

Micropaleontological Reference Centers (MRC) History

Initiation of MRCs:

1975 May 2, John Saunders letter to W. (Bill) Riedel, Curator Deep Sea Drilling Project (DSDP) suggesting repositories for important DSDP Core Material. "*When reviewing the large amount of important biostratigraphic and taxonomic micropaleontological work that has been published to date in the DSDP Initial Volumes, it has begun to worry me that comparative material is not easily available to workers, particularly those living outside the United States. There is a very real need to have properly documented reference a very available for published faunas and floras in the way that one tries to do for type localities erected at surface locations.....*"

1975 - A proposal was made by Saunders and Riedel to create a number of centers where important micropaleontological material from DSDP and later Ocean Drilling Program (ODP) could be made available for study.

1975 July 30, A.P. Crary, Division Director of Earth Sciences, National Science Foundation approves Mel Peterson's request to make the **Natural History Museum in Basel** the first Reference Center.

As a result of discussions in the academic paleontological community and with oil company paleontologists, the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) has recommended that five reference collections be established in order that researchers may examine assemblages from stratigraphically, taxonomically or paleoecologically important DSDP cores (from document dated 1.6.1976 fr. Riedel to McLerran).

The purpose of the MRCs will be to make prepared microfossils available to investigators for examination but not (under special circumstances) for removal from the institution housing the collection. -- As the reference collections grow, an attempt will be made to maintain appropriately balanced coverage in terms of geographic and stratigraphic spread of the samples and groups of microfossils included (from document dated 7.9.1976 to Crary via McLerran from Peterson).

1975 - A letter from Peterson to D.H. Benson gives the following insight: "In an August 1975 letter from DSDP curator W. Riedel to the then Chairman of your Department of Paleobiology, R.E. Grant, it was pointed out that each of the five institutions"(N. America, Western Europe, USSR, NW Pacific region and Australia/New Zealand) housing a reference collection of DSDP microfossils "would receive and treat a share of the {raw} sediment samples of sufficient size to make five copies of preparations, so that four could be distributed to other institutions."

When the Smithsonian indicated that it could not fulfill such an obligation, an alternative location for the North American collection was discussed by the JOIDES Panel on Stratigraphic Correlation, which resulted in a statement in your minutes of the meeting of 18 May, 1977 to the effect that "The alternative seems to house the second reference collection as DSDP Headquarters at **Scripps Institution of Oceanography**.

1975 - Texas A&M University application to house one of the DSDP reference collections.

1976 - First request for MRC reference material approved by the DSDP curator Riedel for 20 foraminiferan samples to be forwarded to Saunders on November 17, 1976.

1976 - First mention of Reference Centers in the Initial Reports of the DSDP, vol. 36, in the sample distribution policy:

"As a separate and special category, samples will be distributed for the purpose of establishing up to five reference centers where paleontologic materials will be available for reference and comparison purposes. The first of these reference centers has been approved at Basel, Switzerland".

1978 - The suggestion that the second reference collection would be housed at the DSDP headquarters at **Scripps Institution of Oceanography** was brought to the Planning Committee meeting of May 2, 1978. The motion was approved by a vote of 11 for and 0 against and 1 abstention. On May 5, 1978, Scripps' Director authorized the expenditure of University (not DSDP) funds to make the necessary microfossil preparations. Since then, Scripps has commenced making slides for calcareous nannofossils and lithology, with the anticipation that they and the other components of the North American reference collection will be housed in close proximity to the West Coast repository of DSDP cores. **U.S. West Coast MRC at Scripps Institution of Oceanography** established (fully operational 1990).

1978 - Riedel visits candidate institutions in Japan to choose a suitable institution for the reference collection.

1979 - Takayanagi, Tohoku University of Sendai, on behalf of the Japanese Scientific Advisory Board for the International Phase of Ocean Drilling (IPOD) reports that the board has given careful consideration to the matter of which microfossil group to prepare for the reference collection, diatoms have been selected, and the responsible institution will eventually be the **National Science Museum in Tokyo**.

