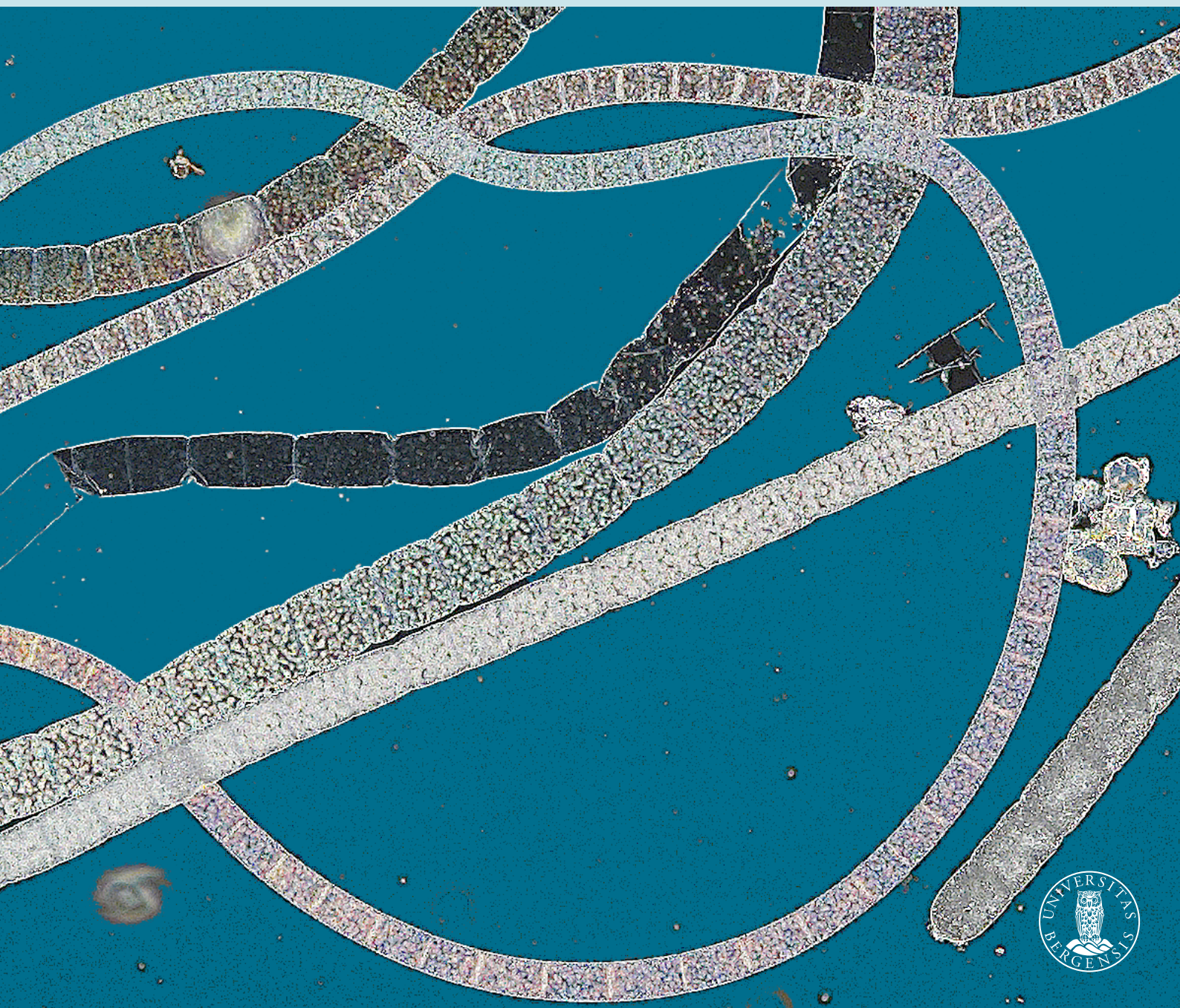
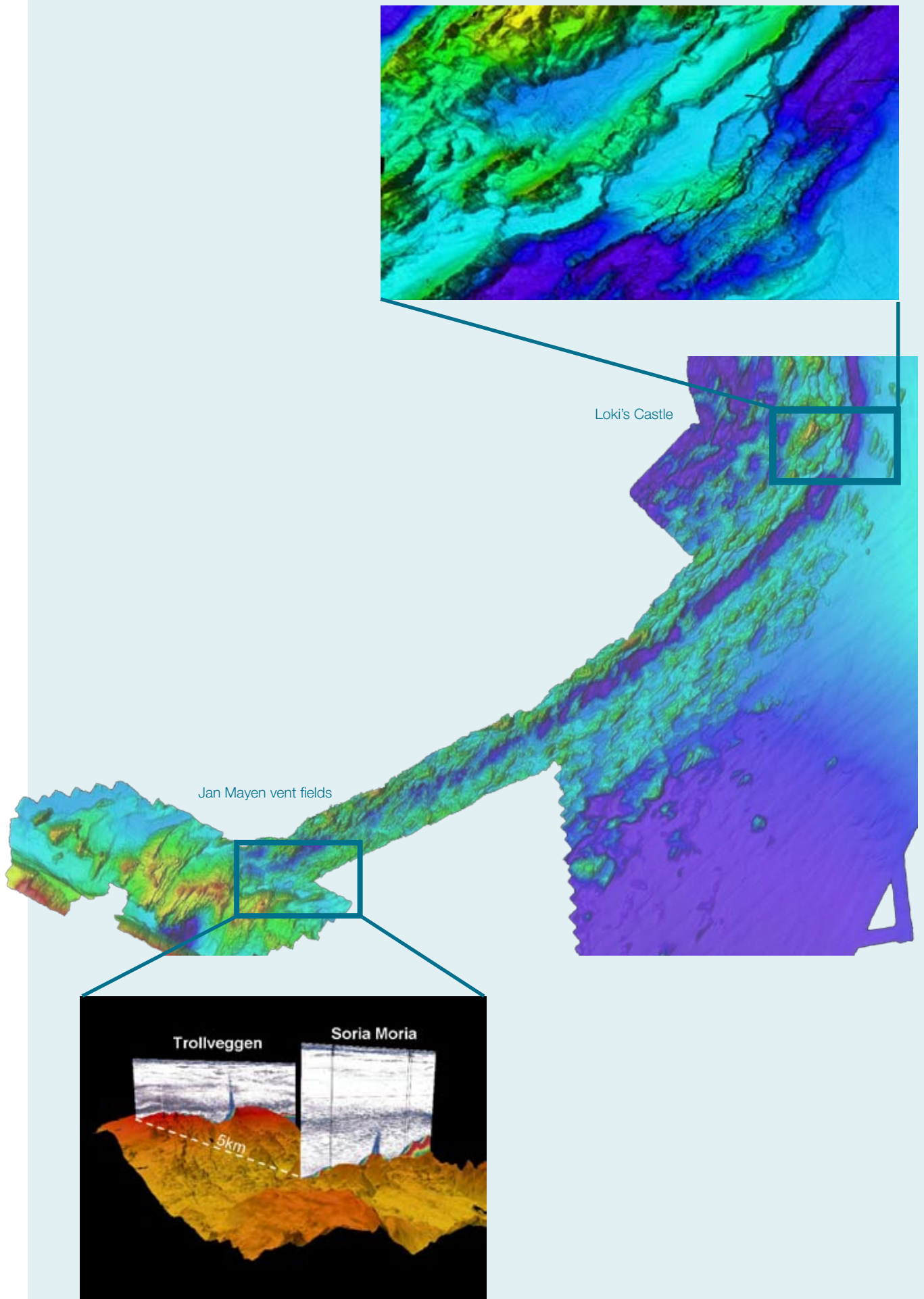


