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Geoviten-ekstern er Institutt for geovitenskap ved Universitetet i Bergen sitt eksterne nyhetsblad og utgis en gang pr. måned. Geoviten-ekstern kan også leses fra vår eksterne nettside: [www.uib.no/geo](http://www.uib.no/geo)  
Gunn Mangerud, instituttleder

Geoviten-ekstern is the Department of Earth Science at the University of Bergen's external newsletter. It is issued once per month and can also be read from our webpages <http://www.uib.no/geo/en>  
Gunn Mangerud, Head of department

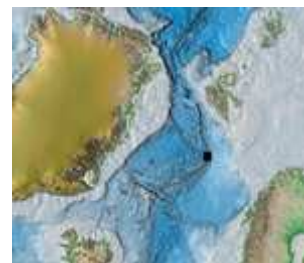
## I denne utgaven

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## High quality scientific research

The department of Earth Science is partner in three Centres of Excellence. We take pride in that! These centres were initiated by the Research Council with the intention of bringing more Norwegian researchers and research groups up to a high international standard. Without doubt our three time-limited research centres fulfil these goals: they attract good PhD candidates, master students, and outstanding researchers and last but not least; they create high quality scientific research.

In the previous issue of "Geoviten-ekstern" we presented a recent paper in Science from the Centre of Excellence in Climatic Research (Bjerknes). This time I would like to draw attention to a paper by colleagues from the Centre of Excellence in Geobiology who present their discovery of Loki's Castle, the most northerly identified black smoker yet identified, as a Nature Communications paper (see below).



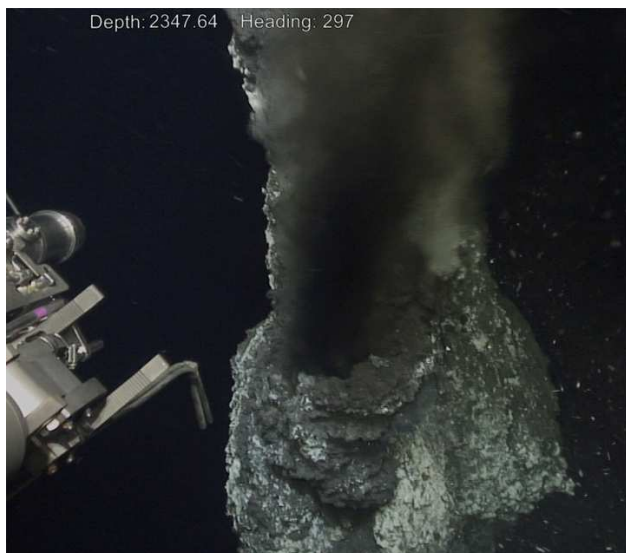
Centre of Geobiology (CGB) was one of the centred who got funding in the last call in 2007. Deep Seafloor, Deep Biosphere, Deep Time and the Roots of Life are key concepts behind their research activity. The vision is to create a centre for integrated interdisciplinary studies focused on the geo-biosphere that will be a central hub in international research at these scientific frontiers.

Integrated training of PhD students and young researchers in an interdisciplinary, international research environment is a major mission for the centre - and they envision that this will provide the foundation for a new generation to tackle the fundamental questions, problems and opportunities related to the complex interactions between Earth's geo- and biosphere in new ways. This paper show that they are heading there.

CGB are presently finishing the input for the midterm evaluation. We wish all of us good luck in this!

Gunn Mangerud

## Discovery of a black smoker vent field and vent fauna at the Arctic Mid-Ocean Ridge



*One of the black smoker chimneys in the Loki's Castle field discovered 2008 by CGB researchers*