1979 - Graham Jenkins submits a proposal for a reference collection of DSDP microfossils to be located in **New Zealand**.

1980 - Inquiry and proposal by Norcott Hornibrook, Chief Paleontologist New Zealand Geological Survey to become a reference center sent to Riedel, DSDP Curator.

1980-81 Status of individual Centers:

Scripps Institution: formal MRC designation 1980. Processing Nannofossils and Lithologic smear slides. Curator Riedel.

Lamont Institution: situation unclear since change of director. Expected to process radiolarian samples.

Smithsonian Institution: formally designated in 1981. Curator R. Cifelli.

Natural History Museum, Basel: formally designated 1975. Processing foraminiferal samples. Curator Saunders.

New Zealand Geological Survey, Lower Hutt: formally designated 1981. Processing some additional foraminiferal samples. Curator N. de B. Hornibrook.

Japan: formally designated in 1981. Initial arrangements being made on the behalf of the Japanese IPOD organization by Takayanagi of Tohoku University, Sendai. Processing diatom samples.

1981 U.S.S.R.: there were conflicting indications as to whether the collection is to be housed in the Institute of the Lithosphere, or the Institute of Paleontology, both in Moscow. Also it is not clear as to whether the curator will be J.A. Basov or V. Krasheninnikov.

1981 - Martin Buzas, Chairman of the Department of Paleobiology at the Smithsonian Institution accepts an invitation to become one of the repositories for the reference collections. The Smithsonian is not required to participate in the preparation of microfossils, but will assume the responsibilities of curating the collection and making it available for examination by visitors.

1981 - Ivan Basov at the **Institute of the Lithosphere, U.S.S.R. Academy of Sciences** is prepared to proceed with participation as a repository for a reference collection of DSDP microfossils.

1981-1982 The original MRC concept for five reference centers was raised to *eight*, making the size of the original sample set inadequate for splitting beyond four. Saunders reviewed the prepared samples in Basel and sent to Riedel in November 1981 a sample request for 54 samples from Legs 1-6. These were resampled as close to the originals as possible and were sent to Hornibrook in New Zealand to prepare for distribution to the new MRCs. By February, 1982 foraminifer samples were sent to New Zealand reference center.

1983 - The first batch of diatom samples are sent to Yoshihiro Tanimura, at the National Science Museum in Tokyo for preparation and distribution to the reference centers.

1985 - No agreement on which institution is the most suitable one to house the reference collection has yet been reached in Russia.

1986 - December, the first batch of foraminiferal separations received by Basov for the reference collection in Russia. Unfortunately the Russian participation in DSDP ceased and negotiations are progressing to join ODP. Completion of MRC at a stand still.

1987 - 680 diatom slides have been distributed to the reference centers.

1990 - Annika Sanfilippo applies to the Joint Oceanographic Institutions (JOI) for funds to process radiolarian samples for the Reference centers. Funding is received for 1990-1993 to process radiolarians from DSDP Legs 1 through 96.

1993 - MRC Workshop - Curation and database management, Basel 7-9 June, 1993. Hosted by Natural History Museum Basel/ Saunders. Results and recommendations of the meeting were forwarded to the Information Handling Panel (IHP).

Major recommendations to IHP: Formalization of a paleontological sub-committee to oversee shipboard paleontological staffing, quality of paleontological and biostratigraphical data collected from each cruise, development of MRC database with image library, MRC advertisement to promote visitation and usage of centers.

