to 3 cm/k.y.) and good preservation of microfossils. Circulation in the area of the eastern transect, at 90-95°W, is not as well developed and the influence of the Peru Current can still be identified. Sedimentation rates in the transect are higher (2 to 5 cm/k.y.) due to higher biogenic productivity and closer proximity to the continents.

Six sites (WEQ-2 through WEQ-7) are proposed for the western transect; four sites [EEQ-1, EEQ-2, EEQ-3, and either EEQ-4(1) or EEQ-4(2)] and two alternatives [the other of EEQ-4(1) or EEQ-4(2), plus EEQ-5] are proposed for the eastern transect. Plate reconstruction models that trace these sites back through time indicate that these sites remain within present water masses if no oceanographic changes had occurred during the Neogene. Thus, these sites will provide a continuous record of the eastern tropical Pacific current systems throughout the past 8 to 10 million years.

Leg 139
Hole 504B: Penetration of Layer 3
30 September-29 November, 1991

Leg 139 is currently scheduled to drill deeper into the crust at Hole 504B. (In the event that the results of the engineering operations at Hole 504B on Leg 136A show that lower crust cannot be drilled there, this leg will instead conduct coring and logging operations at the East Pacific Rise; see below). A primary objective of JOIDES and ODP is to core as deeply as possible beneath the ocean floor to constrain seismic and petrologic models of the structure and evolution of the oceanic crust. Lithologic/ petrologic interpretations of oceanic Layer 3 are based on seismic profiles and ophiolite analogues. As ophiolites in many cases formed in supra-subduction settings, there is a critical need to sample Layer 3 directly by deep drilling.

Drilling at Hole 504B addresses this objective, as it represents a classic crustal profile and has significant drilling and downhole measurement efforts already invested. Hole 504B has penetrated more than twice as deep into oceanic basement as any other DSDP or ODP section and is the only hole that reaches the sheeted dikes of Layer 2C. An oblique seismic experiment during ODP Leg 111 indicates that Layer 3 gabbros probably lie a few hundred meters below the present total depth of 504B (1287.8 meters into basement), within reach of the drill. Therefore, the primary goal of Leg 139 is to core into Layer 3 and to log continuously the newly-cored section.

* *

For latest 1991 and into 1992, the Planning Committee has tentatively scheduled a number of central and eastern Pacific legs for drilling. These tentative plans include the following:

Legs 140 and 141
Chile Triple Junction
December 1991-March 1992

The region of the Chile Trench between 46°S and 47°S latitude is the site of a ridge-trench collision, where the active Chile Ridge spreading system intersects the Chile Trench in a ridge-trench-trench triple junction involving the South American, Antarctic, and Nazca plates. Drilling in this region is aimed at understanding the processes active in the region of a ridge-trench collision, and to understand the geological expressions of these processes. Objectives include: investigating subsidence, deformation, volcanism, and metamorphism within the collision zone; studying the processes of ophiolite emplacement at the Taitao Ridge; studying the process of "rebuilding" the margin in the wake of the northward-migrating triple junction; and, drilling a transect north of the collision zone to establish conditions in the forearc prior to the collision of the ridge, for comparision with the collision and post-collision transects.

Two legs are currently scheduled for drilling in the Chile Triple Junction region. A total of 15 sites are currently proposed (TJ-1 through TJ-15), arranged in transects both along and across the pre-collision, collision, and post-collision zones. If only one leg gets drilled here, priority will be given to drilling in the actual collision zone, with most or all of the pre-collision and post-collision traverses deferred until a future year.

