ECORD

European Consortium for Ocean Research Drilling

Newsletter #17

October 2011

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IODP
INTEGRATED OCEAN DRILLING PROGRAM

Mireille Perrin

Message from the Council Chair

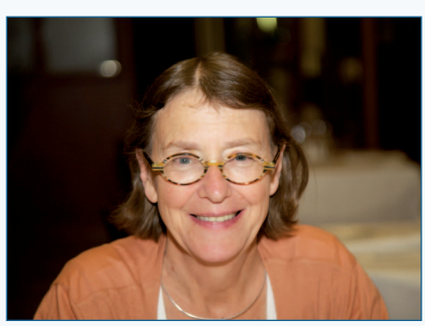
After the meeting of the International Working Group + (IWG+), in Amsterdam, agreements were reached on all points and the future of the new programme seemed pretty straightforward as outlined in the last issue of the ECORD Newsletter. However, in August, a letter from the National Science Foundation (NSF) to the IODP community was a bolt from the blue, followed by an article entitled "U.S. to Leave Consortium and Go It Alone After 2013" published in *Science* (333, p.1079, 2011). This immediately raised many questions within the community and a general feeling arose that it could well be the end of the international programme and a major step backwards for ocean drilling.

The very difficult financial situation in an unstable global economy that is faced by all major partners of IODP implies that the current architecture and funding model for IODP cannot be maintained much longer. However, the most important message to send to the community is that discussions between the different partners of IODP (NSF, MEXT, ECORD, ANZIC) have not stopped even if they have sometimes been a little unclear. There is very strong agreement about the utmost need to maintain the international essence of IODP with its unique common Science Advisory Structure and integrated activities (database, core repositories, etc.). I am therefore confident that we will soon agree business models for the three platform providers (NSF, MEXT and ECORD), which will be acceptable to the funding agencies and will maintain the spirit of IODP. As often happens when something which seems really negative occurs, there is a positive aspect. In our case I think it will be the added flexibility to the programme.

The next ECORD Council meeting will take place in Granada, from November 2 to 3, 2011. After that meeting, discussions with representatives from NSF and MEXT are planned. We are all aiming to reach agreement on a final model at the following IWG+ meeting, which will be held in Goa in January 2012.

Mireille Perrin, ECORD Council Chair, from October 1, 2010 to September 30, 2011
http://www.ecord.org/c/council.php

Catherine Mével will be leaving her role as Director of the ECORD Managing Agency (EMA) at the end of this year. As I was around 10 years ago when IODP was getting started and was instrumental in bringing Catherine onboard, I have been asked to write a few words of thanks on behalf of the community. It is of course a pleasure to do so!



We are all scientists and some have strayed more into the management role than others. However, I stress first of all the role that Catherine has played as a marine geologist. She started her career working on Alpine ophiolites, more or less as some of the first ODP legs were being planned to drill into the mid-oceanic ridge. She has undertaken a number of pioneering research projects, with a common theme being the creation of oceanic crust and more specifically the role of the hydration of the mantle and formation of serpentinites in the process.

Her first ocean drilling leg was with DSDP drilling the Mid Atlantic Ridge in 1977 on Leg 53, where she was exposed for the first time to the international community. It was there that she learned her English, also her ability to work as a team member and she has always been a staunch supporter of the "floating lab" concept of ODP/IODP as she benefited so much from it. She has participated on two ODP legs and was Co-chief Scientist on Leg 147 Hess Deep Rift Valley. For a couple of years, Catherine also served on the ODP Executive Committee (EXCOM) where she represented France.

I was involved in dreaming up ECORD in the heady days when we were planning to have a full two ship and an MSP programme. The CNRS won the competition to run the EMA and this was based largely on the fact that we knew we had someone competent to run such a programme - Catherine. We needed someone who was known to the community, who could manage people, science and in particular delicate negotiations in a new programme with new partners and new ways of working. Catherine was the right choice; she has built a strong leadership style for ECORD and is highly respected by the IODP community. She has had to play a role for us in Europe and also commonly a role as mediator for members of the programme. Without losing her self control, she remains professional and personable.

Catherine will clearly be a hard act to follow although she herself has made it clear that she is replaceable and that ECORD has a long and exciting future in scientific ocean drilling.
Catherine will retire from the CNRS and the Institut de Physique du Globe de Paris next summer. I am sure that she will retain a close interest in IODP and her science in general.

On behalf of the entire ocean drilling community and specifically that of ECORD, I would like to say a very big thank you to Catherine.

John Ludden, IODP Board of Governors - http://www.iodp.org/bog/ and Executive Director of the British Geological Survey


David McInroy

ECORD Science Operator News


Robert Gatliff


Alan Stevenson

ESO staff members have been busy planning for the next mission-specific platform (MSP) expedition, which we aim to implement in 2013. Over the last few months, ESO have been scoping four exciting IODP MSP proposals: #548 Chicxulub K-T Impact Crater, #716 Hawaiian Drowned Reefs, #758 Atlantis Massif Seafloor Processes and #672 Baltic Sea Basin Paleoenvironment.

ESO members met with the proponents of the Atlantis Massif and Baltic Sea Basin proposals in July 2011 (meetings with the Chicxulub and Hawaii proponents took place in October and November 2010). After considering the options for an MSP in 2013 at their August 2011 meeting, IODP's Science Planning Committee chose the Baltic Sea Basin Paleoenvironment as the next MSP. ESO is continuing to scope the remaining highly-ranked MSP proposals which provide excellent options for MSP expeditions in the first years of the International Ocean Discovery Program. A shallow-hazard survey will be undertaken in 2012 at the Chicxulub sites, with a view to undertaking Chicxulub in 2014 as the first mission-specific platform expedition in the new programme. The Atlantis Massif project will be the first ECORD mission to utilise a seafloor drill. Plans post-2013 will be finalised as soon as possible once the funding and operational arrangements are in place.

ESO is also exploring options for a test borehole on the Pleistocene Coralgal Banks in the Gulf of Mexico (#581) with proponent André Droxler (Rice University) to assess the quality of core recovered using a Fugro site investigation drillship in these undrilled features.

The Expedition 313 (New Jersey Shallow Shelf) 2nd Post-expedition Meeting took place from August 15 to 18, 2011, at the University of Utah, Salt Lake City, USA. The Science Party gathered to discuss their results to date and to coordinate their publication approach. The meeting included a field trip to view classic outcrops of the Blackhawk Wave-Dominated Coastal System (Book Cliffs) and the Ferron Sandstone Deltaic System *(above right)*. A series of collaborative peer-reviewed papers from the Science Party are expected to be published before August 2012.


photo M. N. Proust

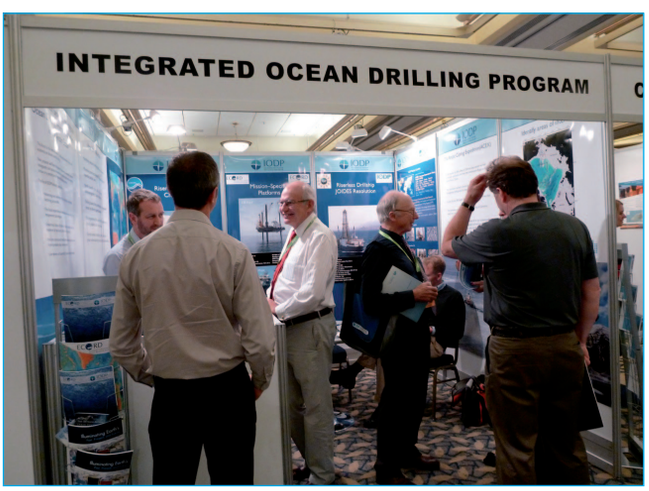
The moratorium period for Expedition 325 (Great Barrier Reef Environmental Changes) ended on July 16, 2011 with the publication of the associated Proceedings volume online at ***http://publications.iodp.org/proceedings/325/325title.htm***. The Science Party are continuing to conduct their post-Expedition research, with two or three peer-reviewed papers expected before the end of the year. The Expedition 325 2nd Post-expedition Meeting will take place from July 3 to 7, 2012, at Heron Island, Queensland, Australia. A special session has been co-organised with scientists associated with Expedition 310 for the 12th International Coral Reef Symposium (July 9-13, 2012, Cairns, Australia), and the majority of the Expedition 325 Scientists are expected to participate. For the latest list of expedition-related publications for all MSP expeditions, please consult the Expedition-related bibliography section of the Proceedings volumes. The Expedition 325 Operational Review Task Force (ORTF) took place at the Edinburgh offices of the British Geological Survey on July 18 and 19, 2011.
All reports by the Operations Review Task Force concerning MSP expeditions can be found on IODP-MI's web site at ***http://www.iodp.org/ortf/***.

ESO staff have been involved in a number of outreach activities, attending the EGU Conference in Vienna, the Goldschmidt Conference in Prague *(page 5)* and at the 3P Arctic Conference

Information and reports of Mission-specific platform Expeditions can be found at:
Arctic Coring Exp. 302: http://www.eso.ecord.org/expeditions/302/302.php
Tahiti Sea-Level Exp. 310: http://www.eso.ecord.org/expeditions/310/310.php
New Jersey Shallow Shelf Exp.313: http://www.eso.ecord.org/expeditions/313/313.php
GBREC Exp. 325: http://www.eso.ecord.org/expeditions/325/325.php

Data from MSP expeditions are available at: http://iodp.wdc-mare.org/

in Halifax, Canada (August 31-September 2). At the 3P Arctic Conference, the aim was to promote industry collaboration in this frontier area for both science and industry. As well as having a stand in the exhibition area *(below)*, at which industry representatives were invited to identify geographical areas where they would benefit from scientific drilling, ECORD organised a scientific session chaired by Richard Hardman, the Chair of the ECORD Industry Liaison Panel - ***http://www.ecord/org/ecord-ilp.html*** - and Robert Gatliff, Chair of the ECORD Science Operator. This included talks on the results of ACEX and outlines of several IODP proposals (Timme Donders, Matt O'Regan, Rüdiger Stein & Leonid Polyak) and talks from Steve Bergman (Shell) and Chris Cooper (Statoil) on their ideas for coring the basement of the Lomonosov Ridge, the Alpha Ridge and the Chukchi Borderlands. The session was well-attended and clearly demonstrated the exciting opportunities for collaboration in the new programme. Abstracts from the conference are available at: ***http://www.searchanddiscovery.com/abstracts-of-meetings.shtml***



The IODP stand at the 3P Arctic Conference in Halifax.