Annual Report 2008

Deep Seafloor • Deep Biosphere • Deep Time & Roots of Life





2008 was a year of discovery

Researchers at the Centre for Geobiology (CGB) had very promising field activities in 2008: at sea and on land. They have also had successes developing new strategies in the lab.

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First of all – at sea: after three weeks, determination and excitement turned to disappointment and frustration and then to discovery and success! For everyone

onboard *G.O. Sars* it was a lesson in the nature of scientific research. July 25th a press release was sent to say that Loki's Castle had been discovered along the Arctic Mid-Ocean Ridge at 73°N. It is the first black smoker vent field to be visited along an ultraslow spreading ridge. The discovery was reported widely in national and international news media.

This discovery raises new research questions. Why were the vent fluids so rich in hydrogen and methane? Was the rich fauna observed at the vent site a distinct Arctic fauna – different from what has been observed elsewhere? Why were the sulphide deposits unusually large? For the students onboard and for the teachers involved in a "Teacher at Sea Program", this was science in action – lesson number two!

At the same time, on the other side of the globe, another group of CGB researchers was preparing to drill into some of the oldest volcanic rocks on earth. Summer 2008 the AEON-CGB Barberton Drilling Program successfully sampled 800 meters of volcanic and sedimentary rocks formed 3.5 billion years ago. Were the oceans at this time boiling hot or freezing cold? This is one of several questions of immense importance to our understanding of early life. Researchers hope that this core may provide some answers.

Loki's Castle and the Barberton Core are new natural laboratories for researchers at CGB. Together with methane seeps and whale falls along the Norwegian coast

and shelf; soda lakes in the African Rift Valley; hydrogen producing serpentinites in Norwegian ophiolite complexes; and the around 2.5 billion year old FARDEEP drill cores, they provide CGB researchers with wealth of material to study.

As these natural laboratories were being explored, another group of CGB researchers worked steadily in our analytical laboratories. They were developing a new precise micro-dating technique that uses laser coupled to a mass spectrometer.

This positions CGB and the Bergen Geo-analytical Facility at the cutting edge of zircon dating. The techniques are of first-order importance for our early earth initiative. In other laboratories micro- and molecular biologists worked systematically towards a common goal: linking metagenomics and metaproteomics to provide new insight to the diversity and functioning of subsurface life and life in extreme environments.

Also, in 2008 the CGB-researchers were extraordinary active in organising workshops and symposia both in Bergen and at international meetings. During last year we initiated and organised 9 workshops and symposia that brought more than 500 scientists together for scientific presentations and discussions of themes central to the CGB science plan.

Finally, and most importantly, over the past year many young, as well as more experienced researchers, have joined the Centre. This growing group of able researchers forms the core of CGB. Presently students and researchers from 14 nations are involved at the Centre, and together with our extensive networks of collaborators, they help to firmly establish CGB as a true international research centre.

Editor

Elinor Bartle

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Rolf Birger Pedersen

Print:

Bodoni AS, www.bodoni.no

Official Opening

On March 11, 2008, one of Norway's newest Centres of Excellence, the Centre for Geobiology (CGB), was officially declared open. Gro EM Helgesen from the Research Council of Norway gave Centre Director, Rolf Birger Pedersen, the official Centre of Excellence plaque.

Helgesen together with Hilde Albech, Are Birger Carlsen and Arvid Hallén represented the Research Council of Norway at the Opening. Following a series of short presentations at UiB's newest lecture hall in ViVite, the invited guests returned to the Centre facilities for tours and demonstrations.

Arvid Hallén, the Administrative Director of the Research Council of Norway, said that the goal in establishing the Centres of Excellence programme in 1999 was to assemble groups of world-class experts in multi-disciplinary centres, provide them with significant funding thus facilitating research advances, as well as generating synergy and trickle-down effects that benefit academic and research milieux locally, nationally and internationally.

UiB Rector, Sigmund Grønmo underlined that such Centres are a very important part of the university's strategic planning. He also stressed the importance of research excellence to international visibility. The two departments that support CGB,

the Departments of Biology and of Earth Science, both have a strong international focus.

Hans Petter Sejrup, the Dean of the Faculty of Mathematics and Natural Sciences added that the establishment of CGB underlines Norway's commitment to basic marine research.