Leg 142
East Pacific Rise I (or II?)
April-May 1992

Leg 142 is tentatively scheduled as the first of a series of legs of scientific drilling along the East Pacific Rise. If, however, Hole 504B can not be reentered and deepened during Leg 139 (see above), that leg will have conducted operations at the East Pacific Rise EPR-1, and Leg 142 will be the second of the series, namely EPR-II. Scientific objectives for drilling at the axis of the fast-spreading East Pacific Rise include: (1) to demonstrate the presence of a reaction zone above an axial magma chamber where fluids are in contact with high-temperature rocks and characterize the chemical and physical nature of the water-rock interaction; (2) to establish the physical and chemical characteristics of the earliest phase of alteration acting upon the newly formed crust by hydrothermal circulation; (3) to provide actual samples of the rock that characterizes geophysical horizons that can be mapped regionally through remote seismic and/or electrical methods; (4) to characterize the physical and compositional structure of young oceanic crust; and (5) to use the relative chronology provided by the drilled sequences to distinguish true temporal variations in magma composition from spatial variations at the ridge crest, and conduct long-term experiments to determine the temporal variation in the physical state of the crust and the chemistry of circulating fluids.

Two areas on the East Pacific Rise are currently under consideration for drilling, one near 9°40'N and the other near 12°50'N. An East Pacific Rise Detailed Planning Group has been established to prioritize between these two regions, and to make recommendations regarding drilling plans and downhole measurements. Regardless of which region ultimately gets drilled, the drilling strategy envisioned at this time requires a suite of eight holes, located at the axis of the ridge and in transects both along and across the ridge segment. Only a portion of this program can be completed

in the time available during this phase of central and eastern Pacific drilling; in order to achieve the full East Pacific Rise drilling program, four to six legs may be ultimately required during a ten-year program.

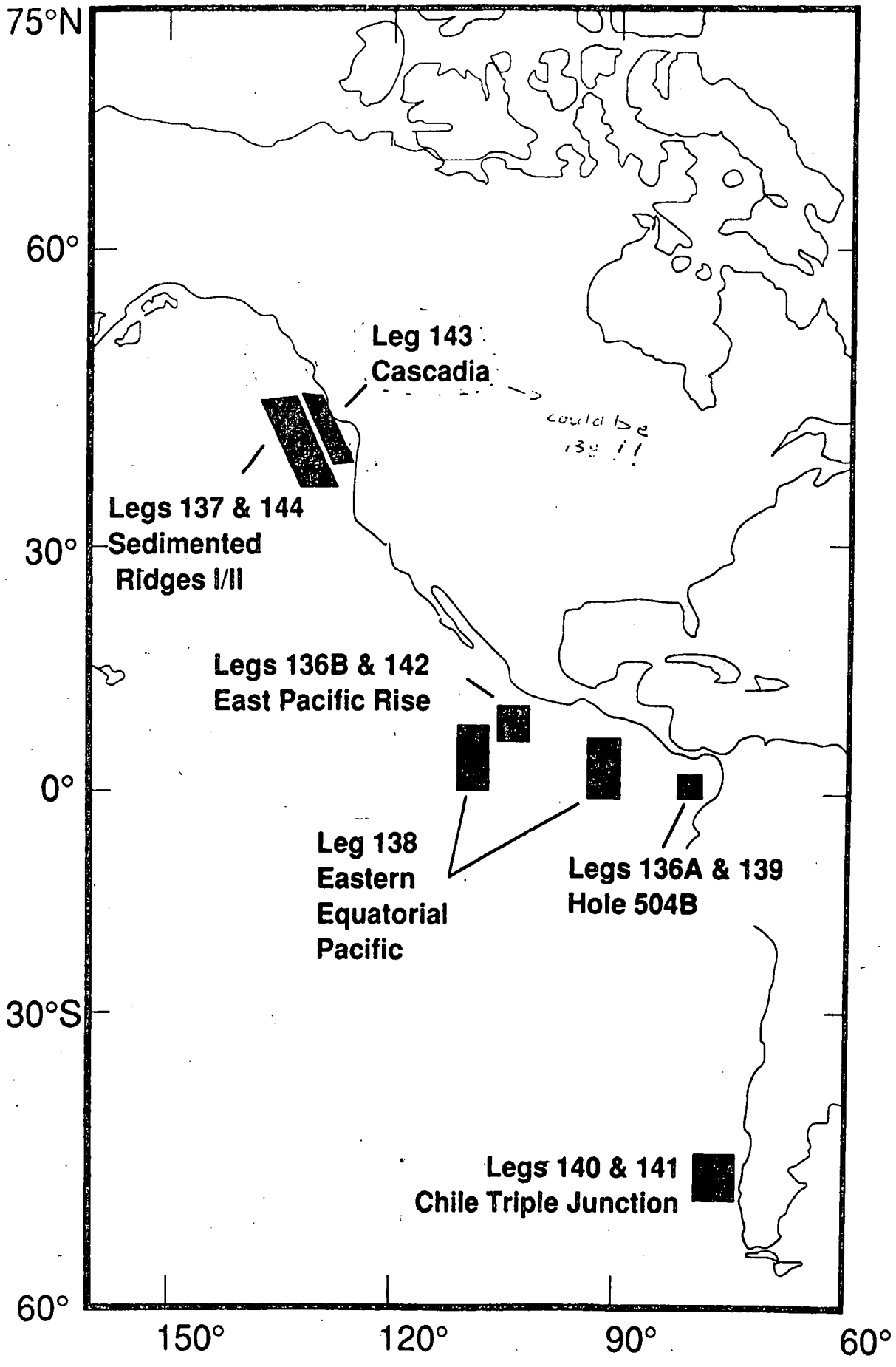
Leg 143
Cascadia Accretionary Prism I
June-July 1992