At the end of October, Colin Graham the ESO Data Manager retired from BGS. Colin has been involved in ECORD since it began in 2003 and, as well as bringing his expertise in data management to the programme, he has been an invaluable member of the ESO crew on all four MSP expeditions (Colin was one of the kilted Scots who appears on ACEX photos from the North Pole!). Colin's operational knowledge gained from his sea-going experience during the days of the BGS regional mapping programme meant that he was able to apply himself to a wide range of tasks on the MSPs and was probably our most versatile member of staff. His ESO and BGS friends and colleagues will miss him and we wish him well for the future. Colin's ESO responsibilities will be taken over by Mary Mowat, who has been involved in ESO for a number of years - Mary also took part in the New Jersey Shallow Shelf and Great Barrier Reef Environmental Changes expeditions. Mary will work with Dr Hans-Joachim Wallrabe-Adams at MARUM in Bremen to manage the ESO database.

Finally, as reported elsewhere in the Newsletter, Catherine Mével will stand down as ECORD Managing Agency Director at the end of the year and the role will be taken over by Gilbert Camoin. Catherine has been the driving force in ocean drilling and ECORD for such a long time that it's hard to imagine the future without her. She has been a strong supporter of ESO and has worked closely with Dan Evans, the ESO Science Manager until May 2010, and more recently with us during what has been a challenging period of transition to the next phase of the programme. It almost goes without saying that she will be greatly missed by everyone in the IODP community, but especially by all of her friends and colleagues in ESO. We wish Catherine well for the future and we hope that when she retires from CNRS she will at last find time to relax and enjoy her garden and wine collection at her home in Lignières.

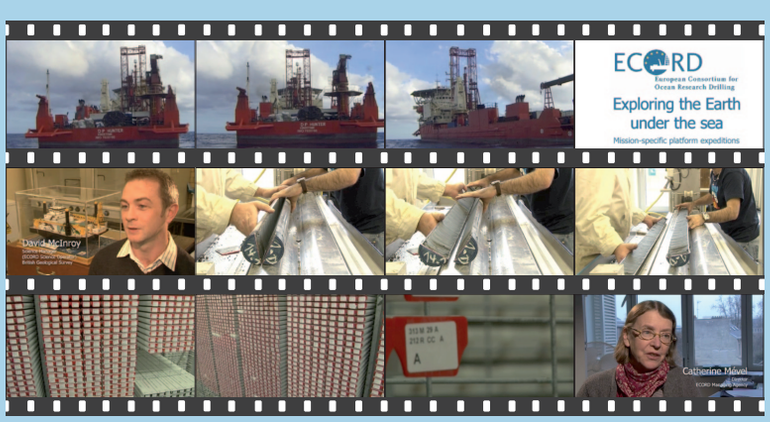
We also welcome Gilbert to his new role and look forward to working with him. Of course Gilbert is well known to everyone in ESO as he was Co-chief Scientist of the Tahiti Sea-Level Expedition and as Chair of ESSAC from 2007-2009. We wish Gilbert every success as Director of EMA.

Robert Gatliff, ESO Chair, David McInroy, ESO Science Manager and Alan Stevenson, ESO Outreach Manager
http://www.eso.ecord.org

ECORD video 'Exploring the Earth under the sea'
presents mission-specific platform expeditions operated by ECORD as part of IODP, including interviews with ECORD and ESO staff as well as Co-chief Scientists.

Co-produced in association with cgvision

Short and long versions are available at:
http://www.ecord.org/pi/promo.html#video




Albert Gerdes


Alan Stevenson

ECORD Outreach and Education Activities


Patricia Maruéjol


Julia Gutiérrez-Pastor

News from the Outreach team

There have been recent changes within the ECORD Outreach team. With the transfer of the ESSAC office to Spain, Jenny Lezius left her position and was replaced by Julia Guttierez-Pastor. We have had excellent collaboration with Jenny throughout the last two years and we would like to thank her for the smooth organisation and her efficiency she brought to our team. We wish her well with her baby Mila Luise. We also thank Rudy Stein, ESSAC outgoing Chair, for having been involved in outreach activities and having hosted our ECORD outreach meeting last year in Bremerhaven. We have also to say goodbye to Catherine Mével who will step down as EMA Director at the end of the year. Catherine has always stongly encouraged and supported all our outreach activities since ECORD was launched. We are happy to welcome Julia Gutiérrez-Pastor who joined the team and Carlota Escutia-Dotti, the new ESSAC Chair.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Since April 2011, the ECORD Outreach team has been busy presenting IODP at three international conferences, EGU 2011, the Goldschmidt 2011 in Prague and the 3P Arctic Conference *(page 4)*. EMA and ESO members of the team met in Prague during the Goldschmidt conference to prepare the upcoming ECORD outreach activities. Albert Gerdes, Alan Stevenson and Patricia Maruéjol took part in the IODP Outreach Task Force meeting chaired by Miyuki Otomo, IODP-MI Outreach and Communications Manager, in Tokyo on September 27-28.

EGU 2011, Vienna, Austria, April 2-7

With about 10,700 scientists from 96 countries, EGU is the major conference to present ECORD and IODP to the scientific community in Europe. This year again, we organised an exhibition booth *(photo 1)* and townhall meeting jointly with ICDP. We had a lot of visitors to the booth, especially many teachers who are now very aware of IODP science. The townhall meeting was well attended, attracting almost 250 participants who heard about recent news from both the IODP and ICDP programmes.

Goldschmidt 2011, Prague, Czech Republic, August 14-19

This year IODP decided to have an exhibition booth at the Goldschmidt Conference, with the aim of presenting the programme to geochemists who did not attend the EGU meeting. With 3,300 participants, the conference was smaller than EGU, but there were many visitors to the booth asking for information and subscribing to *Scientific Drilling* *(photo 2)*. Contacts with the European Association of Geochemistry (EAG) were also made.

GAC-MAC, Ottawa, Canada, May 25-27

IODP-Canada and ICDP-Canada shared an exhibition booth at the joint annual meeting of the Geological Association of Canada and the Mineralogical Association of Canada (GAC-MAC), held at the University of Ottawa. Anne de Vernal, now the ECORD Council Chair, and the Coordinators of IODP-Canada and ICDP-Canada staffed the booth *(photo 3)* and met with students, faculty and funding agency representatives. Many ECORD, IODP and ICDP outreach materials were distributed and subscribers to the Canadian mailing list increased by over 10%. IODP-Canada plans to exhibit at the next GAC-MAC conference, which will be held in St. John's, Newfoundland on May 27-29, 2012.

ECORD brochures were also distributed in IODP booths at the Offshore Technology Conference (OTC) in Houston, JPGU in Chiba-City, Tokyo and AOGS in Tapei.

Upcoming Activities

Members of the team will be involved in the following outreach activities:

- IODP booth, townhall meeting and media activities at AGU 2011,
- Portcall event when the *JOIDES Resolution* returns from Mediterranean Outflow Expedition 339, in Lisbon, on January 18, 2012,
- Joint ICDP-IODP activities at EGU 2012 from April 22 to 27, 2012.

ECORD Education

Reports of several 2011 educational activities are presented in the Newsletter: ECORD Summer Schools in Urbino and Bremen *(page 6)* and School of Rock 2011 *(page 7)*.

ECORD Outreach team: Albert Gerdes and Alan Stevenson, ESO, Patricia Maruéjol, EMA and Julia Gutiérrez-Pastor, ESSAC - http://www.ecord.org/pi/promo.html

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ECORD RSS News: http://www.ecord.org/RSS/ecord-rss.php

Reports of ECORD Summer Schools 2011

8th Urbino Summer School in Paleoclimatology
July 13 - August 2, 2011, Urbino, Italy

As a second year PhD student at the "Laboratoire de Géologie de Lyon, Terre Planètes, Environnement (LGL-TPE)" of the University of Lyon (France) I recently participated in the 8th Urbino Summer School in Paleoclimatology (USSP), Italy. My expectation was to improve and develop my background knowledge in paleoclimatology.

The course aimed at providing participants with the basics of paleoclimatology, from cyclostratigraphy to climate modelling. Even though some of the lectures included information I already knew they were useful reminders and provided a very complete overview that gave me both a broad and detailed understanding of the topic. The summer school was therefore a unique opportunity that allowed me to strengthen and develop my scientific knowledge in this domain. For example, I had the opportunity to be introduced to paleobiological and geochemical proxy data that were still unknown for me, especially those used for climate modelling and in continental systems. In addition, the lectures and practical sessions were given by highly specialised and internationally recognised researchers, who were always available to answer questions. This gave me the opportunity to be part of the scientific community and to personally discuss my work with researchers whom I only knew previously from their published papers.

The USSP was also a unique experience from a social point of view allowing me to meet junior scientists from different research areas and nationalities. The poster session and the Cioppino Workshop provided a state-of-the-art view of current research at many different institutions, as well as insights into future research in the field of paleoclimatology.