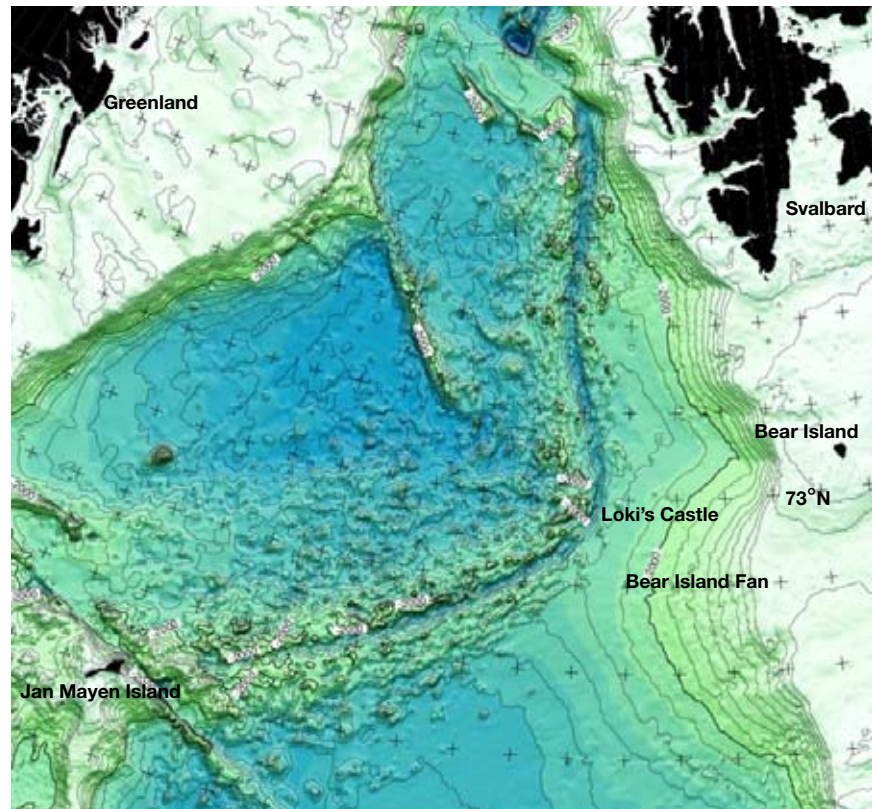
CGB Director, Rolf Birger Pedersen explained that we understand little of the intrinsic biological and geological processes at work on Earth. New frontiers for life are constantly being discovered. In addition, it is becoming increasingly clear that research on geo-bio-chemical processes and the interactions between the geosphere and the biosphere is fundamental for our understanding of Earth's past, present and future.

Pedersen underlined how front-line research at a Centre of Excellence such as CGB is important for development of research-based education, and an important motivational factor in the recruitment of student; the researchers of the future.



(credit:S.U.Hitland)

Map showing Bear Island fan, with sediments extending from the Norwegian mainland, Loki's Castle, Jan Mayen Island and a portion of the Arctic Mid-Atlantic Ridge.



Defining the limits of the continental shelf – CGB to the UN

On 1 July 2008, G.O. Sars is on its way to the Mohns Ridge, gently plowing its bow into the swells of the Norwegian Sea. After an enthusiastic farewell with Tromsø, most of the scientists, students and teachers have suddenly gone quiet - staying in bed with books and biscuits. In the hull of the research vessel the echo sounder system is steadily mapping the seafloor below – generating data that is critically important for defining the limits of the continental shelf.

On 27 November 2006, Norway submitted its claims for extending the boundary of its continental boundary to the Commission on the Limits of the Continental Shelf, in accordance with Article 76 of the United Nations Convention on the Law of the Sea. The claim was based on a wealth of data gathered over years, and included significant contributions from marine geoscientists at the University of Bergen. April 2008 CGB Director, Rolf Birger Pedersen was part of a Norwegian Delegation that travelled to New York to present the scientific data supporting the Norwegian claim.

The Commission was not entirely convinced, so Pedersen had the task of collecting more data. The research cruise of summer 2008 provided an opportunity to gather the last pieces of information needed to prove to the Commission that Norwegian territorial claim should include the Bear Island Fan, a large submarine structure composed of continental sediments deposited as the glaciers of the last Ice Age melted. It stretches westward into the deepsea.

On 3 July, when G.O. Sars reached its destination at 73°N 8°E the final piecing of evidence had been gathered. The ship's sub-bottom profiling system had imaged large underwater landslides at the distal parts of the Bear Island Fan, showing that sediments from Norwegian shelf were indeed transported far out on the abyssal plane and to the mid-ocean ridge at this latitude. The new data was presented to the Commission at a meeting of the United Nations in September 2008. Finally, it appears that there are sufficient convincing scientific arguments. It is now expected that the Norwegian claim will be accepted when the Commission on the Limits of the Continental Shelf convenes in 2009.

In August 2009, scientist and students from CGB will be back at 73°N 8°E revisiting Loki's Castle. By then, this amazing black smoker vent field, which towers at the top of a majestic submarine volcano, may have become a part of Norway.

Field Activities 2008

Field activities are a critical part of CGB's activities. In the field researchers collect data to support or disprove ideas they are working on. Successive field trips allow the researchers to build up clearer pictures of the geology, the biology and the geobiology of the area in question. Two major field initiatives are highlighted here.