Detrital accretionary complexes, commonly tens of km thick, are a critically important component of continental geology. Understanding their development, in all its aspects, is a fundamental goal of geological science which contributes to a wide range of objectives ranging from mineral and energy resource exploration to development of earthquake risk and hazard evaluation. The structure of accretionary wedges varies considerably. So also so the nature of subduction, plate kinematics, the composition of sedimentary and crustal components, and the role of fluids.

The recently established Cascadia Detailed Planning Group (C-DPG) has been charged with examining the competing Cascadia accretionary prism drilling proposals (Oregon margin versus Vancouver Island margin) and providing a prioritized plan for drilling. What sites are drilled during Leg 143 will be based on the report of their deliberations. Primary drilling objectives along the Oregon margin are to study present and past fluid explusion processes, pathways, and effects, as well as to relate these to specific structural and stratigraphic settings. The primary drilling objective along the Vancouver Island margin is to reach the thickened decollement zone underlying the frontal part of the Vancouver accretionary wedge for the purpose of determining the nature of the deformation processes operating there, and the physical, chemical, and stratigraphic composition of the involved beds.

Leg 144
Sedimented Ridges II
August-September 1992

This second leg of drilling in the Juan de Fuca area will focus on understanding sulfide mineralization and deeper hydrothermal circulation (see Leg 137, above). Three sites are currently proposed for this leg: two in the Escanaba Trough (ET-1 and ET-2) and one in the Middle Valley (MV-2). In addition, one of the Middle Valley sites begun on Leg 137 will be deepened about 500 m into basement. The Escanaba Trough sites will address questions about sediment-hosted sulfide deposits that are spatially associated with and probably coeval with volcanic intrusions and flows. This leg is scheduled at this time to allow maximum time to develop the tools needed to drill and log under high-temperature conditions and to provide time for proper evaluation of the Leg 137 drilling, including hydrogeologic modeling, to determine the best placement of the Leg 144 sites.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Leg 143
Cascadia
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Legs 137 & 144
Sedimented
Ridges I/II
Legs 136B & 142
East Pacific Rise
Leg 138
Eastern
Equatorial
Pacific
Legs 136A & 139
Hole 504B
Legs 140 & 141
Chile Triple Junction

#3

ODP PRESSURE CORE SAMPLER (PCS)

compared to #3

DSDP PRESSURE CORE BARREL (PCB)

FEATURE	PCS	PCB
Working Pressure	680 bar (10,000 psi)	340 bar (5,000 psi)
Actuation	Hydraulic	Mechanical
Pressurized Core Length	.86 meter	6 meters
Unpressuried Core Length	N/A	1.8 meters
BHA Compatability	APC/XCB/NCB	RCB