Moreover, I had the chance to collect different opinions and advice on my PhD research through discussions with post-doc and PhD students specialising in other sub-disciplines. This international and scientific network of contacts will be beneficial to my PhD research (and my future scientific career). But the USSP was also for me the opportunity to meet new people who have become colleagues and friends and I look forward to meeting them again at future international meetings and congresses.

In brief, the USSP was fruitful for me both from a professional and a human point of view and I would strongly recommend participating in the summer school.

Julien Plancq, ECORD Scholarship Awardee 2011
plancq@pepsmail.univ-lyon1.fr
http://www.urbinossp.it/

Sub-seafloor Fluid Flow and Gas Hydrates
September 12-23, 2011, Bremen, Germany

I started my PhD in the Department of Earth and Planetary Sciences at McGill University (Montréal, Canada) in January 2010. I am interested in studying sulfur cycling in gas hydrate bearing sediments by developing a multiple sulfur isotope technique. My educational background is in chemistry and I hope to refine my knowledge of the physical aspects of gas hydrate related systems at the ECORD summer school.

I applied for a scholarship from ECORD and IODP Canada to attend the summer school on Fluid Flow and Gas Hydrates in Bremen, Germany. An international group of experts on gas hydrates gave lectures ranging from the basics of these systems to specific topics related to gas hydrate quantification, exploration and exploitation. We learned about the different environments where gas hydrates occur, seismic techniques to assess gas hydrate occurrence and the interactions between gas hydrate and surrounding environments (*e.g.*, pore water, microbial communities). We were updated on current research

projects; one that I found quite interesting discussed using CO_2 to replace CH_4 in gas hydrates as a way of balancing the economic realities with environmental protection. Also, I enjoyed hearing about the links between gas hydrate destability and climate change in vulnerable regions.

Summer school report continued on page 10

Jean-Luc Bérenguer

School of Rock 2011 - A five year review
JOIDES Resolution - July 31-August 5, 2011

The fifth 'School of Rock' teachers' workshop took place this summer onboard the *JOIDES Resolution (JR)* when the drillship was docked at Curaçao for technical maintenance. Gathering fifteen teachers and five IODP instructors *(photo 1)*, the aims of this workshop were to draw up a balance sheet of educational activities since 2005, but also to suggest priorities in future IODP Education and Outreach (IODP E&O) projects.

The 'School of Rock' (SOR) programme was created in 2005 by the IODP-US Implementing Organization (IODP-USIO), who operate the *JR*. During a School of Rock, which is similar to a summer school *(see reports page 6)*, teachers and educators have the opportunity to carry out geological, physical and/or chemical analyses of sediments and cores at laboratories on the *JR* or at Texas A&M University. Researchers from IODP deliver lectures to the participants on selected topics in marine geology and oceanography. Since 2005, several SOR events have taken place aboard the *JR* (2005, 2009, 2010 and 2011) and onshore at TAMU, College Station (2007, 2008). These different events have brought together about 100 teachers, mostly from the USA. Since 2009, ECORD teachers from Portugal, the United Kingdom and France have been invited to join these expeditions.

Before the workshop, a survey was sent to all teachers who have participated since 2005 to assess the impact of the SOR training on publicising and taking IODP resources to schools. During the workshop, new practical activities were proposed to the participants in the *JR's* labs taking advantage of IODP scientists and resources *(photo 2)*. The results of the survey were also discussed *(photo 3)*, which show that the 'School of Rock' contributes significantly to elaborate and to spread educational resources; they provide an excellent platform for IODP E&O, benefitting from the dynamism of the teams. IODP has now built up a significant teachers' network involved in the integration of its resources at various levels of education, from middle school to high school.

In addition to this network, the workshop brings together teachers' leaders who become active ambassadors of 'IODP education'. It was this group of teachers that were asked to draw up the balance sheet of the last five years of education activities, and who were asked about the priorities that should be put forward for future actions.

The workshop ended with the following conclusions:

- It is essential to maintain a training facility (like the School of Rock) where the various disciplines in marine geosciences are addressed (biology, geology, physics, chemistry, etc.),
- It is essential also to maintain training that promotes the relationship between scientists and teachers through mutual understanding of each others work. Teachers' participation in scientific expeditions aboard the *JR* are privileged experiences,
- We also have to strengthen training that links sciences and society, especially as this helps to explain various themes of geosciences such as climate change, natural risks, etc. The seminar was an opportunity to practice examples of activities that are related to these themes,
- Finally, production of more accessible resources and better distribution of these to the teaching community should be a high priority. The preliminary survey indicated that the available resources are used variably at different schools.

This work, in which Europe has been invited to participate, will be very useful in building new action plans aimed at raising awareness and training for teachers, in particular regarding the next 'School of Rock'. The previous 'School of Rock' and 'Teachers at Sea' programmes have involved seven ECORD teachers - four French, one Portuguese, one British and one Swedish *(see ECORD Newsletters #4 and 13)* - with the support of ECORD, national IODP offices and Swedish Polar Research Secretariat, which was deeply appreciated by all teachers. Moreover IODP resources have been developed and distributed

SOR 2011 Report continued on page 13

Catherine Mével

From the ECORD Managing Agency Director

This is my last message in the capacity of EMA Director. Starting in January 2012, Gilbert Camoin (CEREGE, France) will take over. I will have reached the compulsory retirement age in France - although it's hard for me to believe! During the first half of 2012, I will progressively give up all my responsibilities. Gilbert has been around in the drilling programme for ten years in various positions and knows ECORD and IODP quite well. We have already started an overlap and I have no doubt that he will do an excellent job. But this is the time for me to look back at what we have achieved and to give my thoughts on how the future should look.

When I took the job as the ECORD Managing Agency Director back in 2003, I do not think any one - including me of course - really appreciated the level of commitment it required and that it would mean almost giving up my scientific activities. But I have to say that I have really enjoyed these eight years. Everything was still to be built: the structure of ECORD, as well as the international organisation of a multiple platform programme. IODP has been a major step forward compared to its predecessor. Europe and Canada now speak with one voice, have developed more scientific cooperation, thanks to ESSAC and its support activities, and most importantly provide access to mission-specific platforms (MSPs) that open new fields of science. My major reward as a manager has definitively been to contribute to the success of MSP operations. At the international level, the refit of the *JOIDES Resolution* has provided the science community with a wonderful vessel. Access to the *Chikyu* has also opened new opportunities. Even if the NanTroSEIZE project may not be completed by the end of the programme, in particular due to the damage caused by the Tohoku earthquake and tsunami, the science it has already generated is tremendous. Unfortunately, the realities of the world economy have forced us to limit our ambitions. All three platforms have not been used to their full capacities. At the end of the current phase, the ECORD budget will have allowed us to implement only five MSP expeditions instead of the 10 originally planned. But even so, the scientific results are overwhelming and still the most spectacular is ACEX, the first MSP expedition to the Arctic Ocean, with almost 80 scientific papers published to date in major journals.

Scientific ocean drilling has been a great scientific and human adventure. It seems to me, however, that IODP has become too bureaucratic, with no flexibility and with rules piling on top of each other. We have to face it: IODP is considered by the rest of the world, and in particular by other science programmes that would benefit from access to ocean drilling, as obscure and not open. This has been acknowledged by all funding agencies and discussed by IWG+, in which all IODP members are represented. There is a strong will to simplify and streamline the future programme.

As the Co-chair of IWG+, I was hoping that the structure of the new programme would be settled last summer. As I write these lines, unfortunately this is not yet the case. The NSF decision to modify its funding model by requesting international partners to contribute financially to the *JOIDES Resolution* operations has resulted in the necessity to reopen discussions at an international level. These discussions will likely lead to more independence for each platform. I am convinced, however, that we absolutely need to keep an international framework for scientific ocean drilling. We need to be seen as a unique endeavour otherwise we will significantly weaken our case when we compete with other scientific initiatives.

The building of ECORD was a major success. It is essential to keep the integrity of the consortium and continue providing access to MSPs to our international partners. Expanding the MSP concept beyond drillships and platforms to include other tools has already been endorsed and ESO is currently scoping a proposal to be implemented with a seabed drill *(see page 3)*. Securing at least one MSP expedition per year should be a major goal, and returning to the Arctic a priority. But we could go even further and offer the unique ESO expertise to implement projects co-funded by other sources, such as industry, the European Commission, other Government Ministries etc., as long as their science goals are positively evaluated. We should encourage scientists to consider this alternative approach, which would allow us to achieve even more. Flexibility should be the key word of the next phase, to help us to seize all opportunities. There is a lot of expertise in Europe on scientific drilling and borehole measurements and instrumentation. Building a recognised distributed infrastructure would be a major step forward to help the science community have access to the sub-seafloor. It would also give us more visibility within the European scientific landscape.

It has been rewarding albeit sometimes challenging to interact with all the major contributors to ECORD and IODP. These eight years will definitively remain a highlight in my career. I am convinced that a new structure that maintains access to all three platforms for the international scientific community will be agreed upon in the next months. The exciting New Science Plan is waiting to be implemented. Scientific ocean drilling is a key tool to understanding our planet and the interactions between the Earth system and human activities. I cannot imagine that it will not continue.

Catherine Mével, ECORD Managing Agency Director
http://www.ecord.org/ema.html

Carlota Escutia-Dotti

News from ECORD Science Support & Advisory Committee

Julia Gutiérrez-Pastor

This issue of ESSAC news coincides with the preparations to move the ESSAC Office from Bremerhaven in Germany to Granada in Spain. Julia Gutiérrez-Pastor, the new Science Co-ordinator, and myself as new ESSAC Chair, are getting ready to take over the leadership of ESSAC Office from the capable hands of the former Chair Rüdiger (Rudy) Stein and Science Co-ordinator Jeannette (Jenny) Lezius, who have prepared most of the ESSAC reports in this Newsletter.