The Arctic Mid-Ocean Ridges (AMOR) represents one of the most slow-spreading ridge systems on Earth. Previous attempts to locate hydrothermal vent fields and unravel the nature of venting as well as the provenance of vent fauna at this insular, northern termination of the global ridge system have been unsuccessful. Here we report the first discovery of a black smoker vent field at the AMOR. The field is located on the crest of an axial volcanic ridge and is associated with an unusual large hydrothermal deposit documenting that extensive venting and long-lived hydrothermal systems exist at ultraslow spreading ridges despite their strongly reduced volcanic activity. Whereas the reaction zone appears to be located at similar depth as on ridges spreading at much faster rates, a larger proportion of the crust here is cooled

convectively due to thinner crust. The vent field hosts a distinct vent fauna that differs from the fauna present to the south along the Mid-Atlantic Ridge. The novel vent fauna seems to have developed by local specialization and by migration of fauna from cold seeps, as well as from the Pacific. The new Arctic vent field provides the first detailed insight into hydrothermal systems at ultraslow spreading ridges, which make up 20% of the global ridge system. The discovery of this Arctic vent field provides a new opportunity to further our understanding of the migration of vent fauna and interactions between different chemosynthetic deep-sea environments.

Click here to access the paper:

<http://www.nature.com/ncomms/journal/v1/n8/full/ncomms1124.html>

## This edition's colleague

**Henk Keers** is associate professor in geophysics at the Department of Earth Sciences (UiB) since January 2010. He received his undergraduate degree in geophysics from the University of Utrecht (the Netherlands) and his PhD in seismology from Princeton University (USA) in 1997. After his PhD he did a three year postdoc at the University of California, Berkeley (USA) in environmental geophysics. In 2000 he started as a senior research scientist in Schlumberger Cambridge Research (UK) where he did research in seismic imaging and time-lapse seismics for the oil industry. After seven years he transferred to WesternGeco's Oslo Technology Centre in Asker (Norway) where he became seismic advisors for two groups of mainly electrical and mechanical engineers which design new acquisition systems. During his time in Cambridge his was co-supervising a PhD student in environmental geophysics at the University of Oslo.

Currently his research interests are twofold: 1. to use physical measurements made at the Earth surface to determine properties of the Earth below the



Earth surface, and 2. in the use of physical methods to determine the properties of the Earth. A number of physical measurements can be made at the surface of the Earth, such as gravity, electromagnetic and seismic (or seismological) measurements. It turns out that the most detailed pictures of the subsurface can be made using seismic measurements. These pictures can be made on all scales, from thousands of kilometers to several kilometres to only a couple of meters. Over the past 30 years enormous progress has been made to improve the quality of these pictures. This has helped the geosciences to get a much better understanding of many

processes that going on below the surface of the Earth. Examples of research that Keers has conducted are the use of seismic and electromagnetic measurements to image flow of contaminants through the soil above the groundwater table, the determine of the geological structure of an area that can potentially be used as a geothermal reservoir using seismic imaging and outlining the properties of an oil reservoir in the North Sea (also using a seismic method).

However, many challenges still remain. For example in order to mitigate the effects of climate change CO<sub>2</sub> can be injected into the ground. It is very important that this injected CO<sub>2</sub> does not leak to the surface. Seismic monitoring of the CO<sub>2</sub> that is stored underground will be very relevant for this. One of the challenges with monitoring the injected CO<sub>2</sub> is to get very high quality images of the subsurface as the CO<sub>2</sub> leakage, if it occurs, will probably occur in narrow plume like structures. There are many other examples in the geosciences where small scale structures, which are currently not detected using seismic methods, play an important role (e.g. the structure below volcanoes, the mantle of the Earth). Current seismic techniques only use part of the seismic data (often these are the travel times of the seismic waves and not their amplitudes). The use of more data (such as amplitudes) should lead to higher quality and more detailed images. This however poses a significant research challenge. Furthermore there is room for improvement in the imaging techniques themselves. Keers' main research foci therefore on these two areas. He is also interested in combining other types of data (geological and geochemical) together with geophysical data, to further improve the understanding of the Earth.

Keers' involvement in teaching is related to his research. He currently teaches a course in solid Earth physics. He will be teaching a more advanced course on computational methods in solid Earth physics, with emphasis on seismic methods, in the spring.