PCS DEVELOPMENT PLAN

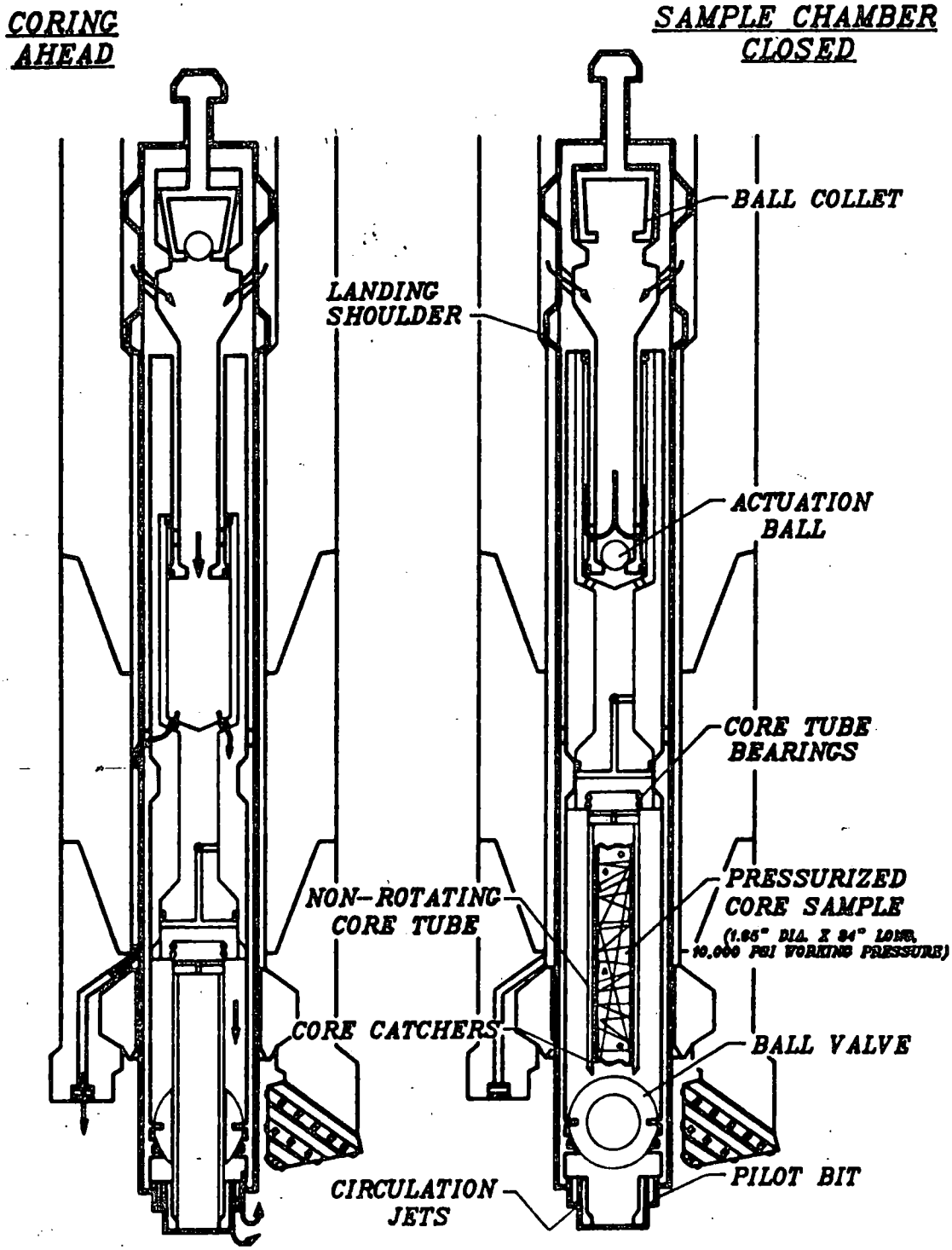
PCS PHASE I

Gas and water samples at near insitu pressure.
Unpressurized core sample.