During the last months, we have issued calls for five expeditions with the *JOIDES Resolution*: Expedition 340 (Lesser Antilles Volcanism and Landslides), Expedition 341 (Alaska Tectonics, Climate and Sedimentation), Expedition 342 (Newfoundland Paleogene and Cretaceous Sediment Drifts: Deep-sea circulation in a Greenhouse World), Expedition 344 (Costa Rica Seismogenesis Project 2 (CRISP) and Expedition 345 (Hess Deep Plutonic Crust). ESSAC has completed the selection of ECORD scientists for expeditions 339, 340 and 341, and the staffing is still in progress. Calls for applications to sail on expeditions 344 and 345 are open until December 15, 2011. More information about the scientific objectives, precise dates, and official notification of all these expeditions can be found in the table *(below)* and on the IODP web site at ***http://www.iodp.org/expeditions/***.

As the current Integrated Ocean Drilling Program will come to an end in September 2013, numerous activities within ESSAC have been focussed on shaping of the successor programme: the International Ocean Discovery Program (IODP) "Exploring the Earth under the Sea". Related to this initiative, a new Scientific Advisory Structure (SAS) will be formed by October 2011 with the aim of guiding the scientific, technological and engineering aspects of the current IODP as well as the new programme from October 2013. Compared to the old SAS, the new SAS has a more simplified structure with only a single layer of science and technology assessment panels. These panels include the Scientific Technology Panel (STP), the Proposal Evaluation Panel (PEP), the Site Characterization Panel (SCP), and Environmental Protection and Safety Panel (EPSP). These four panels sit below the SAS authority that determines the actual implementation (the Science Implementation and Policy Committee-SIPCOM), assisted by an Operations Task Force (OTF). A full description of the tasks of each of the new SAS panels can be obtained at ***http://www.iodp.org/Committees-and-Panels-New/4/***. A diagram illustrating the structure of the new SAS can also be downloaded from this web page. The ECORD representatives in the new SAS structure are listed on *page 14* of this Newsletter.

The second phase of the ECORD Distinguished Lecturer Programme is running very successfully with the ECORD Distinguished Lecturers Kai-Uwe Hinrichs (MARUM, University of Bremen, Germany, "Benthic archaea - the unseen majority with importance to the global carbon cycle revealed by IODP drilling"),

IODP Expedition Drilling Schedule

Expedition	Exp #	Drillship	Dates	Co-chief Scientists
Costa Rica Seismogenesis Project (CRISP)	334	*JR*	March 15 - April 13, 2011	P. Vannucchi - K. Ujiie
Superfast Spreading Rate Crust IV	335	*JR*	April 13 - June 3, 2011	B. Ildefonse - D. Teagle
Mid-Atlantic Ridge Microbiology	336	*JR*	Sept 16 - Nov 17, 2011	W. Bach - K. Edwards
Mediterranean Outflow	339	*JR*	Nov 17, 2011 - Jan 17, 2012	F. Hernandez-Molina - D. Stow
Atlantis Massif Oceanic Core Complex	340T	*JR*	Jan 17 - Feb 6, 2012	D. Blackman
Lesser Antilles Volcanism and Landslides	340	*JR*	Feb 6 - March 18, 2012	O. Ishizuka - A. Le Friant
Japan Trench Fast Drilling Project	343	*Chikyu*	April 1 - May 21, 2012	*tba*
Paleogene Newfoundland Sediment Drifts	342	*JR*	June 18 - August 17, 2012	R. Norris - P. Wilson
Deep Coalbed Biosphere off Shimokita	337	*Chikyu*	July 6 - Sept 15, 2012	K. U. Hinrichs - F. Inagaki
NanTroSEIZE Plate Boundary Deep Riser 2	338	*Chikyu*	Sept 19, 2012 - Jan 31, 2013	*tba*
Costa Rica Seismogenesis Project 2 (CRISP)	344	*JR*	Oct 22 - Dec 17, 2012	R. Harris - *tba*
Hess Deep Plutonic Crust	345	*JR*	Dec 17, 2012 - Feb 16, 2013	*tba*
S Alaska Tectonics Climate and Sedimentation	341	*JR*	May 27 - July 27, 2013	J. Jaeger - S. Gulick
Asian Monsoon	346	*JR*	Aug 18 - Sept 26, 2013	*tba*
Baltic Sea Basin Paleoenvironment	*tbd*	MSP	*2013*	*tba*

JR: JOIDES Resolution, MSP: mission-specific platform. Sailing dates may change slightly - http://www.iodp.org/expeditions. ECORD Co-chief scientists are marked in blue. The drillbit onboard the Greatship Maya during GBREC Expedition 325 (photo D. Smith © ECORD/IODP).

Dominique Weis (PCIGR, University of British Columbia, Canada, "What do we know about mantle plumes and what more can we learn by IODP drilling?"), and Helmut Weissert (ETH Zurich, Switzerland, "Carbon cycle, oceans and climate in the Cretaceous: lessons from Ocean Drilling (DSDP to IODP) and from records on continents"). This phase will be active until June 2012. ECORD still invites colleagues, university or non-profit organisations in **ALL European countries and Canada** to apply via electronical mail to *iact_essac.office@iact.ugr-csic.es* to host a lecture. Applications from non-traditional IODP and ECORD audiences within the European Community are especially welcome.

In 2011, two summer schools were funded by ECORD:

- ECORD Summer School on Subseafloor Fluid Flow and Gas Hydrates, Bremen, Germany,
- The 8th Urbino Summer School in Paleoclimatology, Urbino, Italy.

ECORD provided scholarships to allow young scientists to attend one of the ECORD Summer Schools 2011. From the 50 applicants, ESSAC decided to fund 14 students from ECORD and non-ECORD countries with amounts between € 500 and 1,500. A report of each summer school has been provided by Julien Plancq (University of Lyon, France) and Thi Hao Bui (MacGill University, Canada) *(see page 6)*.

ECORD sponsored merit-based awards for outstanding graduate students to conduct research related to the Integrated Ocean Drilling Program. We received highly qualified applications, from which five young researchers have been awarded an ECORD Research Grant of around € 2,000 each to cover travel and lab expenses.

ECORD also provided scholarships to allow outstanding young scientists to attend the workshop "Engaging Early Career Scientists in Future Scientific Ocean Drilling" at Texas A&M University. ESSAC chose five young scientists to receive the ECORD Scholarship with maximum amounts of € 1,300. Matthias Forwick (University of Bergen, Norway) has written a report of the workshop *(page 11)*.

All links and further information are provided on our web site *http://www.essac.ecord.org/index.php?mod=education*.

Julia and I thank Rudy and Jenny for their successful leadership of ESSAC and the running of the ESSAC Office during the past two years. We will do our best to continue their success. For this, we will need the continued active participation of all the ESSAC delegates and collaboration with the IODP/ECORD bodies, as well as the input of the scientific community. The move of the ESSAC Office to Granada coincides with the final two years of the current IODP in September 2013. Many challenges need to be overcome in the near future by the scientific drilling community as the detailed structure and international partnerships in the new programme are yet to be defined. ESSAC is committed to being central to these discussions, acting as the advisory and support body for the ECORD community.

Carlota Escutia-Dotti, ESSAC Chair and Julia Gutiérrez-Pastor, ESSAC Science Co-ordinator
http://www.essac.ecord.org/

Continued from page 6

With this two-week training period, I attained an up-to-date synthesis of gas hydrates. From the lectures of experts and the presentations of my fellow attendees, I gained a better understanding of how my specific research may contribute to our overall understanding of gas hydrate systems.

One of the most eye-opening aspects of the school was the hands-on practice we had with various laboratory and field methods. For instance, I practiced measuring marine heat flow, calculating gas hydrate stability and participated in describing ODP/IODP sediment cores. Going on a research cruise to the Baltic Sea was a particularly great experience. I was able to experience how a sediment core is collected (which I had never seen before), how scientists occupy their time on board, and how samples are preserved for further analysis back on land. This was all very impressive to a lab-based scientist.

Finally, I had the chance to meet a bunch of sympathetic aspiring "gas hydrate scientists" from around the world at this summer school. Within the great learning atmosphere provided by the instructors and organisers, we learned and cooperated together in order to further our understanding of how gas hydrates actually work. I am sure that I will be interacting with my fellow summer school attendees on exciting science in the future.