Five curators (Brian Huber, Rusti Lotti, Sanfilippo, Saunders, Tanimura + various visitors and presenters) reported that commonly only one fossil group per center has been consulted, and the fossil group consulted depends on the interest of the expertise of the curator. Full potential of a center will only be reached with active rather than passive curation. The possibility exists that not all fossil groups making up one of the eight collections need be kept physically in the same institution. General feeling, particularly among curators doing the processing of the fossil groups, was that it would be very difficult to increase the number of centers in existence above the 8 already running. The alternative is to maintain the present control system but that these centers might sub-loan one or more of the fossil groups. In this case there has to be a firm commitment by the sub-centers to provide financial or other support in a way that the main centers do. Loan to a sub-center should be relatively short term one depending on the continuing presence of a specialist interest group. A period of 5 years is suggested for an initial loan and this depends on submission of yearly reports to the main center. Formal agreements should be made with each sub-loan center.

Stratigraphic Panel within JOIDES (no longer in existence) - Information Handling or appropriate thematic panels to oversee the completeness of coverage of biostratigraphic information from the various oceans. One way to keep track of the missing intervals is by the creation of atlases of the type first attempted by Isabella Premoli Silva et al. Great advance in technology make such compilations much easier. Computer generated maps for indexing MRC material were demonstrated at the workshop.

1993/1994 - Huber takes over from Saunders as lead curator for the MRCs.

1994 - Saunders announces that his position as Curator for Micropaleontology and Supervisor of the Micropaleontological Reference Center in the Geological Department of the Natural History Museum in Basel, Switzerland has been filled by Michael Knappertsbusch.

1994 - Funding for the preparation of radiolarian slides in Japan will commence April 1, 1994. Utsunomiya University takes responsibility for preparation of the MRC radiolarian slides (Leg 110-) from June 1994 after consultation between ODP Japan office, MRC Tokyo and Japanese radiolarian community.

1994 - Saunders, Sanfilippo and Huber used ODP published and in-press papers as a basis for selecting levels to be sampled from Legs 132-144 for the MRCs (182 foram samples, 240 rads, 523 nannos, 255 diatoms, 631 lithologic).

1994 - Saunders, Sanfilippo & Huber prepare "Micropaleontological Reference Center Curatorial Guidelines " as a suggested means of placing the MRCs in institutions that would increase their accessibility to currently interested researchers, while ensuring their security.

In essence, it was suggested that there be (A) three complete sets of preparations on permanent loan to museums in Washington, D.C., Tokyo and Basel, and a set at ODP headquarters at College Station, (B) sets, not necessarily complete, on semipermanent loan to several institutions which provide geographically convenient access to researchers who would actively use the materials, and (C) subloans or preparations of one or more of the microfossil groups to satellite institutions where groups of specialists are actively pursuing research on those microfossils. Functions, inter-relations and co-ordination mechanisms for the proposed constellation of reference centers are spelled out in Appendix C. Some details remain to be worked out.

1994 - Agreement to establish **Nebraska subloan MRC** with sample processing to start at the end of 1994. Moscow MRC - no action to change status. Advertise Lamont foraminifera and radiolarians to make these collections available to other institutions. Smithsonian - IHP needs to endorse change of status to make MRC collections fully accessioned by Smithsonian. **Gulf Coast** - All MRC samples have been moved from Dept. Oceanography to ODP. John Firth oversees the MRC collections and will oversee transfer of foraminiferans to vials. **Satellite MRC California Academy of Sciences** - IHP needs to endorse move of diatom collections from Scripps Institute of Oceanography (SIO). Basel - no new curator yet. Samples through Leg 138 prepared, will be distributed within next two months.

1994 - Proposal for relocation of the ODP calcareous nannofossil and diatom reference collections to the University of Nebraska, Department of Geology/State Natural History Museum.

1994 - **California Academy of Sciences (CAS)** request to be a sub-loan repository for an MRC diatom collection. CAS is a natural history museum, with a long record of conferring on its materials a high level of care, great number of visitors, developing an image storage and retrieval system tied to the database system over the Internet as well as a database of diatom literature linked to the collection database, so that material and publications resulting from it are related.