South African drilling expedition

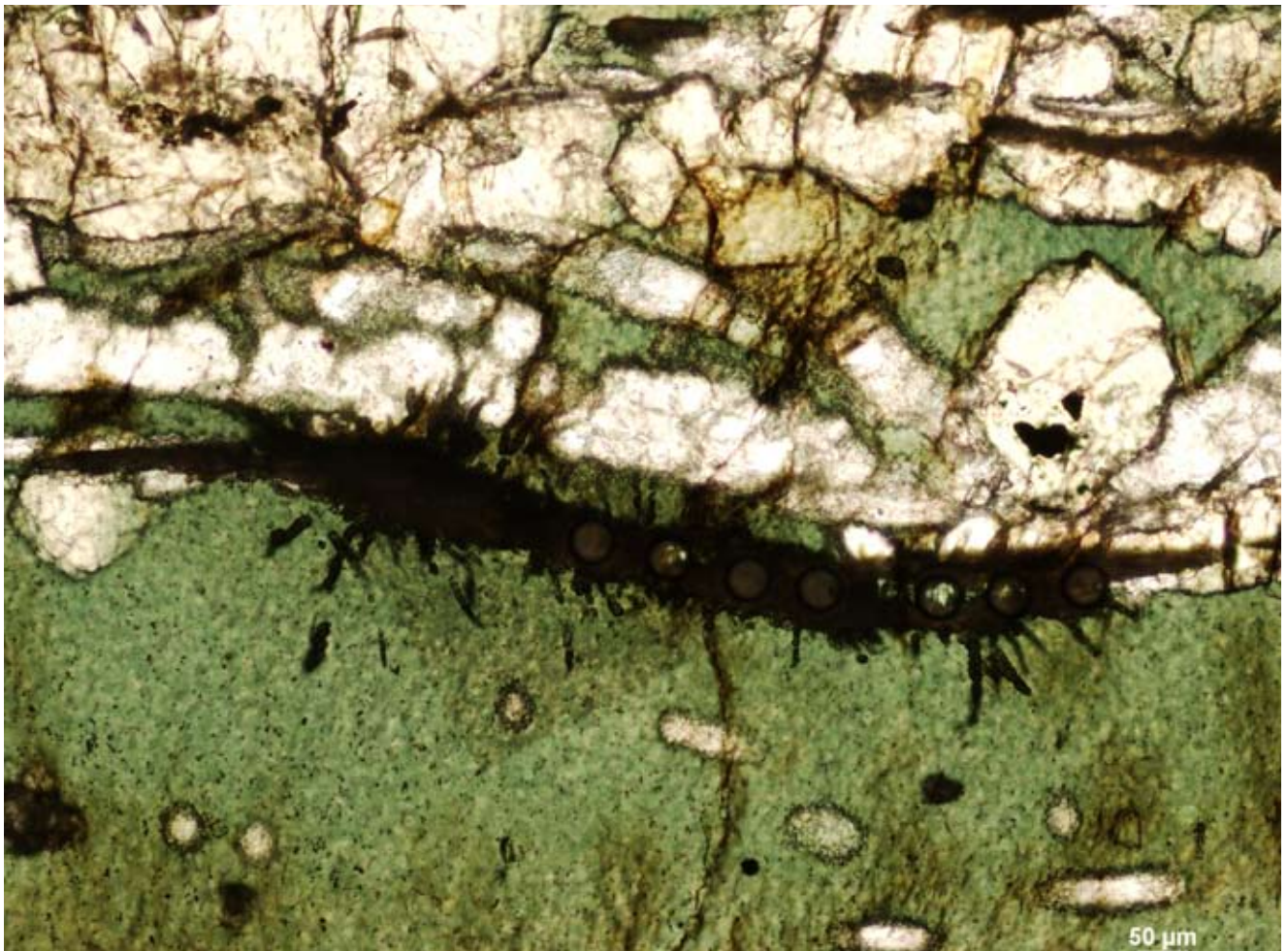
November 2008, 90 boxes with 800m or 2.5 tonnes of core material arrived in Bergen ready for archiving. Once archived, this material represents a unique resource for many different kinds of studies for years to come.

The core was drilled summer 2008 when scientists from CGB and their colleagues from AEON (Africa Earth Observatory Network) at the University of Cape Town successfully undertook a drilling expedition in the Barberton Mountain land in South Africa.

Perhaps the most important aspect of any drilling operation is the description and measurement of the rock as it comes out

of the ground. Firstly, this allows verification of the kind of rock material being accessed. Secondly, the logging and labelling of the giant jigsaw puzzle of hundreds of meters of rock allows it to be fitted together again back at the lab.

The nearly continuous recovery of rock that is c. 3.5 billion years old and its pristine, un-weathered condition provides CGB with a unique resource that will allow researchers to reconstruct a detailed history of the evolution of life and environments on the earliest earth. Only with drilling at depths in excess of tens of meters is it possible to access material that has undergone a minimal amount of contamination by the biological and chemical activities at the surface.



Molecular fossils or biosignatures of life. (credit N. McLoughlin)



Loki's Castle (bottom left) vents near Jan Mayen (top) and recovery of an incubator set out in 2006.

Research cruise 2008

CGB researchers formed the core of three international teams of multi-disciplinary experts that headed out to some of the most dramatic landscapes on earth-mid-ocean ridges. This summer's discovery proved conclusively that ultra-slow spreading does not mean in-active. Many years persistent searching paid off with the discovery of an arctic "black smoker". The vent, Loki's Castle, may be associated with one of the largest hydrothermal mineral deposits yet found in the deep sea.

The second portion of the research cruise headed to the previously located vent fields off Jan Mayen Island where long-term incubators set out in 2006 were recovered with their treasure troves of unique material and data that will reveal information about the relatively unknown and unexplored geobiology of hydrothermal vents. More incubators were set out to gather data that will elucidate valuable information about the unusual fauna that exists in unique communities in this extreme and inhospitable environment.

The data collected this summer will reveal new information about vent geobiology and geochemistry. Evidence is also accumulating that indicates that these northern vents may be associated with a unique and unknown macro-biological community, quite unlike that associated with the Pacific vents or even the vents south of the Azores in the Atlantic. CGB researchers are working to identify and characterise these new organisms.

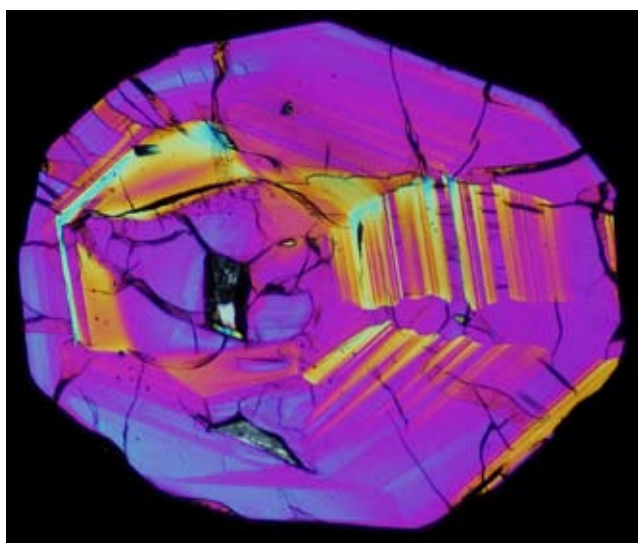
The third portion of the cruise and the final major field activity of the summer went to cold methane seeps at Nyegga on the continental margin. It is important to learn more about these methane gas-hydrate accumulations and to understand more about the dynamics and impact of their presence on the sea floor.