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Link to our three Centres of Excellence:

<http://www.bjerknes.uib.no/>

<http://www.cipr.uib.no/>

<http://www.uib.no/geobio/en/>



## Geo-letter from abroad From Bergen to Boulder and Bremerhaven

Letter from Professor Haflidi Haflidason



My first part of the sabbatical year started in January this year by heading for Boulder in Colorado. This mile high city, at the eastern foothill of the Rocky Mountains, welcomed with a cold and sunshine day with patches of snow on the ground. After a quick visit to the new hosting institute, INSTAAR, I spend the first day in the new country to buy both a 4WD car and a road bike with a good help from Hans Petter Sejrup. A 30 years break from biking was well noticed the first day after a 25 km long ride. The good biking facilities in and around Boulder and the generally stable weather conditions resulted also in an almost daily ride either to the institute and/or to the country side.

The daily work at INSTAAR was mainly focused on paleoceanographic and chronological studies centered on tephra and amino acid analyses. Regular seminars with the Master and PhD students of Gifford Miller and the discussions with Scott Lehman and John Andrews were inspiring. One of the unusual things to do this semester was however to participate in a regular class with both geological and archeological students where the theme was on the rise and fall of old cultures and centers, mainly in America and Mediterranean and its potential link to climatic changes. The new high-resolution marine data we have acquired from the Ormen Lange area, off Mid-Norway, seems also to be a brick in a better understanding of these dramatic cultural changes. The Institute of Arctic and Alpine Research (INSTAAR) has a long history and is the oldest of the seven research institutes at the University of Colorado. It was inaugurated in 1951 but its origins extend back to the Mountain Laboratory in Tolland, Colorado (1909–1919). With its ca. 300 fellows working on either high-altitude or high-latitude issues the seminar series gave also insight into new research fields.

After a short visit to Bergen, including a research cruise from Bergen to Spitsbergen, the course was set to Bremerhaven in September for spending the second part of the sabbatical year at Alfred Wegener Institute (AWI). The institute, focusing on marine and ice research in high-latitude areas, has a 30 years celebration this year. The research focus for me at AWI has been on marine microfossils and stable isotopes in seeping areas and a collaboration on this with Andreas Mackensen. New colleagues at AWI and a couple of meeting tours to new colleagues at MARUM have been very useful for upcoming research activities. Bremerhaven, with all the new modern buildings or the renewed old building around the centrum harbor area has been, has been a surprising nice experience. Before heading back to Bergen I will also have an opportunity to see the wonderful Christmas markets both in Bremen and Bremerhaven. A nice end of a great sabbatical year.

Haflidi Haflidason





## Andre nyheter/other news

In the last issue of Campus review, journalist John Ross ran a story on a Visiting researcher Program, based on a chat between our colleague professor Ritske Huismans and Associate Professor Florian Fusseis, University of Western Australia. The interview is included below:

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*Campus Review is  
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independent voice.  
As the only  
newspaper in  
Australia dedicated  
to reporting higher  
education and  
vocational  
education and  
training issues,  
Campus Review's  
news and analysis is  
unrivalled.*

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### Brain trade by John Ross

**The real beauty of sending top Australian researchers to Europe, Austrade says, is luring top students down under.**

We're sitting in a University of Bergen lecture room. It's about 10am and daylight is starting to seep through the clouds and the wind is howling off Mount Ulriken. Snow pastes the squares and hillsides of Norway's second city.

And we're talking about cooling for sweltering Perth households.

"What is the spatial and temporal variability of secondary porosity and permeability relationships?" Associate Professor Florian Fusseis asks the small audience of Bergen geology students and academics.

Fusseis is a researcher with the Western Australian Geothermal Centre of Excellence, whose mission is to develop geothermal power for urban households and industry such as Perth's desalination plant.

Much of this work involves accessing hot groundwater – say, 60° Celsius at 500 metres depth – for household and industrial heating and cooling purposes. One possible application will be cooling of the supercomputer planned as part of Australasia's bid for the square kilometre array radio telescope.

But Fusseis's personal interest is in direct electricity generation from the much hotter groundwater – say, 200° Celsius – found at greater depths.

