**Innkalling til møte i styringsgruppen i Akademiaavtalen**
**Tid:** Onsdag. 4 februar, 2015, kl. 09:00 – 12:00
**Sted:** Universitetet i Bergen, Museplass 1, Kollegierommet

**- SAKSLISTE –**

**SAK 01-15: Godkjenning av innkalling og dagsorden 04.02.15**

**SAK 02-15: Referat fra møte i styringsgruppen 10.12.14**
Saksdok: 02-15-1: Referat fra møte i Styringsgruppen i Akademiaavtalen 10.12.14.

**SAK 03-15: Drøfting av Akademiaavtalen fremover der rektor Dag Rune Olsen er tilstede**

**SAK 04-15: Søknad om fortsatt driftsstøtte til Nasjonal forskerskole i petroleumsfag (NFIP) for perioden 2015-2017**
Saksdok: 04-15-1: NFIP søknad fra Styreformann Arne Graue
Saksdok: 04-15-2: NFIP forskerskole rapport 2014
Saksdok: 04-15-3: NFIP forskerskole rapport 2013
Saksdok: 05-15-4: NFIP forskerskole rapport 2012

**SAK 05-15: Forslag om støtte av et tverrfaglig forskningsprosjekt (ANIGMA) innen geotermisk energi ledet av prof. Atle Rotevatn siden prosjektet mangler 20 % bidrag fra industri for å få utløst støtten fra NFRs ENERGIX program**
Saksdok: 05-15-1: Søknad til forskningsrådets ENERGIX program
Saksdok: 05-15-2: Prosjektbeskrivelse ANIGMA

**SAK 06-15: Budsjett og regnskapsrapport**
Saksdok: 06-15-1: Budsjett og regnskap pr 31.12.2014.
Regnskapsrapporten viser avvik og udisponerte midler ved årsskiftet, og prognose for 2015.

**SAK 07-15: Forslag til rangering av prioriterte II-stillinger i Akademiaavtalen**
Saksdok: 07-15-1: Rangering av prioriterte II-stillinger foretatt av SFF på vegne av MN-fakultetet.
07-15-2: Brev fra Gunn Mangerud vedrørende overgangstilling ved Institutt for geovitenskap.

## SAK 08-15: Orientering

**Ny representant i styringskomiteen**
Dekan Helge K. Dahle, Det matematisk-naturvitenskapelige fakultet, erstatter professor Lise Øvreås som representant i styringskomiteen (ePhorte:2009/4636).

**Gaveforsterkninger for Akademiamidler**
Gry Flatebø, ved Kontor for budsjett, har sendt inn søknad i 2014 om gaveforsterkninger for Akademiamidler.

## SAK 09-15: Eventuelt

**Protokoll fra møte i styringsgruppen i Akademiaavtalen**
**Dato:** Onsdag. 10 desember, kl. 09:00 – 12:00
**Sted:** Universitetet i Bergen, Museplass 1

**Tilstede:** *Anne Lise Fimreite (styregruppeleder, UiB), Lise Øvreås (UiB), Knut Helland (UiB), Leif Lømo (Statoil), Bård Krokan (Statoil), Heidi Annette Espedal (UiB), Helge Dahle (observatør, UiB), Kristin Hansen (referent)*
**Frafall:** *Sigrun Merete Løkkebø (Statoil), Hege D. Høiland (UiB)*

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Styregruppeleder og prorektor Anne Lise Fimreite ønsker velkommen til møte.

## SAK 13-14: Godkjenning av saksliste og dagsorden til møte 10.12.14

Saksliste til møtet 10.12.14 ble godkjent uten merknader. Det var ingen saker til eventuelt.

## SAK 14-14: Referat fra møte i styringsgruppen 3.9.14

Saksdok: 14-14-1: Referat fra møte i Styringsgruppen i Akademiaavtalen 3.9.14

Referatet fra møtet i styringsgruppen 3.9.14 ble godkjent uten merknader.

## SAK 15-14: Kort om tildeling av midler til faglig utveksling søknadsrunde 2

Saksdok: 15-14-1: Saksforelegg
Saksdok: 15-14-2: Referat fra komiteens møte 7.11.14

Styregruppeleder orienterte om antall søknader mottatt og innvilget i søknadsrunde 2, som hadde frist 20.oktober, 2014. Tre spørsmål fra komiteen for faglig utveksling ble diskutert.

***Vedtak:*** *1. Fra 2015 vil kun PhD-studenter, vitenskapelige ansatte og gjesteforskere ved UiB kunne søke midler til faglig utveksling.*
*2. En tidsplan vil sendes ut årlig til alle fakultet med prosess om fremtidige fagseminarer som er tilknyttet Akademiaavtalen slik at flere forskere kan delta.*
*3.* Det vil bli gitt en lengre søknadsfrist for forskningsprosjekt under Akademiaavtalen slik at forskere vil få god tid til å forberede prosjektsøknad, nettverksbygging og partnersøk. Refererer til sak 19-14-1.