Development of analytical facilities and techniques...

Research at CGB uses a spectrum of analytical facilities and techniques ranging from molecular biology and isotope geochemistry to remotely operated robots used to explore and sample extreme environments in the deep sea. Some of these facilities and techniques were already available to Centre researchers; others needed to be developed. In 2008 we focused on establishing new Geomicrobiology and Biogeochemistry laboratories, and these now represent key facilities for the interdisciplinary research at the Centre. In addition we carried out a major upgrade of the ICP-laboratory to advance our age dating capabilities.

Zircon dating at the ICP-MS lab

Last year was very busy but also very productive for the analytical laboratories associated with CGB. The Centre has appointed several new scientists and postdoctoral researchers that significantly contributed to the development of new analytical techniques and their applications in geobiology. It is expected that in the coming years, this activity will continue and will result in improvements of our analytical capabilities to study natural processes in geo- and bioenvironments.



Development of new in-situ geochronological techniques

The multicollector ICP mass spectrometer at the Bergen Geoanalytical Facility (BGF) has been recently upgraded with an array of sensitive channeltron detectors that allow for simultaneous acquisition of up to 8 isotopes. The “killer application” of this detector configuration is in-situ laser ablation U-Th-Pb dating of grains of accessory minerals with complex crystallization histories. Parts of zircon as small as 2000 μm^3 containing picogram amounts of radiogenic Pb have been successfully dated with geologically useful precision. It is expected that the technique will prove valuable for deciphering ages of titanite in biotextures, complex zircons from Proterozoic and Archaean rocks as well as very young accessory minerals.

Furthermore, CGB initiated development of a new calibration material for in-situ laser ablation dating and Hf isotopic analysis of mineral zircon (Sláma et al. 2008, Chem Geol 249, 1-2, 1-35). The newly-characterized natural zircon standard has now been distributed to over 70 laboratories worldwide and has become a generally accepted calibration material in laser ablation ICP-MS analysis.

A Plešovice zircon crystal seen in cross-polarized light and showing typical compositional zoning (credit Jiri Slama).



View of unknown microbes from a sample being screened aboard ship summer 2008.

Geomicrobiology Laboratory

Early in 2008, the final pieces of equipment were placed in CGB's geo-chemical microbial lab facility. The range of equipment in the new lab means that researchers can take samples collected in the field, the deep sea for example, and undertake a vast array of experimental protocols with them. They aim to determine the diversity and functioning of the unique microbial communities in the extreme environments that CGB is studying. Working closely with bioinformaticians, CGB researchers are coupling together different kinds of genomic data that will aid in the achievement of this goal.

The lab, in many ways, is the heart of the trans-disciplinary activity of the Centre: geochemists, microbiologists, geologists, geobiologists, bioinformaticians all work side by side. The close

proximity of so many different researchers and approaches is already yielding interesting synergy effects. With so much excellent environmental sample material already collected and such a broad range of scientific expertise, the results from this lab are going to be exciting.

In particular, researchers are currently undertaking detailed molecular studies such as enumeration of microorganisms in the samples, as well as functional studies of the sample material. In depth investigations of the physiology of selected model organisms is also in progress. The co-location this new facility near to geochemical labs facilitates integrated geo-microbial studies. Special efforts are being taken to integrate metagenomic, metatranscriptomic and metaproteomic data.

Workshops and symposia...

Hydrogen-based deep biosphere (H2Deep), Bergen, May 2008

CGB hosted the annual H2Deep workshop at Solstrand. The H2Deep project is led by CGB and is one of eight international projects organised by the European Science Foundation (ESF) as part of the EUROMARC program. The national research councils of Norway, Switzerland, Portugal and France fund the project. The project objective is to search for a potential hydrogen-based deep biosphere using the sedimented, ultraslow spreading Knipovich Ridge in the Norwegian-Greenland Sea as a target area. At Solstrand, the participants from the four countries presented the scientific basis for the project and discussed strategies and sub-goals for this new project.



The 9th European Laser Ablation Workshop, Prague, July 2008

The Workshop provided a forum to discuss the progress of laser ablation and laser assisted spectroscopy. It was jointly organized by CGB at UiB and Czech Geological Survey in the Brevnov Monastery in Prague. It was attended by over 150 researchers and students from more than 20 countries. The main theme was to discuss the outstanding problems in laser ablation and laser assisted spectroscopy. Recent progress in using lasers for sampling materials for spectroscopic analysis, better understanding of the laser-sample interactions, improvements in aerosol transport and increasingly better detection capabilities of analytical instruments resulted in growing number of applications of laser ablation in environmental, Earth and material sciences. The meeting provided ample opportunities for discussion both inside and outside the auditorium and provided an opportunity for both new and experienced researchers to mingle and exchange their ideas.

IGC in Oslo, August 2008:

Scientists from CGB led four symposia at the 33d International Geological Congress which was held in Oslo, August 2008.

(i) Geomicrobiology: Low-temperature alteration, mineralization, and microbial interactions.

Convenors: Ingunn H. Thorseth (CGB, University of Bergen) and Crispin Little (University of Leeds).

The importance of microorganisms in many surface and subsurface geochemical processes (e.g. rock weathering, diagenesis, hydrothermal activity) is widely recognized. However, further extensive interdisciplinary research effort is required to fully explore and evaluate these processes. The objective of this session was to present the latest results and approaches in linking water-rock geochemical reactions and microbial processes. Contributions ranged from field studies of different environments (subaeric, freshwater, marine), laboratory experiments and modeling.