And this more experimental work shares some of the challenges faced by his host, Professor Ritske Huismans, who heads Bergen University's geodynamics research group.

Huismans' group is looking at the feasibility of injecting fluid to enormous depths – say, five kilometres – where it's heated by the earth's crust before being raised back to the surface.

This involves daunting challenges, not least the extraordinary cost of drilling two extremely deep tunnels a couple of kilometres apart – one for injection and one for extraction – and somehow joining them at the bottom.

Another is keeping the channels open against the ravages of high temperatures and pressures and volatile chemicals.

"It hasn't really been done before. There are some aspects that people have taken on separately, but linking all these aspects together is very challenging," says Huismans.

The challenges include enormous variability's of scale, both in space and time. "The space where the fluid is migrating is really minute," Fusseis explains. "The pores we look at are as small as 50 nanometres. In the end they're processed in a geothermal reservoir where the distance between the injection and extraction holes is in kilometres. And there are processes that happen on time scales of a few seconds, yet we want to maintain our



Professor  
Ritske  
Huisman

permeability over 50 years. So we really need to develop a multi-scale understanding of the system. It is a really complex field, and that is why it is not yet solved."

Norway - arguably the world's richest nation on a per capita basis - is not a bad place to solve it. The petroleum giant Statoil, a co-funder of Huisman's group, has intensive drilling experience. And geothermal heating and cooling is widely used by Norwegian households and big facilities such as Oslo's Gardermoen Airport and Akershus University Hospital.

Australia has something to bring to the party, too. Perth's sedimentary basin is a great test site because of its natural permeability. Australia also has a wealth of subterranean granite, which is hard and therefore very challenging, but also very hot.

And Huisman and Fusseis can offer each other new insights in a field where expertise is so specialised that researchers sometimes have no idea what their colleagues are talking about. In such an environment, a grain of information from one team can be the vital clue that helps the other over its latest obstacle.

That's why most researchers jump at the chance to hobnob with their overseas counterparts. Fusseis is visiting Norway and Germany as part of the Visiting Researchers Program (VRP), a brainchild of Austrade's Copenhagen-based trade commissioner, Flemming Larsen. It covers travel costs for selected Australian researchers and arranges meetings with like-minded European academics.

The program can also involve media appearances and, if the work has commercial applications, meetings with locally-based corporations. But Larsen insists that all visiting researchers also talk to students while they're here.

The program isn't about setting up new research links, he explains, so much as capitalising on those that already exist. Larsen says Australia needs to be seen as more than a destination for bulk numbers and "bums on seats". Its capacity for research training has always flown under the radar, he says. "We use the research angle to move up the value chain. Australia has more to offer than language training and undergraduate studies. If we invite top researchers here they can develop their academic relationships. But if we can get them in front of postgraduate students with similar interests, we can plant the idea in their minds - maybe I can study in Australia."

Huisman says he and Fusseis - who, as it happens, are meeting each other for the first time today - can "learn from each other's mistakes". And he says student exchanges involving their home institutions are also a possibility, with overseas study treated as a priority at Bergen at both undergraduate and postgraduate level. "We're actively pushing the students to go - already in the first three years we want them to go abroad for half a year.

"We think exposure to a different academic environment is very important, but also being faced with a completely different situation where you have to solve your own problems. It's a bit rough in the beginning; you need to be able to accommodate not being in your home country. It makes young people much more independent, much more capable of solving problems."



They'd better get used to it, he adds, with career academics mobile by nature. "If you want to be an academic, and you want to be successful, there's no other way."

Huisman is a Dutchman who came to Norway via Canada, while Füsseis arrived at the University of Western Australia from his native Austria via Germany. His team boasts members from Germany, France, Tunisia and China as well as Australia. German is the group's main language, followed by French. But Füsseis seeks time away even from this diverse environment. "I just returned from six weeks in Tokyo, and our PhD students are flying all over the place," he says.

"Perth is one of the most isolated places in the world. We need to keep travelling."

John Ross is in Europe courtesy of a travel award from Universities Australia and the National Press Club, and is being assisted within Europe by Austrade.