Thi Hao Bui, ECORD Scholarship Awardee 2011
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http://www.marum.de/Page10870.html

Workshop and Conference Announcements

- IODP Workshops http://www.iodp.org/workshops/8/
  - Scientific Drilling in the Indian Ocean - *October 17-18, 2011*, Goa, India
- ESF Magellan Workshop Series http://www.esf.org/magellan
  - Overcoming barriers to Arctic Ocean drilling: the site survey challenge - *Nov 1-3, 2011*, Copenhagen, Denmark
- ECORD Distinguished Lecturer Programme 2010-2012 http://www.essac.ecord.org/index.php?mod=education&page=dlp
- AGU 2011 Fall Meeting, December 3-8, 2011, San Francisco, USA http://sites.agu.org/fallmeeting/
- DS^{3}F Conference, March 11-14, 2012, Sitges, Spain http://www.ds3f2012.org
- EGU 2012, April 22-27, 2012, Vienna, Austria http://meetings.copernicus.org/egu2012/
- JPGU 2012, May 20-25, 2012, Makuhari Messe, Japan http://www.jpgu.org/meeting_e/
- GAC-MAC 2012, May 27-29, 2012, StJohn's, NF, Canada http://www.gac.ca/activities/
- Goldschmidt 2012, June 24-29, 2012, Montréal, Canada http://www.goldschmidt2012.org/
- 12th International Coral Reef Symposium (ICRS), July 9-13, 2012, Cairns, Australia http://www.icrs2012.com/
- 34th IGC, August 5-10, 2012, Brisbane, Australia http://www.34igc.org/
- AOGS 2011, August 13-17, 2012, Singapore, http://www.asiaoceania.org/aogs2012/public.asp?page=home.htm

Report of IODP Workshop "Engaging Early-Career Scientists in Future Scientific Ocean Drilling"

March 31 - April 1, 2011, College Station, TX (USA)

From March 30 to April 1, 2011, the Consortium for Ocean Leadership and the IODP arranged the USSSP workshop "Engaging Early-Career Scientists in Future Scientific Ocean Drilling" at the IODP facility at Texas A&M University in College Station, Texas, USA. The workshop provided a platform for early-career scientists within Earth, Ocean and Life Sciences to develop contacts, to learn how to become an active member of the international drilling community, to discuss the new science plan of IODP, as well as to share ideas for new projects and experiments fitting into the new science plan.

41 participants from 34 institutions attended the workshop: thirty from the US, five from Japan and six from ECORD. In addition, five early-career scientists from Canada, Germany, Norway, Switzerland and the UK received ECORD travel grants of up to € 1,300 to participate in the workshop.

The programme included oral and poster presentations, group and plenum discussions, as well as the visit of the IODP Gulf Coast Repository (GCR). On the first day, the oral presentations dealt with the history of Scientific Ocean Drilling, on overview of drilling and coring technology, down-hole logging, borehole installations and laboratory technology, as well as the presentation of the IODP New Science Plan. The latter was followed by a discussion in which the participants (who were asked to familiarise themselves with the science plan prior to the workshop) were encouraged to provide feedback and suggestions for improvements that should be considered for the final version of the science plan. After lunch, break-out groups were established focussing on the four research themes of the new IODP science plan - Climate and Ocean Change, Biosphere Frontiers, Earth Connections and Earth in Motion. These break-out groups were asked to create ideas for projects that eventually can provide the bases for future drilling proposals. The first day ended with poster presentations from the participants and a barbecue at the core repository, providing a good opportunity for the early-career scientists to mingle with experienced IODP members.

The second day commenced with a panel discussion between five workshop participants who have already been involved in IODP activities. Subsequently, presentations were given dealing with the staffing process of IODP expeditions, as well as how to write drilling proposals. After lunch, the workshop participants learned about site surveys for IODP expeditions and how to access archives (cores, samples and data). A visit to the IODP Gulf Coast Repository completed the programme of the second day.

During the third and last day of the workshop, advice about how to find drilling-related research within the NSF was given. This was followed by an overview of the evaluation and selection process of IODP proposals. Towards the end of the workshop, the four break-out groups presented their topics for potential drilling proposals that were discussed and evolved during the previous days.

The workshop was very well organised and the discussions with other early-career scientists, as well as experienced IODP members, were very beneficial for all participants. It was very inspiring to share and discuss ideas with people who are thinking in different ways, but in the same direction, namely a better understanding of the Earth's past, present and future using oceanic scientific drilling.

Matthias Forwick, ECORD Scholarship Awardee,
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http://iodp-usssp.org/workshop/269/

Reports of Magellan Workshop Series

♦ Geological carbon capture & storage in mafic and ultramafic rocks: Role of oceanic and continental scientific drilling , January 8-12, 2011, Muscat (Sultanate of Oman)

Convenors: Marguerite Godard (mgodard@univ-montp2.fr), Damon Teagle (dat@noc.soton.ac.uk), Peter Kelemen (LDEO, USA) and Sobhi Nasir (SQU, Oman)

Mitigation, avoidance and reduction of increasing atmospheric CO_2 concentrations due to burning of hydrocarbons are among the most pressing technological challenges to society. Geological carbon storage is a key component of mitigation strategies. A workshop recently organised in Muscat (Sultanate of Oman), brought together scientists from communities associated with the Integrated Ocean Drilling Program (IODP) and the International Continental Scientific Drilling Program (ICDP) with colleagues from

the geothermal, chemical, and mining industries to raise the profile of research on geological carbon capture and storage, with particular focus on the potential for storage in ultramafic and mafic rocks. The interest in these rocks, little exploited yet for industrial purposes, stems from their high potential for mineral carbonation, which represents one of the safest and most effective means to achieve long term carbon storage.

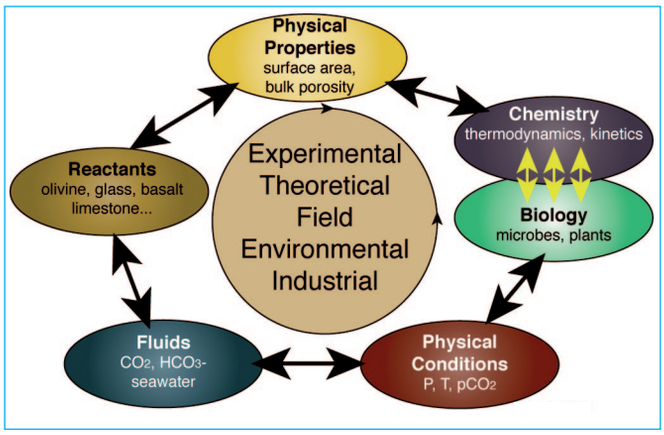
The workshop was held in Oman because of the exceptional extent of the ongoing peridotite carbonation process. It was organised by M. Godard (CNRS/UM2, France), P. Kelemen (LDEO, USA), S. Nasir (SQU, Oman) and D. Teagle (NOCS, UK) and attended by 87 registered participants from 15 countries: Australia, Canada, China (PRC), France, Germany, The Netherlands, Hungary, Iceland, Italy, Japan, Norway, Oman, Switzerland, the United Kindom and USA. The workshop was sponsored by IODP-MI, Sultan Qaboos University, the (US) National Science Foundation, the European Science Foundation (ESF), UK-IODP, InterRidge and the (US) Consortium for Ocean Leadership.

The opening ceremony was attended by Her Royal Highness, Mona Al Saaid and His Excellency Dr. Ali Al Bemani, Vice Chancellor of Sultan Qaboos University. Addresses were given by Dr. Saif Al-Bahri, Dean of the College of Science, and Prof. Peter Kelemen, Chairman of the Workshop. The first plenary lecture was by Prof. Richard Darton of Oxford University, on chemical separation of CO_2.

The workshop was organised as a series of presentations alternating with breakout sessions for discussion. Keynote lectures were on natural and enhanced geological storage of CO_2 in mafic and ultramafic rock formations, experimentally determined rates of CO_2 reaction with rocks, volume expansion and fracturation due to formation of carbonate minerals, maintaining or enhancing permeability and reactive surface area, use of ultramafic mine tailings for mineral carbonation for CO_2 storage, ongoing projects involving CO_2 injection into mafic rocks, and methods for engineered hydraulic fracture - enhancing permeability - in the geothermal power and mining industries. Small working groups met to discuss mineral carbonation on land and at sea, monitoring of CO_2 storage sites at sea and on land, geophysical rock properties necessary for CO_2 storage, ideal storage site characteristics on land and beneath the seafloor, and the role that could be played by ICDP and IODP in this new field of research.
The final report, poster abstracts as well as a copy of the keynote presentations can be downloaded on the workshop web site at ***http://ccs-oman2011.org/***.

The workshop was followed by two days of field trips to view natural mineral carbonation processes in the Oman Mountains *(below).*

Consensus was reached over the need to develop integrated international research networks to favour the development of new geological storage techniques adapted for long-term CO_2



Flow chart summarising the research and technological issues for the development of geological storage in (ultra-)mafic rock formations (courtesy D. Teagle, 2010).

storage in mafic and ultramafic reservoirs and to support the development of pilot studies.

The main scientific and technical challenges are:

(1) to characterise the bio-geochemical processes limiting/enhancing transport and carbonation efficiency,

(2) to acquire a better knowledge of the hydrogeology of the ultramafic and mafic geological systems, and of the physical mechanisms enhancing/limiting permeability and other hydraulic parameters in these systems.

Discussions outlined the scientific and technical objectives that could be integrated in the new science plans for international ocean and continental drilling programs as part of these collaborative efforts, in particular the study of natural geological analogues (oceanic hydrothermal vents where carbonation occurs, ageing of basalts and peridotites with or without sedimented covers). In this perspective, a group of participants have submitted a proposal for an ICDP sponsored workshop to develop a full proposal for scientific drilling in the Samail ophiolite in Oman. One of the objectives of drilling is to investigate present-day alteration processes, their relationship to the deep biosphere, and their potential for acceleration to achieve carbon capture and storage via *in situ* mineral carbonation.

Full reports of the Magellan Workshop Series are posted on http://www.esf.org/magellan *(click on 'Science Meetings')*

Continued from page 7

to assist the teachers in their classroom (for example: the use of replicas of sedimentary cores, the organisation of video broadcasts from 'ship to shore' *(photo 4)*, the implementation of practical activities in the school laboratory, such as fossils and microscopy, or sediments and carbonates).

Teachers' participation in the next events are to be encouraged and supported. It would also be desirable that the 'School of Rock' initiative could have its own ECORD version to bring together more European teachers in the future.

It is important to recognise that all these educational activities allowed a teachers' network to be developed, providing the oppportunity to assess the IODP teaching resources. We hope to develop these activities further in the near future, by building on this network to create and spread IODP resources to national educational networks.