1995 - DSDP samples from Legs 40 through ODP Leg 131 sent to Department of Geology, University of Nebraska/Dave Watkins for preparation of lithologic smear slides and nannofossil slides for eight MRCs.

1995 - transfer of the West Coast MRC diatom collection from Scripps Institution of Oceanography to the California Academy of Sciences/John Kociolek.

1995 - First *MRC home page* reside on the National Geophysical Data Center (NGDC) web site.

1996 - JOI established a new publications committee to oversee the transition to electronic publication. Aprovevement of a proposals to develop a micropaleo database and age modelling tool for the MRCs by Swiss National Fonds (collaboration of MRC Basel with ETH Zürich, where this kind of research tool has been developed since 1990/91 by Dave Lazarus (Neptune

database, age modelling software Age Depth Plot and Age Maker - ADP and AM).

1996 - September IHP meeting noted Wolfgang Berger's objection to moving the MRC foraminiferan collection housed at Scripps Institution of Oceanography to Brazil. IHP again supports its decision to permit the move of the foraminiferan collection to Brazil. (Diatoms and forams partial in Moscow. Remainders at the Smithsonian. IHP recommends that Huber sends the diatoms but hold the foraminiferans until some agreement is reached for providing the necessary vials. A suggestion is made to invite Basov to next meeting. Radiolarians, nannofossils and lithologic smear slides have never been sent to Russia - Huber is to advertise these collections for subloan.

1996 - University of Bremen established as Subloan Satellite MRC with the promise to take over the production of 10,000 smear slides.

1997 - US West Coast, Scripps Institution of Oceanography MRC collection of foraminifera shipped to the **Federal University of Rio de Janeiro, Brazil** (Aristoteles de Moraes Rios-Netto), with the promise that they would contribute to improving the foraminifer database.

1997-1999 continuation of age modelling effort as a preparation to better oversee MRC sampling density and gaps in coverage.

1997-1998 - Review of MRC Sub-loan proposals (Radiolarians - Lazarus; Calcareous nannofossils - Mutterlose, Bochum Univ., Germany; Laurie, Australian Geol. Survey, Canberra, Australia; Monechi, Museum of Geology and Paleontology, Florence, Italy; Villa, University of Parma, Italy; Hale, ODP Bremen Core Repository and Cepek, Bremen University; Wise and Janecek, Antarctic Marine Geology and Research Facility, Florida State Univ., Tallahassee, Florida; Young, Natural History Museum London). Reviewers: Huber, Sanfilippo, Knappertsbusch and Watkins, and Firth (for nannos only).

1998 - MRC radiolarian collection originally intended for Russia shipped to **Museum of Natural History, Berlin** (Radiolarian Satellite MRC)/David Lazarus; MRC nannofossil collection originally intended for Russia shipped to **Natural History Museum, London** (Nannofossil satellite MRC)/Jeremy Young, and the US West Coast, Scripps Institution of Oceanography MRC collection of nannofossils shipped to **University of Parma, Italy**/Giuliana Villa (Italian Nannofossil satellite MRC). Article on MRCs appears: Knappertsbusch et al., 1998. Micropaleontological Reference Centers, Rev. Espanola de Micropaleontologia 30(3): 331-336.

1999 - MRC curatorial workshop in Washington: Huber announces that he will rotate off as lead MRC curator. Proposes Knappertsbusch (Basel) as successor, the Scientific Measurements Panel (SciMP) approves. MRC sample shipments to Russia discontinue until situation is more clear in Moscow. Changes to MRC policy to permit loan of samples for purpose of research or advanced education. Setup of new priorities in MRC activities in order to identify stratigraphic and geographic gaps of MRC sample coverage. Call for more effort on databases and chronostratigraphic databases/age modelling.

1999 - Yoshiaki Aita, **Utsunomiya University** applies to become a **radiolarian satellite Loan MRC**. Approval by SciMP and formal announcement on 25 July 2000, with a promise to prepare a total of 100-200 radiolarian slides per year. Together with a slide making effort in Berlin of similar scope, the large backlog of radiolarian samples (>1,000) begins finally to be reduced.