## Ny ved instituttet/New in the Department



Christian Baldersheim nytilsatt avdelings ingeniør på GMS laboratoriet vårt. Christian (34) har en mastergrad i molekylærbiologi fra molekylærbiologisk Institutt ved Universitetet i Bergen og kommer fra stilling som laboratorietekniker hos M-I Swaco Norge AS ved Sture Oljeterminal.

Baldersheim vil blant annet ha driftsansvar for laboratoriet for stabil isotop massespektrometri (GMS), herunder utvikling og daglig oppfølging av instrumentering, kalibrering og teknisk vedlikehold av utstyr, samt at han vil delta i opplæring og oppfølging av PhD-/masterstudenter og gjesteforskere ved laboratoriet.

Hovedarbeidsområdet vil være innenfor marin paleoseanografi og kjemisk oseanografi, men også analyser for petroleumsgeoslogiske, berggrunnsgeoslogiske og biologiske studier inngår i arbeidsoppgavene.

## GEO i media

Søndag 31.10 kl 22.45 var det et 15 minutters innlegg om Klimapark 24469 v/ **Atle Nesje**. <http://www.oppland.no/Klimapark2469/Aktuelt/Klimaparken-pa-NRK/>



Professor Atle Nesje





Øystein Jansen

**Geoportalen.no** (Øystein Jansen, Bergen Museum/Institutt for geovitenskap)

Tittel: **Geologisk forklaring av lokaliteten**

På et gatehjørne i Gamle Bergen Museum står en loslitt marmorsøyle. Det viser seg å være en merkelig type som ikke ligner noen av de norske marmorforekomstene vi kjenner til.

<http://www.geoportalen.no/geofunn/funnene/gamlebergen/>

**Fædrelandsvennen** (Anne Lise Kjærgaard, Institutt for geovitenskap)

Tittel: **Utslag på seismografen i Bergen**

Det mystiske smellet som ble hørt rundt kvart på ett i natt kan ha blitt registrert av en seismografstasjon. <http://www.fvn.no/lokalt/article805004.ece>



## Nye uteksaminerte

Nedenfor følger en oversikt over nye uteksaminerte i denne perioden.

### Mastergrad

Dato	Kandidat	Oppgavetittel	Veileder(e)	Sensor (ekstern/intern)
22.11.10	Siri Brønlund	Reservoir modelling of fluvial systems: An example from the Gulf of Thailand	J.Howell	Prof. Adrian Hartley, Aberdeen university Rob Gawthorpe

### Ph.D – disputas/PhD dissertations

Dato	Kandidat	Oppgavetittel	Veileder(e)	Bedømmelseskomite
09.11.10	Mohammad Reza Saberi	An integrated approach for seismic characterization of carbonates (see below)	Tor Arne Johansen	Dr. Aart-Jan van Wijngaarden, Statoil Dr. Manika Prasad, Colorado School of Mines Dr. Ivar Brevik, GEO





## Publications

**Bruvoll V., Kristoffersen Y.,** Coakley B.J. & Hopper J.R., 2010. Hemipelagic deposits on the Mendeleev and northwestern Alpha submarine Ridges in the Arctic Ocean: acoustic stratigraphy, depositional environment and an inter-ridge correlation calibrated by the ACEX results. *Mar Geophys Res.*  
Doi:10.1007/s11001-010-9094-9

**Robins B.,** Sandstå N.R., **Furnes H.** & De Wit M., 2010. Evidence for refilling of previously emptied basaltic pillows in the Hooggenoeg Complex, Barberton Greenstone Belt. *Geol Mag*, pp 7. Doi:10.1017/S0016756810000853

**Muntlige og poster presentasjoner på konferanser (med abstract) / Oral and poster conference presentations (with abstracts)**

Nussbaumer S.U., **Nesje A.,** Steiner D. & Zumbühl H.J. Historical glacier fluctuations of Jostedalsglaciären and Folgefonna, southern Norway, reassessed by new documentary evidence, and their connection to climate. *Nordic Glaciology Meeting, Copenhagen, Denmark, October 2010.*

Olsen A. & **Ninnemann U.,** 2010. Large  $\delta^{13}\text{C}$  Gradients in the Preindustrial North Atlantic Revealed. *Science*, v330, no6004, 658 – 659.  
doi: 10.1126/science.1193769, ISSN 0036-8075 (print), 1095-9203 (online).