Jean-Luc Bérenguer, Science teacher at International High School Valbonne, Sophia Antipolis, France
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Bringing the ship to the classroom - video broadcast (IODP Exp 335 - Superfast Spreading Rate Crust)

School of Rock: http://www.oceanleadership.org/education/deep-earth-academy/educators/school-of-rock/
ECORD Education and Resources: http://www.essac.ecord.org/index.php?mod=education

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http://www.essac.ecord.org/index.php?mod=about

A Letter from Norway

Norwegian ocean drilling participation

Norway is a seafaring nation, with proud traditions exploring and conducting research in the high latitude oceans. In recent decades, these traditions have inspired active participation in DSDP, ODP and IODP. As shipboard and shore-based participants, Norwegian researchers have built international careers and networks and contributed to increased scientific knowledge through access to the pioneering geological archives that are the unique legacy of these expeditions.

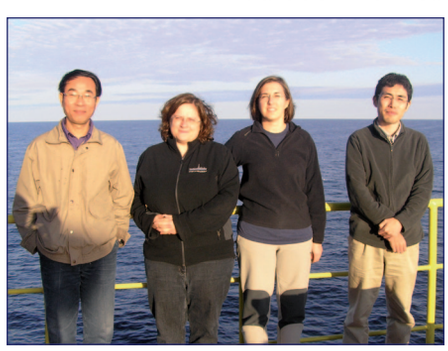
Norwegian scientists played an instrumental role in establishing the ESF Consortium for Ocean Drilling (ECOD) of which the Research Council of Norway (RCN) became a member in 1986. The RCN has continued to fund and support Norwegian participation in ocean drilling through ECORD membership since 2003. RCN financial support has not only ensured cruise participation, but laid the foundation for full post-cruise research projects with funding for post-doc and PhD fellows, securing the continuous renewal of Norwegian ocean drilling research.

Bjørn Olav Steinsbu sailed as a microbiologist on South Pacific Gyre Subseafloor Life Expedition 329. In this photo Bjørn (right) and Laurent Toffin (microbiologist, Ifremer, France) take microbiology samples onboard (photo John Beck, IODP/TAMU).

Legacy of Norwegian ocean drilling research

ODP Leg 104 in the Norwegian Sea initiated the golden era of scientific drilling in Norway. Looking back at the list of the 41 ECOD researchers that embarked on ODP expeditions, many of them today form the backbone of senior staff at universities and research institutions in Norway and have acted as door openers and role models for new generations of expedition participants.

The Norwegian participation, including Co-chief Scientists on Legs 104, 114, 151, 162 and 187, have been crucial in establishing Norway's strong research position in earth science and paleoclimatology, particularly related to processes and dynamics of high-latitude oceans, evolution and development of passive continental margins, as well as research encompassing the sub-seafloor and deep biosphere - themes that figure prominently in the national research strategy.



Katrine Husum participated as a foraminifera specialist on Bering Sea Expedition 323. She represented the Department of Geology at the University of Tromsø, Norway. Here she is posing with the nightshift biostrat team: Muhong Chen from the Chinese Academy of Science, Katrine, Elena Colmenero-Hidalgo, University of Salamanca in Spain and Jonaotaro Onodera, Kochi University in Japan.

When the Research Council of Norway initiated a Centre of Excellence (CoE) scheme with the intention of bringing more Norwegian researchers and research groups up to a high international standard, the success of ocean drilling research was fundamental in achieving CoE status for both The Bjerknes Centre for Climate Research (BCCR) and The Centre for Geobiology (CGB), led by two former ODP Co-chief Scientists; Professor Eystein Jansen and Professor Rolf Birger Pedersen, respectively.

ODP data and samples still play an important role in ongoing Norwegian research through Norwegian led ESF EuroMARC projects, participation in EU FP7 projects as well as RCN and industry funded research.

Since the days of DSDP, Norwegian scientists have enjoyed excellent relations with the petroleum industry and the Norwegian Petroleum Directorate, a government agency. The scientific community has greatly benefitted from this cooperation during the planning, execution and interpretation phases. Norwegian scientists have participated in the planning of the future drilling program, and in the planning of a full-year research platform operating in the ice-covered Arctic Ocean - *Aurora Borealis.*

A new wave of ocean drilling researchers

Norwegian scientists have already participated in eight IODP expeditions, utilising an array of drilling platforms including the *JOIDES Resolution* (Exp. 301, 305, 306, 318, 323 and 329), the *Chikyu* (Exp. 333) and the ACEX (Exp. 302) mission-specific platform expedition. Most Norwegian participants have been students and early-career scientists, engaged in the full breadth of IODP scientific themes.

Nalan Koc (Exp. 302) and Kjell Bjørklund (Exp. 306) have been involved in drilling the Arctic Ocean and North Atlantic Ocean respectively, collectively increasing our knowledge about the long-term geologic and climatic evolution of these ocean basins. Catherine Stickley (Exp. 318) continued this high-latitude approach, with a research focus on the story of Antarctica's transition from balmy greenhouse to ice-covered climes, and Katrine Husum (Exp. 323) explored the Pliocene-Pleistocene evolution and glacial-interglacial changes in the Bering Sea. Heidi-Elisabeth Hansen (Exp. 305) probed processes in the deep Earth through drilling of the Oceanic Core Complex Formation in the central Atlantic, whereas Jan Sverre Laberg (Exp. 333) sailed onboard *Chikyu* studying submarine slides off the Japanese continental margin. Bjørn Olav Steinsbu searched for life in the deep sub-seafloor biosphere as a microbiologist on both Exp. 301 at Juan de Fuca and 329 at the South Pacific Gyre. And even now, Steffen Leth Jørgensen, a PhD student from the Centre for GeoBiology at the University of Bergen is taking part in Expedition 336, Mid-Atlantic Ridge Microbiology.

Helga F. Kleiven (ESSAC alternate), Nalan Koc (ESSAC delegate) and Øyvind Pettersen, (ECORD Council delegate)

Achim Kopf

Deep Sea and Sub-Seafloor Frontier (DS^{3}F) Progress report

Achim Kopf and Catherine Mével

Catherine Mével

The Deep-Sea and Sub-Seafloor Frontier (DS^{3}F) project, funded by the European Commission (EC), provides a pathway towards sub-seafloor sampling strategies for enhanced understanding of deep-sea and sub-seafloor processes and sustainable management of oceanic resources on a European scale. It will connect marine research in life and geosciences, climate and environmental change, with socio-economic issues and policy building. The main objectives of this EC Coordination Support Action (CSA) are (1) the development and most efficient use of subseafloor sampling techniques and existing marine infrastructure to study the geosystem, its effects on the deep biosphere and marine ecosystems, (2) the establishment of state-of-the-art research goals in each field (*i.e.* work package) for the next decade(s) of deep-sea science by bringing together the leading experts in Europe at workshops, (3) to identify links to both industry and society to maximise the outcome of the CSA, and (4) to provide, as the final product, a comprehensive "white paper" for a sustainable use of the oceans and a Maritime Policy.

Since the launch of the project in January 2010 *(see ECORD Newsletter #13)*, substantial progress has been made. Scientific **work packages** (WP) **1 to 6** have organised an *ad-hoc* workshop and produced a report identifying the key scientific questions to address during the next 15 years. Scientists from the ECORD community were heavily involved in these activities. All six work packages have stressed that access to the sub-seafloor is crucial and have identified specific technological requirements for their future research. These requirements were passed to WP7, concerned with 'mission-specific sub-seafloor sampling' technology at and beneath the seafloor.

Work package 7 is led by Catherine Mével (IPGP, France) and Maria Ask (Luleå Technical University, Sweden) and aims to gather experts from many European countries to sketch a roadmap for emerging technological needs of marine researchers in general, and the deep-sea drilling community in particular. As an initial step, a workshop was organised in which 25 scientists and engineers from seven European countries and two non-European countries (Russia and USA) participated. The workshop was held in Grenoble (France) in February 2011 *(photo)*, a location and date chosen to allow a joint session with the IODP Engineering Development Panel (EDP), an international group of about 25 international drilling experts and engineers.

The **general objectives** of the DS^{3}F workshop were (1) to review the state-of-the-art for scientific sub-seafloor sampling, (2) to recognise critical technological needs for improving sub-seafloor sampling and (3) to identify key areas where substantial European engineering development is likely to materialise, including technology transfer.

The **first objective** was achieved by inviting key expertise and by organising the workshop as a mix of presentations and discussions under the seven key technology areas for sub-seafloor sampling identified prior to the meeting: drilling technologies, sea-bed drills, long piston coring, downhole logging and petrophysics, high temperature conditions and monitoring and borehole instrumentation.

The **second issue**, the critical technological requirements to achieve the emerging scientific goals in deep-sea research, was discussed in the context of work packages 1-6 covering lithosphere-biosphere interaction, ecosystems at the sediment-water interface, the deep biosphere, marine resources, sediment dynamics, geofluids and gas hydrates, and climate change. The **needs** include: improved core recovery and quality in the upper 100 m below the seafloor, including the water-seafloor interface, deeper boreholes, development of uncontaminated coring and sampling methods, better *in-situ* pressure cores, improved downhole logging, monitoring and drilling capabilities. Examples of the latter are improved abilities to perform geotechnical *in-situ* tests, sample gas, pore water, and water flow, and development of multi-instrumented corers.