## SAK 16-14: Budsjett og regnskapsrapport per 10.12.2014

Saksdok: 16-14-1: Budsjett og regnskap

Budsjettet og regnskapsrapporten for Akademiaavtalen pr. 10.12.14 ble gjennomgått. Styregruppen ønsker en regnskapsrapport med forklaringer på avvik og som viser udisponerte midler ved årsskiftet samt en prognose for hva som er forpliktet i prosjektet fremover.

*Oppfølging:* *Hege D. Høiland sender en oppdatert regnskapsrapport til styringsgruppen med forklaringer på avvik og prognose for 2015.*

## SAK 17-14: Fagdager

Saksdok: 17-14-1: Annonsering av fagdag på SV 5.12.14
Saksdok: 17-14-2: Forslag til program for fagdag MN 23.1.2015

Konferansen om samfunnsperspektiver på energi- og klimaomstilling ble diskutert. Konferansen var vellykket hvor SV-miljø som driver med klima og energiomstilling ble synliggjort og ble informert om Akademiaavtalen og de muligheter den gir. Samfunnsfagene var godt representert noe som kan være et første steg til et tverrfaglig samarbeid med naturvitenskap. I planleggingsfasen og annonsering oppfattet ikke alle fakultetene at konferansen ble arrangert i samarbeid med Akademiaavtalen.

Forslag til program for fagdag 23.1.15 ble diskutert (MN-fakultetet sitt program for fagdagen 23.01.15 er nå klart og er vedlagt).

*Oppfølging:* *Styringsgruppen er åpen for at et nytt seminar skal arrangeres siden fakultetene ikke fikk tilstrekkelig informasjon i planleggingsprosessen av konferansen holdt 5.12.14. Hvis en ny konferanse blir planlagt vil Nils Gunnar Kvamstø inviteres til å holde innlegg (se orienteringssak 20-1).*

*I planleggingsfasen av neste fagdag 23.01.15 må det komme tydelig frem at fagdagen blir arrangert i samarbeid med Akademiaavtalen. Fokuset på seminaret skal være kartlegging og modellering av undergrunnen, og formålet er å være et ledd i arbeidet med å utkrystallisere satsinger og legge grunnlag for nye prosjekt finansiert av Akademiaavtalen. Inga Berre kontakter Leif Lømo for å få en tydelig bestilling, og Helge K. Dahle følger opp organiseringen med instituttlederne ved IFT, Kjemisk institutt og Institutt for biologi. Det ble foreslått at en samfunnsviter gir en kommentar på slutten av fagdagen hvor blant annet den økonomiske og antropologiske siden blir trukket frem.*

*Referat fra fagdagen 5.12.14 sendes Styringsgruppen. Knut Helland kontaktes.*

## SAK 18-14: Prioriteringer av II-stillinger

Saksdok: 18-14-1: Brev fra MN om opprettholdelse av prioriteringer
Saksdok: 18-14-2: Omdisponering av midler til prof. II-stilling. Epost datert 26.9.14
Saksdok: 18-14-3: Omdisponering av midler til prof. II-stilling. Epost datert 15.8.14

Leder i Strategiutvalg for energiforskning (SEF), Helge K. Dahle orienterte styringsgruppen om prioritering/omdisponering av II-stillinger ved MN-fakultetet.

Omdisponering av midler for å tilsette Barbara Wohlmuth i professor II-stilling ved å benytte lønnsmidler som blir ledig etter Pettersen er ikke vedtatt. Det ble referert til vedtak 10-14 fra møte i styringsgruppen den 3.9.14 som bekrefter at «Wohlmuth ikke vil kunne ansettes med tildeling fra Akademiaavtalen fra september, 2014 og må avvente Styringsgruppens vedtak om tildeling av professor II-stillingene når det gjelder finansiering av Wohlmuth fra 2015».