(ii) General Contributions to Biogeoscience

Convenors: Bjarte Hannisdal and Nicola McLoughlin (CGB, University of Bergen)

The interaction of biological and geological processes is at the heart of Earth System Science. Such interactions occur at a range of scales: from microbial cells in pore fluids to global biogeochemical cycles, and from metabolic reaction kinetics to the co-evolution of life and our planet over billions of years. This symposium invited interdisciplinary contributions encompassing geomicrobiology, geochemistry, petrography, palaeontology and numerical modelling to address key questions in the Biogeosciences. It thus became an eclectic symposium with a broad spectrum of contributions ranging from planetary thermodynamics to modern microbial mats and arctic biogeochemistry. A highlight of session were the invited keynote speeches, which were broad ranging and accessible, and the poster session facilitated extensive discussions among participants.



Macro-biology near the Jan Mayen vents.

(iii) New developments in microbeam techniques

Convenors: Jan Kosler (CGB, University of Bergen), John Hanchar (Memorial University of Newfoundland) and Martin Whitehouse (Swedish Museum of Natural History)

The symposium summarized some of the recent advances in micro-analytical techniques, including laser ablation ICP-MS, accelerator, electron and x-ray microbeam analysis that have opened new possibilities to study elemental and isotopic variations with previously unmatched spatial resolution, detection capabilities and analytical precision. Contributions in this session included analytical technique development and new applications of microbeam analysis, including elemental concentration measurements, elemental and isotopic mapping and use of microbeam techniques for studying spatial variations in chemical and isotopic composition of geological and environmental materials.

(iv) Life of the early Earth

Convenors: Harald Furnes (CGB, University of Bergen), Maarten de Wit (University of Cape Town), Minik Rosing (University of Copenhagen)

When and how microbial life first appeared on planet Earth and the consequences for rock-water chemical exchange are the subjects of heated scientific debates. How do we recognize the traces of early life in various rock types, and how far back in time can these be reliably traced? In this session we particularly welcome contributions that focus on these questions. Key topics included: early Archean biosphere, meta-volcanic rocks, meta-sedimentary rocks, geochemical cycles and astrobiology.

Astrobiology workshop, Bergen, September 2008

Nineteen students, teachers and supervisors from the Astrobiology Graduate School (AGS) at Stockholm University visited CGB for a joint workshop with the students, post docs and researchers at the centre. The workshop included general presentations of CGB and AGB by their directors, and 20 min. oral presentations of individual research projects by the young PhD students and post docs from both centres. The topics for the presentations ranged from astronomy and astrophysics to geochemistry, molecular biology and geobiology.

The workshop also included a presentation of the planned NASA-Nordic Summer School 2009 and other NordForsk activities in the coming years, i.e. Young Astrobiologist's Meeting 2010.

Geobiology workshop, Bergen, October 2008

The workshop focused on three of CGB's research themes: 1) Water-rock-microbe interactions, 2) Deep biosphere, and 3) Roots of life. A fourth topic "Novel organisms, methods and technologies" was also included. Six internationally highly recognised scientists were invited to give keynote talks. The main research themes at the Centre were introduced by 30-40 min talks by the theme leaders, followed by the invited speakers. Nearly all the 44 participants from CGB contributed with 20 min oral presentations and/or posters. For the students it was a useful, first-time experience. The workshop provided an opportunity to present the diversity of project activities and the broad competencies within CGB as well as its interdisciplinary geo-biosphere focus. There was also ample time for further discussions and exchange of ideas.

AEON-CGB Barberton Early Earth Workshop, Bergen, November 2008

CGB invited researchers from AEON (Africa Earth Observatory Network) at the University of Cape Town to Bergen for a workshop to review what our field observations (from 2003 to 2008) and analytical data from the Barberton greenstones can tell about the construction of the volcanic pile, the chemostratigraphy and petrology, the 3.5 Ga biosignatures in the cherts and pillow lavas, and hydrothermal activity/sea water temperatures during the formation of the sequence. Discussions included publication planning and progress of our data so far. Another significant goal of the workshop was to learn about who will be working on the cores, how to best share analytical facilities and expertise, identify other colleagues and young students for further work and set realistic future targets for completion of work.

A “dumbo” type, deep sea octopod, tentatively identified as *Cirrotheuthis muelleri*, a species believed to be found near vent locations.



Projects

Title	Duration	*Leader/**Partner	Funding
Comparative genomics of <i>Archaeoglobus fulgidus</i> .	2008-2009	Nils-Kåre Birkeland*	UiB/Friforsk
Direct dating of diagenetic processes by in-situ analysis of U-Th-Pb isotopes in authigenic phosphate minerals by laser ablation ICP-MS	2009 – 2012	Jan Kosler*	StatoilHydro
Functional Metagenomics to Study Prokaryotes from Arctic/Sub-arctic Springs of Hydrothermal Origin	2006-2010	Christa Schleper*	NFR
Hidden reservoirs of Biological diversity – geobiology of unexplored endolithic communities associated with lichens	2006 - 2010	Torbjørn Bjelland*	NFR
Integrated Ocean Drilling program (IODP): Norwegian Network and Office	2005 – 2008	Rolf Birger Pedersen*	NFR
Life in the volcanic crust of the early Earth: conditions, timing and depth	2006 - 2009	Harald Furnes*	NFR
Linking Hydrothermal Alteration, Serpentinization, and Fluid Fluxes to Biological Niches at the Knipovich Ridge.	2008-2011	Ingunn Thorseth**, Rolf Birger Pedersen**	ESF/Swiss NSF
Metagenomics and gene discovery in Antarctic terrestrial habitats.	2008-2011	Nils-Kåre Birkeland*	ESF/Swiss NSF
Mikrobiell studie av Kristin/Morvin-feltet	2008-2009	Sigmund Jensen/Nils-Kåre Birkeland*	StatoilHydro
Silicon cell model for the central carbohydrate metabolism of the archaeon <i>Sulfolobus solfataricus</i> under temperature variation.	2007-2011	Christa Schleper*	EU/SysMo (ERA-net) and NFR
SPONGRAM Sponge Risk Assessment and Monitoring	2008 - 2009	Hans Tore Rapp*	StatoilHydro
Sulfide Petrology, Ore Genesis and the Deep Biosphere at Knipovich Ridge	2008-2011	Ingunn Thorseth**, Rolf Birger Pedersen**	ESF/FCT
The deep biosphere of the ocean crust: biomass, diversity, activity and biogeochemical cycles	2008 - 2011	Rolf Birger Pedersen*	NFR
The Emergence of an Aerobic World – Drilling Early Earth Project	2009 – 2012	Victor Melezhibik*	NFR
The Jan Mayen micro-continent - searching for new knowledge on perspectives, basin evolution and sediment provenance	2006 - 2009	Rolf Birger Pedersen*	NFR
Ultra-slow spreading and hydrogen-based biosphere: A site survey proposal for zero-age drilling of the Knipovich Ridge	2008-2011	Rolf Birger Pedersen*	NFR