Concerning the **third objective**, substantial European engineering development has been achieved in four areas that should be further pursued: (1) sea-bed drills should be refined to expand their operational depths and improve their logging capabilities, (2) simple and affordable, but yet very functional long-term instrumentation of shallow holes should be further developed. They should be ready to be employed from different platforms such as sea-bed drills, (3) pressure sampling and high-temperature tools should be further developed to preserve *in situ* conditions for microbiology samples. Developers of high-temperature tools should develop collaboration with the geothermal industry on Iceland and (4) long-piston coring tools should further be improved in terms of core quality as well as capability of collecting large volumes of material.

Strategies for transferring technology developments to and from the European scientific community were discussed within the development of the next international scientific drilling programme (*e.g.* the role of ECORD in the post-2013 IODP, but also ICDP, of which representatives participated in the workshop), as well as within the future EU funding structure. The latter could either mean that projects related to DS^{3}F topics could be realised during the next framework programme 'Horizon 2020', or that a 'Drilling & Logging Research Infrastructure' is established within ESFRI. It will be one of the utmost concerns of DS^{3}F during the remainder of the project until mid-2012 that key elements of deep-sea drilling and sub-seafloor sampling and measurements will be incorporated into the DS^{3}F white paper.

DS^{3}F Report continued on page 19

Rüdiger Stein

Challenges in Arctic Ocean Drilling

Rüdiger Stein

In spite of the critical role of the Arctic Ocean in climate evolution, this region is one of the last major physiographic provinces of the Earth where understanding of the short- and long-term paleoceanographic and paleoclimatic history through late Mesozoic-Cenozoic times, as well as the plate-tectonic evolution, is well behind that of other oceans. As a result, the data base we have from this area is still very weak, and large parts of the climate history have not been recovered at all in sedimentary sections *(Figure 1)*. Most of the available information on the paleoenvironment of the early Arctic is derived from petroleum exploration drill holes from the Arctic marginal seas and DSDP and ODP drill cores from sub-arctic regions. Direct information from sediment cores derived from the central Arctic Ocean, however, were restricted to a very few short sections - at least prior to the IODP-ACEX drilling campaign in 2004. This lack of knowledge is mainly caused by the major technological/logistical problems in reaching this permanently ice-covered region with normal research vessels, and in retrieving long and undisturbed sediment cores.

With the Arctic Coring Expedition - ACEX IODP Expedition 302, the first IODP mission-specific platform (MSP) expedition implemented by the ECORD Science Operator (ESO) in 2004, a new era in Arctic research has begun *(Backman, Moran, Mayer, McInroy et al., 2006)*. ACEX proved that, with an intensive ice-management strategy, successful scientific drilling in the permanently ice-covered central Arctic Ocean is possible. ACEX is certainly a milestone in Arctic Ocean research and yielded some surprising discoveries such as:

(1) The middle/early Eocene Arctic Ocean surface-water was warm with temperatures as high as about 20-25 °C, indicating a much lower equator-to-pole temperature gradient than previously believed *(Sluijs et al., 2006; Weller and Stein, 2008)*,

(2) The Eocene Arctic Ocean acted as one of the largest freshwater bodies on the planet, allowing e.g. blooms of freshwater plants to a scale that it possibly could have affected, and or even driven Earth's nutrient and carbon cycling *(Brinkhuis et al., 2006)*,

(3) ACEX results push back the date of onset of northern hemisphere glaciation and/or sea ice to about 46-47 Ma and suggest that the Earth's transition from the greenhouse to the icehouse world was bipolar, which may point to greater control of global cooling linked to changes in greenhouse gases in contrast to tectonic forcing *(Backman, Moran, Mayer, McInroy et al., 2006; Moran et al., 2006; St. John, 2008; Stickley et al., 2009)*.

Despite the success of ACEX, major key questions related to the climate history of the Arctic Ocean and its long- and short-term variability during Mesozoic-Cenozoic times cannot be answered from the ACEX record due to the partly poor core recovery and, especially, a major mid-Cenozoic hiatus *(Figure 1)*. This hiatus

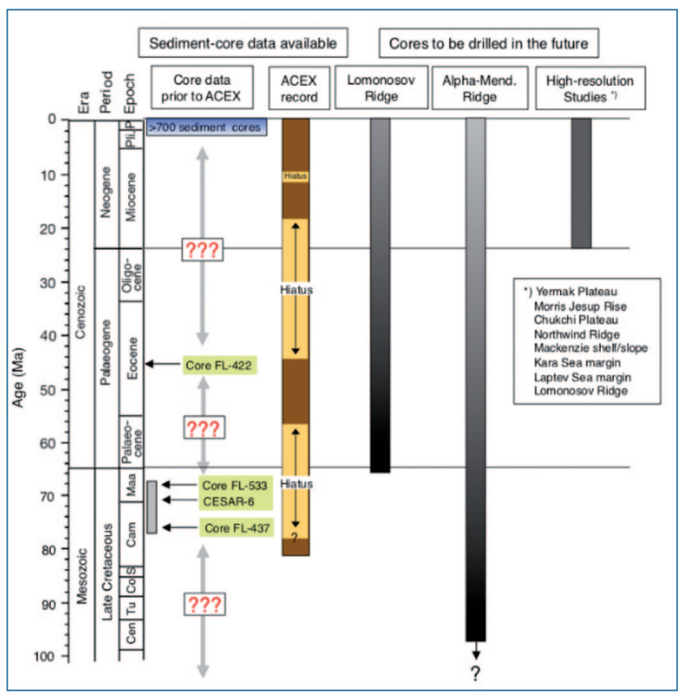


Figure 1: Stratigraphic coverage of existing cores from the Alpha Ridge (central Arctic Ocean) prior to ACEX and the section recovered during the ACEX drilling expedition, and stratigraphic coverage and key locations of sites to be drilled in the future (from Stein, 2008, 2011, and further references therein).

just spans the critical time when prominent changes in global climate took place during the transition from the early Cenozoic greenhouse world to the late Cenozoic icehouse world *(Figure 2; Zachos et al., 2008)*. The success of ACEX has certainly opened the door for further scientific drilling in the Arctic Ocean. The ACEX results will frame the next round of questions to be answered from new drill holes to be taken during a series of drilling legs.

Following the ACEX expedition, a workshop on "Arctic Ocean History: From Speculation to Reality" was held in Bremerhaven/ Germany in November 2008 to develop a scientific drilling strategy for investigating the tectonic and paleoceanographic history of the Arctic Ocean and its role in influencing the global climate system *(Coakley and Stein, 2010)*. Key objectives were discussed, and key locations to drill were indentified *(Figure 3)*.

Major scientific themes for future Arctic drilling will include:

- The Arctic Ocean during the transition from greenhouse to icehouse conditions and millennial-scale climate changes,
- Physical and chemical changes of the evolving polar ocean and Arctic gateways,
- Gas hydrates and permafrost,
- Land-ocean interactions,
- Tectonic evolution and birth of the Arctic Ocean Basin: Arctic ridges, seafloor spreading, and global lithosphere processes.

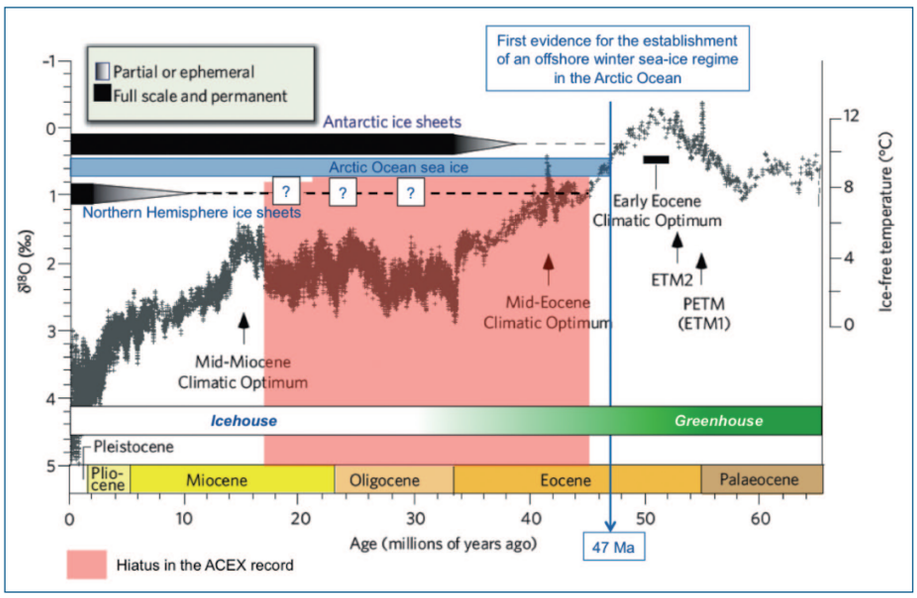


Figure 2: A smoothed global benthic foraminifer $\partial^{18}O$ time series showing the long-term cooling and the Greenhouse/Icehouse transition through Cenozoic times (Zachos et al., 2008, supplemented). The occurrence of Cenozoic glaciations on the Northern and Southern Hemisphere and Arctic sea ice are shown (Zachos et al., 2008; Stickley et al., 2009). The hiatus in the ACEX record is indicated. (from Stein, 2011, and further references therein).