PCS PHASE II

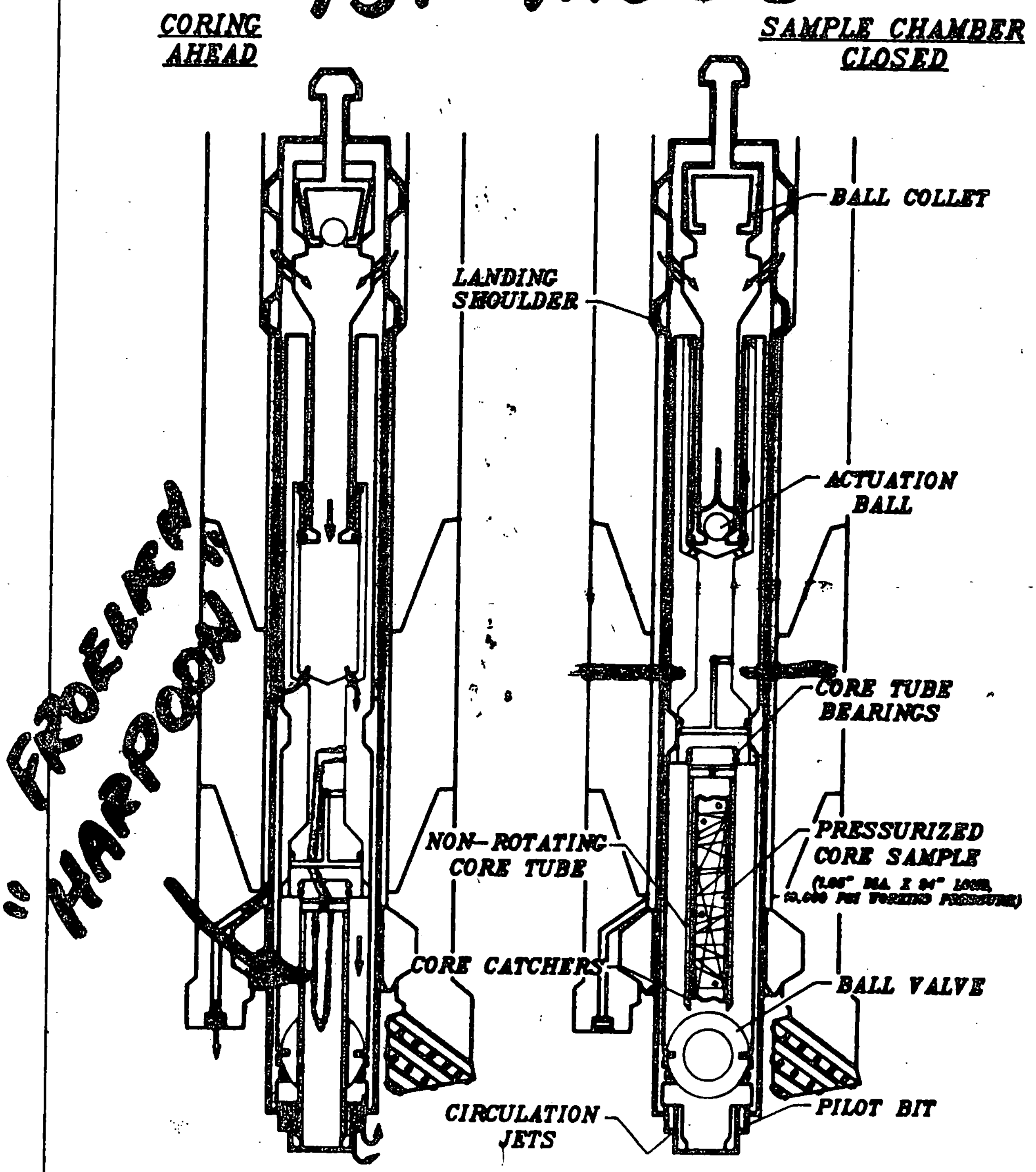
Gas and water samples at near insitu pressure.
Ability to transfer core to pressurized test chamber for sampling under near insitu pressure.