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Dundas, Siv Hjort
Norheim, Marianne
Ronen, Yuval
Tumyr, Ole

Employees at CGB

■ non-Norwegian¹
■ Norwegian



PERSONNEL SUMMARY

Category	Person-years	Foreigners (%)	Women (%)
Scientists	9,7	30	28
Postdocs	6,2	41	49
PhDs	3,6	50	33
Technicians	3,0	16	51
Administration	1,0	20	100
Total	23,5		

Visiting Scientists

Caves are also a unique window into Geobiology. In caves one finds material that is often pristine and un-touched. It is sub-surface and unweathered and thus can provide us with a unique glimpse into a world where Ramanathan Baskar tells us that the global spheres overlap: the atmosphere, lithosphere, biosphere and geosphere!

Ramanathan and Sushmitha Baskar have been guest researchers at CGB since August 2008. In their native India they have combined their joint specialisations of geology (Ramanathan) and environmental biology (Sushmitha) to

found the new discipline of Cave System Geomicrobiology.

According to Baskar, India is a land of caves. Most of the over 80 caves are unexplored – providing unique research possibilities. Just as with the other unique unstudied environments being researched at CGB, the geobiological interactions in caves may provide important insights into fundamental biological questions such as the origin of life, primordial environments, biosignatures for life on other planets, new species, potential bio-prospecting resources ...

During their stay the Baskars have been honing their molecular biology techniques. They have been working closely

with the microbiologists and geochemists at CGB and are in the process of publishing results together. Sushmitha says that it has been an incredibly productive period for them. They have also attended a number of workshops and conferences. They and their young son will return to India this spring.



Selected publications 2008

In 2008, CGB researchers published 60 peer reviewed articles in journals and symposia proceedings, and gave 87 presentations with abstracts at international meetings. For a complete listing visit <http://www.geobio.uib.no/Default.aspx?pageid=1088>.

1. Antcliffe, J. **McLoughlin, N.** 2008. Deciphering the fossil evidence for the Origins of Life, Origins of Animals: Common problems in different worlds. In "From Fossils to Astrobiology" M. Walsh and J. Seckbach (eds) Springer, pp 211-229
2. **Baskar S, Baskar R**, Lee N, Kaushik A, Theophilus P.K. 2008. Precipitation of iron in the microbial mats of the spring waters of Borra Caves, Vishakapatnam, India: Some geomicrobiological aspects. *Environmental Geology*, 56: 237-243
3. **Dahle H**, Garshol F, Madsen M, **Birkeland NK**. 2008. Microbial community structure analysis of produced water from a high-temperature North Sea oil-field. *Antonie van Leeuwenhoek*. 93: 37-49
4. **Einen J, Thorseth IH, Øvreås L**, 2008. Enumeration of Archaea and Bacteria in seafloor basalt using real-time quantitative PCR and fluorescence microscopy. *FEMS Microbiol Lett*. 282: 182-187.
5. Engelen B. et al. (**Steinsbu BO**), 2008. Fluids from the oceanic crust support microbial activities within the Deep Biosphere. *Geomicrobiology Journal*, 25: 56-66.
6. Fallick AE, **Melezhik VA**, Simonson B. 2008. The ancient anoxic biosphere was not as we know it. In: Dobretsov, N., Kolchanov, N., Rozanov, A. and Zavarzin, G. (eds), *Biosphere origin and Evolution*. Springer Science Business Media, pp. 169-188
7. **Furnes H, McLoughlin N**, Muehlenbachs, K, Banerjee NR, Staudigel H, Dilek Y, de Wit M, Van Kranendonk M, Schiffmann P. 2008. Oceanic pillow lavas and hyaloclastites as habitats for microbial life through time – a review. In: Dilek Y, **Furnes H**, Muehlenbachs K (eds), *Links between geological processes, microbial activities & evolution of life - microbes and geology*. Springer Science Business Media. pp 1-68
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12. Kleinert M, **Barth T**. 2008. Towards a lignocellulosic biorefinery: Direct one-step conversion of lignin to hydrogen-enriched biofuel. *Energy & Fuels*. 22: 1371-1379
13. **Kosler J.**, 2008. Laser ablation sampling strategies for concentration and isotope ratio analyses by ICP-MS. In: *Laser ablation ICP-MS in the Earth sciences: current practices and outstanding issues* (ed. P. Sylvester), Mineral. Assoc. Can. Short Course Series, 40, 79-92
14. **Kruber C, Thorseth IH, Pedersen RB**. 2008. Seafloor alteration of basaltic glass: Textures, geochemistry, and endolithic microorganisms. *Geochemistry, Geophysics, Geosystems*, 9, 12.
15. **McLoughlin M**, Wilson LA, Brasier MD. 2008. Growth of synthetic stromatolites and wrinkle structures in the absence of microbes – implications for the early fossil record. *Geobiology*, 6: 95-105.



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Public Outreach

CGB was very active in Public Outreach in 2008. There was extensive media coverage of this summer's Black Smoker discovery. A number of deep sea videos were shown in VilVite for Geology Day, September 2008. Filming for two documentaries was part of the summer field activities. The CGB website made it possible for the general public to be virtual participants in this summer's activities (in both Norwegian and English).