### Andre presentasjoner/other presentations

**Sejrup H.P.** Marine based ice sheets of Europe; why study them.  
Fredagsseminar, UiB, 22.10.2010

**Svendsen J.-I.** Ice age. Fredagsseminar, UiB, 05.11.2010

**Thieulot C.** An introductory seminar on the Finite Element Method applied to geodynamical systems. Geodynamics seminar, UiB, 28.10.2010.



Professor John-Inge  
Svendsen

### Populærvitenskaplige bidrag/ popular Science

**Aarseth I.** Geologisk bydelvandring rundt Langevannet i Åsane. Samarrangement mellom "Geologiens dag" og "Åsane Kulturfestival".  
31.10.2010.

**Mangerud J.** Vulkansk aske over Norge. Møte i St. Georgsgildene i Bergen, Statens hus, Bergen, 25.10.2010.

## Seismisk karakterisering av karbonatreservoarer



Mohammed Reza Saberi disputerte tirsdag 9. november for ph.d.-graden ved Universitetet i Bergen med avhandlingen: "**An integration approach for seismic characterization of carbonates**".

Karbonater er en av de vanligste bergarter i petroleumfelt, og kan utgjøre en reservoarbergart, et mellomliggende lag eller et forseglende lag. Effektiv hydrokarbonutvinning krever dyktig integrering av kunnskaper og metoder fra ulike disipliner som geologi, geofysikk, petrofysikk og reservoarteknologi.

Den beste måten å skaffe seg viktig informasjon om undergrunnens karbonatbergarter på er ved seismiske metoder. Komplekse strukturer i karbonatbergarter gjør at kvaliteten og oppløsningen av refleksjonsseismiske data fra slike bergarter ofte er dårligere enn ved tilsvarende undersøkelser av sandsteinsreservoarer.

Målet med studiet var å utvikle metodiske forbedringer på dette området. Studiet fokuserer på å integrere geologiske og geofysiske strategier ved hjelp av bergartsfysiske modeller. Anvendelse av disse strategiene viser lovende resultater på noen datasett. Ved hjelp av de nye metodene vil man oppnå en bedre forståelse av hvordan porøsitet og porevæske er fordelt i karbonatbergarter. Et annet aspekt ved avhandlingen var å skille mellom hydrokarbon og vann som porevæske ved hjelp av seismiske data. Integrasjon av geologi og geofysikk fører igjen til forbedrede diskrimineringsmetoder, og bruk av disse metodene på reelle data fra karbonatbergarter viser lovende resultater. Data fra Ontong Java platået og Finnmarks karbonatplattform ble brukt i studiet. De nye, integrerte strategiene ble anvendt på disse datasettene. Resultatene er presentert på to internasjonale konferanser, og er forberedt som fire vitenskapelige artikler for internasjonale tidsskrifter.

### Personalia:

Mohammad Reza Saberi ble født i 1975 og vokste opp i Mashhad, Iran. Han tok sin bachelor i bergverksdrift ved Universitetet i AmirKabir og fullførte sin master i geofag og petroleumsteknologi ved NTNU i Trondheim i 2003. Deretter arbeidet han som geofysiker ved det Nasjonale Iranske Oljeselskapet. I januar 2007 startet han på ph.d.-studiet ved Institutt for geovitenskap, Universitetet i Bergen.

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Avhandlingen kan lånes på Bibliotek for realfag. For kjøp/bestilling av avhandlingen, kontakt kandidaten direkte.

[http://www.uib.no/info/dr\\_grad/2010/Saberi\\_Mohammad.html](http://www.uib.no/info/dr_grad/2010/Saberi_Mohammad.html)