PRESSURE CORE SAMPLER (PCS)
OPERATING SCHEMATIC



PRESSURE CORE SAMPLER (PCS)
OPERATING SCHEMATIC

131 MODs



#4

Exerpt from "ENGINEERING DEVELOPMENT STATUS REPORT
November 1989 (WHOI) PCOM MEETING

SONIC CORE MONITOR (SCM)

The SCM was deployed with the Extended Core Barrel (XCB) eight times during Leg 127 and four times on Leg 128. Of those twelve runs seven were successful in measuring and recording actual downhole core entry data. The five misruns were caused by a variety of problems: pressure seal leakage, battery failure, broken connector wire, and operator programming error. Post-cruise analysis of the seven successful runs showed that all succeeded in measuring core entry against time, and four runs produced data which is considered completely reliable and in conformance with on-deck measurements of the core as recovered. Thus, the feasibility of the device for measuring core entry has been demonstrated.

Phase I testing will continue during Leg 130 where numerous XCB coring deployment opportunities are anticipated. The Leg 130 deployments will focus on testing different types of sonic targets which ride on top of the incoming core, evaluating upgraded input-output software to reduce the chances of operator error, testing improved transducer pulsing options, and optimizing test protocol to minimize data ambiguity.

The prototype hardware will then be modified to create Phase II hardware packaged into the RCB coring system. Features to enable hard rock orientation will be added including tungsten carbide core scribers and a magnetic multishot system. This combination will be ready for initial field testing on legs 133 or 134.

A phase III development is envisioned which will incorporate an MWD pulsar unit to enable real-time transmission of core entry data to the driller.

DRILLING/STRADDLE PACKER

The TAM Straddle Packer (TSP) now resides within ODP's domain of responsibility. ODP part numbers are being assigned to the assemblies and individual parts for inventory tracking. A complete operations manual is being written for shipboard use in assembly, maintenance and deployment of the TSP.

New updated TAM Drilling Packer (TDP) operation manuals have been sent to the ship for use beginning with Leg 129. A new "go-devil" has been designed for use with the TDP. The new go-devil will allow the packer to be set with the inflation pressure locked in the packer element, without pulsing the formation. Upon venting of the drill pipe pressure (after setting) the go-devil will automatically open ports to below the packer, allowing for porosity/permeability tests to be carried out.

The new go-devil will allow deflation of the TDP when a 1/4" brass ball is dropped down the drill string onto the go-devil deflate sleeve. Pressure is then applied via the drill string to shift the deflate sleeve, opening the inflation ports and allowing the packer element to deflate.

By using a drop ball rather than a go-devil to deflate the TDP, the drill string can remain closed and the heave compensator engaged at all times. This will eliminate the excessive stress which can be applied to the drill string and/or packer when the drill string is hung off at the rig floor (no longer heave compensated) and opened to drop a deflation go-devil.

The new TDP go-devil should be ready for operational use on Leg 131 (Nankai, April/May 1990).

An ODP Summary Statement on packers is currently in preparation. It will describe, in detail, the design philosophy and historical use of the TDP and TSP. Also included in the Summary Statement will be ODP engineering and drilling operations recommendations for the use and deployment of the packers from the JOIDES Resolution.

ADVANCED PISTON CORER - DESIGN UPGRADE

The upgraded (APC-129) version of the hydraulic piston corer has been withheld from shipment to Leg 129. No piston coring work is planned during the Old Pacific drilling program. Instead, the design is being modified to overcome several potential problems identified at the end of the design phase. A lock-open device will be added to prevent partial collapse of the telescoped elements during a washover procedure to save a stuck core barrel. The lock-open feature will keep flow passages open which is essential in a successful washover operation. It will also enable the anti-spiral key to exit the groove at the end of the full stroke of the core barrel so that rotation of the drill string will be decoupled from the stuck APC components. This feature prevents failure of piston rod connections in torsion during washover and eliminates the need for a more complex thrust bearing assembly at the landing shoulder as originally planned.