The Centre director gave advisory talks to Norway's Oil Ministry, Foreign Ministry and the United Nations. A number of centre researchers were involved in interviews with national news and radio, and wrote popular science articles or gave popular science presentations. (see the full list of publications for more details)

<http://www.geobio.uib.no/Default.aspx?pageid=1088>

TEACHER AT SEA



CGB collaborated with UiB's Skolelaboratorium program, and particularly their Norwegian teacher database to invite applications for participants in last summer's cruises. In all, five teachers were selected to participate on the three different legs. They were responsible for maintaining a daily diary of activities at sea. The internet connection was poor – but the teachers persevered and did a great job!

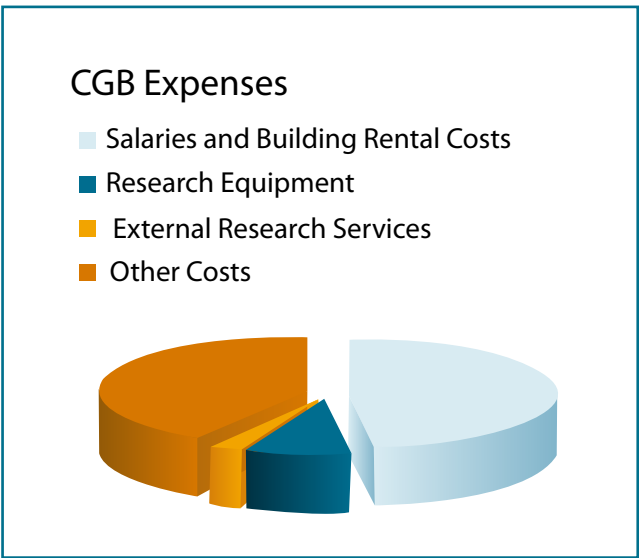
<http://www.geobio.uib.no/field-activities.aspx?pageid=1090>

Annual Accounts

The tables below show funding sources and expenses for 2008.

Funding		(1000 NOK)
Research Council of Norway, CoE		8 656
University of Bergen		14 222
Total		22 878

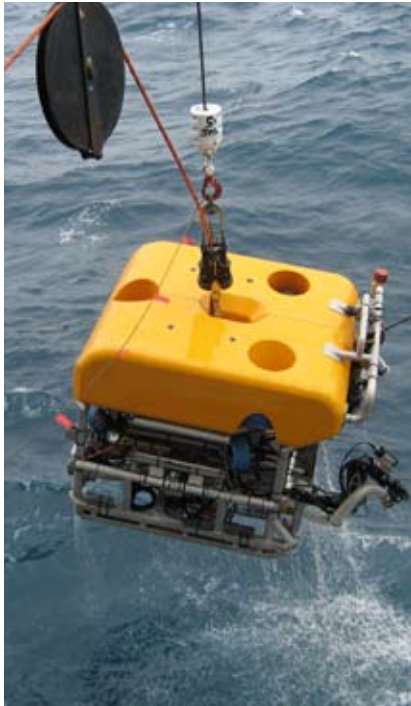
Expenses		(1000 NOK)
Salaries and Building Rental Costs		14 655
Research Equipment		2 287
External Research Services		770
Research and Operating Costs		12 737
Total		30 449



Sunset over the Baberton mountains in South Africa. (credit: N. McLoughlin)

Organisation

The Centre for Geobiology (CGB) is part of the Faculty of Mathematics and Natural Sciences (www.uib.no/matnat) at the University of Bergen and is a collaboration between the Departments of Biology (www.uib.no/bio) and Earth Science (www.uib.no/geo).



SCIENCE ADVISORY COMMITTEE:

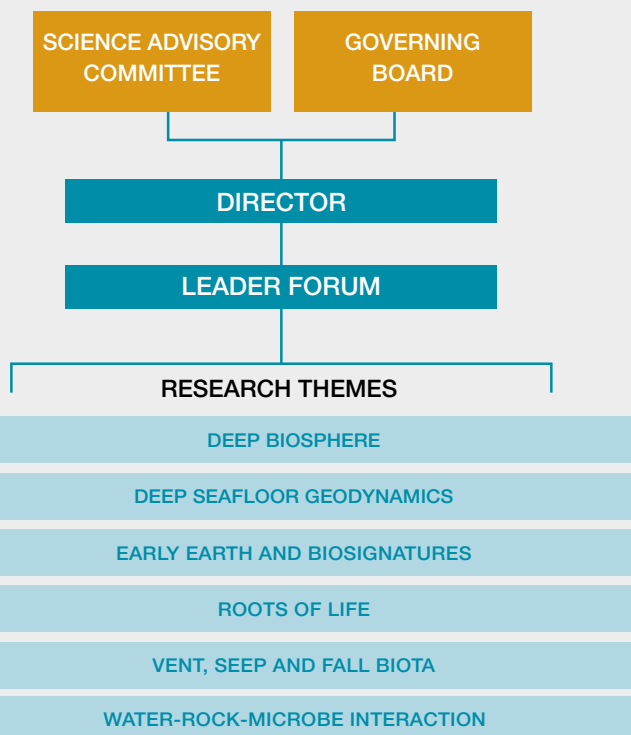
The Scientific Advisory Committee was approved by the Board of The Faculty of Mathematics and Natural Sciences, UiB, in December 2008 and includes the following members:

Antje Boetius	Max-Planck-Institut für Marine Mikrobiologie, Bremen, Germany
Chris German	Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA
Cindy Van Dover	Duke University Marine Laboratory, Beaufort, North Carolina, USA
Frances Westall	Le Centre de Biophysique Moleculaire, CNRS, Orléans, France

THE GOVERNING BOARD:

Geir Anton Johansen (chairman)	Vice Dean of The Faculty of Mathematics and Natural Sciences, UiB
Olav Eldholm	Head of Department of Earth Sciences
Jarl Giske	Head of Department of Biology
Kristen Haugland	Director of the Department of Research Management
Bjarte Hannisdal	Employee representative Department of Earth Sciences (substitute: Ingunn Thorseth),
Ida Helene Steen	Employee representative Department of Biology (substitute: Jørn Einen)

ORGANISATION MAP





The volcanic island of Jan Mayen



Bacterial mats on vents near Jan Mayen

CGB - Centre for

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Geobiology

Annual Report 2008