2000 - Knappertsbusch takes over as lead MRC curator.

2000 - June 7-9, MRC curatorial sampling meeting in Bremen. Intense working on nannofossil and radiolarian sampling backlog by concerted effort (Bremen, Berlin, London and Utsunomiya). New sampling from Legs 165, 171B, 177, 178, 181, and additional sampling from early DSDP cores to provide reference materials to the Kennett & Srinivasan Atlas of Neogene planktic foraminifera.

2001 - October 1-3, MRC curatorial meeting in Berlin, Ken MacLeod, ODP panel advisory and Emmanuel Soeding, Ocean Stratigraphic Drilling Network (OSDN) guests. With respect to the winding down of the ODP and the transition from ODP into IODP (Integrated Ocean Drilling Program) in 2003 the MRC curatorial party thinks how to move the MRC program into the plans of IODP. MRC curators concluded on the need for continuation of the MRC program, and prepared an endorsement to SciMP. In addition, the MRC curatorial party emphasised more effort on database development (databases for sample overview available via the web, stratigraphic tools, micropaleontological image databases for educational/training purposes), and that the effort of the Neptune/OSDN databases should be tied with the new JANUS database developments, that are planned by Japan Science and Technology Agency (JAMSTEC).

2002 - Despite heroic efforts by Knappertsbusch (Basel) and Cinzia Cervato (U. Maine; now head of CHRONOS) the volunteer based numeric age-modeling effort can't keep up with new samples from holes drilled by the ongoing ODP program. Lazarus develops and with help of several other curators populates first full MRC database with alternate, lower resolution 'text' type age entries (e.g. 'Mio/M'). The first overview of MRC collections by group, age and geography are presented at that year's London workshop. This year and the next initial discussions are held with interim panel members on MRC continuance into IODP. (The age modelling work continues and contributes to an important update of Neptune by the CHRONOS project).

2004 - the Scientific Measurements Panel (SciMP, now Science and Technology Panel, STP) funds a joint MRC and ad-hoc IODP Paleo Advisory Group workshop to clarify paleontology planning into IODP. The meeting is hosted by Huber, Smithsonian, March 2004. Several major decisions come out of this meeting. It is recommended that the MRCs continue into IODP. Routine sampling of new cores should end, but selective sampling to improve the uniformity of coverage should continue. At least one of the MRC slide sets for each fossil group should be given permanent status at a major taxonomic archive to allow MRCs to be used as types for new species descriptions. (MRC slides are currently considered National Science Foundation (NSF) property and only on loan to the MRC host institutions). Funds should be obtained to prepare the backlog of samples. The MRCs should consider

developing plans for more active involvement in teaching and public outreach. In addition to these MRC specific conclusions, the workshop identifies several long-term needs for paleontologic data in IODP. These include development of (digital) taxonomic dictionaries (DTDs) and management of taxonomic name lists in databases to provide coherent, high quality new data and compatibility with existing previously collected paleontology data. A broader need to maintain and update age models for previously drilled, older 'legacy' holes is also identified. Several possible community resources are identified that can help with these efforts including CHRONOS and the MRCs.

2005 - Lazarus assumes the role of lead curator in May. A detailed report summarizing MRC history, capability and future work in IODP is prepared by Lazarus and presented by Noritoshi Suzuki to the July STP panel meeting in Bremen. The MRCs propose to complete their sample processing and to act as a coordinating agency for the development, by the external community, of DTDs for use in IODP. STP approves and passes this recommendation on to the Science Planning Committee (SPC).

2006 - After additional rounds of clarification and much support by several IODP panel members, SPC approves this plan and asks IODP Management International (IODP-MI) to implement. In preparation for this new activity the MRC database and website are updated, and a short overview article on the MRCs is written for IODP's *Scientific Drilling* news magazine.