The new "heavy-duty" APC will be ready for Leg 130 (Ontong Java, January-March '90) where the drilling plans call for significant piston coring operations.

APC BREAKAWAY PISTON HEAD

A Breakaway Piston Head (BPH) for use with the Advanced Piston Corer (APC) has been under development at ODP for several months on a low priority basis. The BPH is intended to prevent core flow-in when incomplete stroke of the APC occurs. A common scenario where the BPH is needed occurs when coring with the APC in sand-dominated formations. The limited compressibility of the sandy or granular material often inhibits the penetration of the piston core barrel and results in a partial stroke. The first step in retrieval is to pull up with the drill pipe. As a result, the APC unit is mechanically stroked until full travel is reached. In most cases a significant portion of "core" is produced by flowed-in material which can be very difficult to positively identify and differentiate from "real" core on deck, even after the core liner is split. In other cases the suction on top of the core caused by continued piston head retraction is enough to implode the plastic core liner resulting in serious core disturbance or loss.

The BPH is designed to prevent all of the above undesirable effects. Modeled after oceanographic piston corer breakaway heads, the BPH will "breakaway" and separate into two halves when "suction" between the piston head and the top of the core is sensed. This will allow flow past the piston head seals and prevent the suction which causes the undesirable flow-in. The current design is a modification of a BPH field tested during Leg 96 of DSDP which was functional in deck tests but apparently not downhole. The current BPH will be lab-tested in December and sent to the ship for initial field tests on Leg 130 (Ontong Java,

February/March 1990). It is designed to be interchangeable with the standard, solid piston head and does not require modifications or special operating procedures for the APC.

PRESSURE CORE SAMPLER (PCS)

Phase I of the PCS development was completed with the successful deployment of a prototype tool during Leg 124E (Engineering Leg I). The Phase I tool proved the original concept which utilized hydraulic actuation to close the pressure chamber. The Phase I tool is limited to recovering a core at near insitu pressure (hydrostatic) and allowing for gas and fluid sampling under pressure. The core sample itself can not be accessed under pressure.

The Phase I downhole PCS tool will be available for use on leg 131 (Nankai, April/May 1990).

Phase II in the development of the PCS will be a very intensive engineering endeavor. Phase II will allow for transferring the core sample from the downhole PCS tool into a temperature and pressure controlled lab chamber without requiring pressure bleed off. The lab chamber will be designed to allow access to the pressurized core sample for yet undetermined testing.

Development on the PCS project has been on a low priority "hold" basis while awaiting scientific design input for Phase II. The Sedimentary and Geochemical Processes Panel (SGPP) has recently shown an interest in the continued development of the PCS and as such the desired input data may soon be forthcoming. A PCS design package has been prepared and sent to the SGPP for review and comment.

VIBRA-PERCUSSIVE CORING (VPC)

The Ocean Drilling Program (ODP) has entered into a contract with Novatek based in Salt Lake City, Utah to develop a wireline retrievable coring tool capable of imparting a high frequency vibratory or percussive force onto an Advanced Piston Corer (APC) core barrel.

This development is a transfer of technology to sediment coring from previous work undertaken by Novatek in designing a mud actuated rotary percussion tool for hard rock drilling.

Conceptual design of the new tool has been completed and based on the concepts a mathematical model detailing piston motion and actuating fluid flows has been constructed to determine the operational capacity of the tool.

Interfacing between ODP and Novatek personnel has commenced to determine the design details and assembly requirements for operation with the existing APC subassembly. The work to date has constituted a preliminary design phase. A pre-prototype design is scheduled for completion by end early December 1990 after which two to three months of manufacture and preliminary testing will take place.

The prototype "vibration enhanced" APC or vibracorer (VPC) is seen as a critical segment of the overall effort to develop an operational wireline retrievable coring system for use in coring unconsolidated formations. The prototype VPC is projected for sea trials on leg 134 (Vanuatu, October/November 1990).