When thinking about future Arctic drilling, it should be clearly emphasised that for precise planning of any future Arctic Ocean drilling campaigns, including site selection, evaluation of proposed drill sites for safety and environmental protection aspects, etc., comprehensive site-survey data are needed first. The development of a detailed site-survey strategy is therefore a major challenge for the coming years. To proceed with more concrete planning of future Arctic expeditions, further workshops will be carried out in the near future:

(1) Overcoming barriers to Arctic Ocean scientific drilling: the site survey challenge, in Copenhagen, Denmark, November 1-3, 2011; Convenor: Naja Mikkelsen - *nm@geus.dk*

(2) Coordinated Scientific Drilling in the Canadian Beaufort Sea: Addressing Past, Present and Future Changes in Arctic Terrestrial and Marine Systems, Kananaskis, Alberta, Canada, February 12-15, 2012; Convenor: Matt O'Regan - *oreganm1@cardiff.ac.uk*

Within the current phase of IODP, ECORD is the platform provider for MSPs, and the ACEX drilling was certainly one of the most successful IODP drilling projects, as partly described above. In a new phase of scientific drilling post-2013, ECORD would like to continue to lead the future sub-seafloor investigation of the Arctic through scientific drilling. As ocean drilling is very expensive in general, but especially in ice-covered regions, and having in mind the reality of shrinking science budgets in an unstable global economy, European research-industry partnerships in drilling related to environmental impact and resource assessment may be a useful approach for future drilling in the Arctic. A first step forward in this direction was the recent 3P (Polar Petroleum Potential) Arctic Conference & Exhibition held in Halifax, Canada *(see page 4)*. At this conference, which focused on petroleum geology and exploration of circum-Arctic basins, a special session related to past and future ECORD drilling activities was scheduled. Presentations from academia and industry were given during the session, summarising the different interests of both groups. Hopefully the event may act as a nucleus for further discussion rounds and future joint ventures in Arctic Ocean drilling.

I finish this short contribution on the challenges of future Arctic Ocean drilling with a statement given by Catherine Mével (EMA Director): "The seafloor of the Arctic Ocean is still largely unknown territory. The one IODP expedition implemented by ECORD provided very exciting results and the scientific community is pushing to acquire new data. This interest is obviously shared by industry to which the Arctic is one of the last frontiers. The mission-specific platform concept developed by ECORD within IODP is particularly appropriate to build joint projects on specific scientific targets

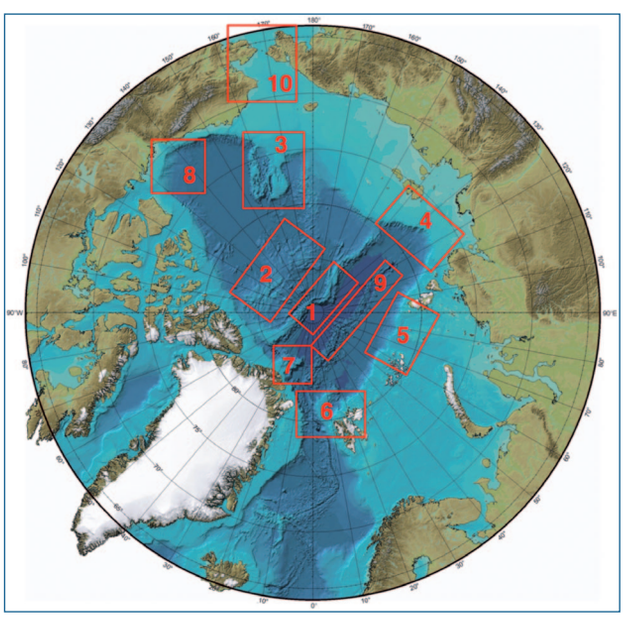


Figure 3: Key areas for future drilling areas in the Arctic Ocean (from Stein 2011, based on Coakley and Stein, 2010; bathymetric map according to Jacobsson et al., 2008).
1: Lomonosov Ridge; 2: Alpha-Mendeleev Ridge; 3: Chukchi Plateau/Northwind Ridge; 4: Laptev Sea continental margin; 5: Kara Sea continental margin; 6: Fram Strait/Yermak Plateau; 7: Morris Jesup Rise; 8: Mackenzie shelf/slope; 9: Gakkel Ridge; 10: Northern Bering Sea/Bering Strait area.

and the ECORD Science Operator has demonstrated its 'know how' for drilling in ice-covered areas. The ECORD Council will favour all initiatives to jointly fund operations and advance knowledge of this remote area. The mutual interest is there, and working together will help us progress faster and more effectively." (taken from the brochure entitled "Scientific Drilling in the Arctic", prepared by Dayton Dove and Sasha Leigh, UK-IODP).

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References

• Backman, J., Moran, K., McInroy, D.B., Mayer, L.A., and the Expedition 302 Scientists (incl. R. Stein), 2006. Proc. IODP, 302: Edinburgh (Integrated Ocean Drilling Program Management International, Inc.), doi:10.2204/iodp.proc.302.2006

• Brinkhuis, H., Schouten, S., Collinson, M.E., Sluijs, A., Damsté, J.S.S., Dickens, G.R., Huber, M., Cronin, T.M., Onodera, J., Takahashi, K., Bujak, J.P., Stein, R., van der Burgh, J., Eldrett, J.S., Harding, I.C., Lotter, A.F., Sangiorgi, F., Cittert, H.v.K.-v., de Leeuw, J.W., Matthiessen, J., Backman, J., Moran, K. and the Expedition 302 Scientists, 2006. Episodic fresh surface waters in the Eocene Arctic Ocean. Nature, 441(7093): 606-609, doi:10.1038/nature04692

• Coakley, B. and Stein, R., 2010. Arctic Ocean Scientific Drilling: The Next Frontier. Scientific Drilling 9, 459, doi:10.2204/iodp.sd.9.09.2010

• Jakobsson, M., Macnab, R., Mayer, L., Anderson, R., Edwards, M., Hatzky, J., Schenke, H. W. and Johnson, P., 2008. An improved bathymetric portrayal of the Arctic Ocean: Implications for ocean modeling and geological, geophysical and oceanographic analyses . Geophys. Res. Lett. 35 L07602, doi:10.1029/2008GL033520

• Moran, K., Backman, J., Brinkhuis, H., Clemens, S.C., Cronin, T., Dickens, G.R., Eynaud, F., Gattacceca, J., Jakobsson, M., Jordan, R.W., Kaminski, M., King, J., Koc, N., Krylov, A., Martinez, N., Matthiessen, J., McInroy, D., Moore, T.C., Onodera, J., O'Regan, M., Pälike, H., Rea, B., Rio, D., Sakamoto, T., Smith, D.C., Stein, R., St John, K., Suto, I., Suzuki, N., Takahashi, K., Watanabe, M., Yamamoto, M., Farrell, J., Frank, M., Kubik, P., Jokat, W. and Kristoffersen, Y., 2006. The Cenozoic palaeoenvironment of the Arctic Ocean. Nature, 441(7093): 601-605, doi:10.1038/nature04800

• Sluijs, A., Schouten, S., Pagani, M., Woltering, M., Brinkhuis, H., Damsté, J.S.S., Dickens, G.R., Huber, M., Reichart, G.-J., Stein, R., Matthiessen, J., Lourens, L.J., Pedentchouk, N., Backman, J., Moran, K. and the Expedition 302 Scientists, 2006. Subtropical Arctic Ocean temperatures during the Palaeocene/Eocene thermal maximum. Nature, 441(7093): 610-613, doi:10.1038/nature04668

• St. John, K., 2008. Cenozoic ice-rafting history of the central Arctic Ocean: terrigenous sands on the Lomonosov Ridge. Paleoceanography 23, PA1S05, doi:10.1029/2007PA001483

• Stein, R., 2008. Arctic Ocean Sediments: Processes, Proxies, and Palaeoenvironment. Developments in Marine Geology, Vol. 2, Elsevier, Amsterdam, 587 p

• Stein, R., 2011. The great challenges in Arctic Ocean paleoceanography, IOP Conf.Series: Earth and Environmental Science 14, 012001, doi:10.1088/1755-1315/14/1/012001

• Stickley, C. E., St John, K., Koc, N., Jordan, R. W., Passchier, S., Pearvce, R. B. and Keasrns, L. E., 2009. Evidence for middle Eocene Arctic sea ice from diatoms and ice-rafted debris. Nature, 460, 376-80, doi:10.1038/nature08163

• Weller, P. and Stein, R., 2008. Paleogene biomarker records from the central Arctic Ocean (IODP Expedition 302): Organic-carbon sources, anoxia, and sea-surface temperature. Paleoceanography 23, PA1S17, doi:10.1029/2007PA001472

• Zachos, J. C., Dickens, G. R. and Zeebe, R. E., 2008. An early Cenozoic perspective on greenhouse warming and carbon-cycle dynamics. Nature, 451, 279-83, doi:10.1038/nature06588

Continued from page 16

Work package 8 addressed 'Infrastructure and synergies" within DS³F and, more generally, the deep sea during two short workshops in Marseille and Vienna. They concentrated mostly on seafloor observatories. This group previously gathered experience concerning EC-funded initiatives (GEOSTAR, ASSEM, ORION-GEOSTAR-3,EXOCET/D and ESONET), and how to transfer those achievements into an ESFRI infrastructure called EMSO-PP (European Multidisciplinary Seafloor Observatory - Preparatory Phase) during FP7. For the next decades of deep-sea research, the WP8 experts identified the need to expand the ESFRI list by having a larger number of coordinated infrastructures such as cabled (NEMO/SN-1, ANTARES and others such as Hausgarten), temporary uncabled in remote areas, and a distributed drilling infrastructure that will allow researchers to couple their instruments more robustly to the ground *(see also WP7 page 16)*. Similar to EC initiatives such as EuroFleets, where ship time is managed between member (and even non-member) countries, precious observatory components may become available to a larger group of scientists if organised as an RI on the ESFRI list.

The outcomes of all these workshops (WP1 to 8) will be combined at an overarching meeting to be held in Brussels this Fall, as a major step towards the writing of the road map.

To finalise and advertise the road map developed by DS³F, a **major conference** will be held in Sitges, Spain, in March 2012 *(right)*. Active participation of the ECORD community will be vital.

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