*Oppfølging:* *SEF-leder, Helge K. Dahle ber SEF lage en prioritert liste over II-stillinger som ønskes forlenget eller omdisponert. Prioriteringene må lenkes opp mot satningstema, og vil bli behandlet i neste møte i styringsgruppen.*

***Vedtak:*** *Barbara Wuhlmuth kan legges til i prioriteringsliste fra MN-fakultetet.*

## SAK 19-14: Prosess i forkant av utlysning av forskningsmidler

Saksdok: 19-14-1: Saksforelegg
Saksdok: 19-14-2: Styresak

Prosessen i forkant av utlysning av forskningsmidler ble diskutert. Med bakgrunn i de diskusjoner som har vært i universitetssamfunnet planlegges en ny utlysning av forskningsmidler i Akademiavtalen våren 2015. I forkant av utlysningen foreslår styringsgruppen følgende intern prosess:

***Vedtak:*** *1. Fagdager gir idedugnad og faglig forankring av fremtidige prosjektforslag til Akademiaavtalen. SV gjennomførte en fagdag 5.12.2014. Den 23.01.15 vil MN-fakultetet gjennomføre følgende fagdag med innspill fra fagmiljø: «Measurements and modeling of the subsurface». Hovedtemaene er: «Combined modeling and measurements in the characterization of the subsurface, combined measurements and simulation of the subsurface fluid flow, new technologies for EOR and producion of new resources, flow control and measurements».*
*2. I møte i UiBs sentrale Forskningsutvalg (FU) den 05.02.15 vil det oppnevnes et rådgivende utvalg til søknadsbedømming.*
*3. Styringsgruppen vedtar tematisk innretning for utlysning av forskningsmidler samt kriterier for tildeling. Det tas sikte på en utlysning våren 2015 med søknadsfrist høsten 2015.*
*4. Utlysningen sendes til alle fakultet i Ephorte og pr epost.*
*5. Det vil opprettes en elektronisk søknadsdatabase.*
*6. Det rådgivende utvalget vil på faglig grunnlag foreslå innstilling av søknadene.*

*Merknad:* I neste møtet i styringsgruppen 04.02.2015 vil utlysningsprosessen av forskningsmidler i Akademiaavtalen diskuteres videre for å sikre en raskere prosess, samtidig som synliggjøring og kvalitetssikring ivaretas.

## SAK: 20-14: Orientering om søknad om professorat/amanuensis i energimeteorologi ved GFI

Saksdok: 20-14-1: Forslag om professorat i energimeteorologi ved GFI

*Oppfølging:* *FA lager utkast til svarbrev til GFI v./instituttleder Nils Gunnar Kvamstø. Akademiaavtalen støtter ikke allerede etablerte sentre og har heller ikke offshore vind som prioritert satsningsområde. Instituttet inviteres til å komme med ny søknad med ny innfallsvinkel, i forbindelse med vårens utlysning av forskningsmidler. Brev utgår fra leder i styringsgruppen.*

***Vedtak:*** *GFI v./instituttleder Nils Gunnar Kvamstø får brev i henhold til foreslått oppfølging.*

## SAK 21-14: Eventuelt

Ingen.

Emne: FW: Nasjonal forskerskole i petroleumsfag
Vedlegg: 2014 Annual NFiP Report with Appendices.pdf; Annual report NFiP 2013- Febr 12th 2014-final.pdf; Annual report NFiP 2012- Dec 19th 2012 -brief.pdf

Fra: Arne Graue <Arne.Graue@ift.uib.no>
Dato: 23. januar 2015 15.24.51 GMT+01.00
Til: <post@mnfa.uib.no>
Kopi: <arne.graue@fi.uib.no>, '"Helge K. Dahle"' <Helge.Dahle@math.uib.no>
Emne: Nasjonal forskerskole i petroleumsfag

Til Dekanus;
I egenskap av Styreformann i Nasjonal forskerskole i petroleumsfag (NFiP) søkes det herved om kr. 300 000.- pr. år i fortsatt driftstøtte til NFiP fra Akademiavtalen ved UiB for nye 3 år; for perioden 2015-2017. Tilsvarende søknad sendes de øvrige universitetene som har Statoil Akademiavtale.

Kort info om NFiP:
- NFiP omfatter alle de 5 universitetene i Norge som har PhD utdanning i petroleumsfag; inklusivt UNIS
- Styret består av 2 fagpersoner fra hvert av de 5 universitetene oppnevnt av rektor ved hver institusjon
- NFiP ble opprettet i 2010 og har fungert meget godt i 5 år
- Mer enn 400 PhD studenter har deltatt i NFiP-aktiviteter de siste 3 årene
- NFiP-aktiviteter er finansiert av oljeindustrien, hovedsakelig ved søknader til hvert av universitetene sine Akademiavtaler; men også fra BP
- Link: www.NFiPweb.org

Grunnet dramatisk fall i oljeprisen er det nå en utfordring å få tildelt midler fra oljeindustrien.
T.o.: Vedlagt er Årsrapporter for de siste 3 årene.

Mvh,
Arne Graue

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NORWAY

# 2014 Annual Report:
# Petroleum Research School of Norway;
# *Nasjonal forskerskole i petroleumsfag (NFiP*)

**Activities**

Petroleum Research School of Norway (NFiP) includes PhD students from all of the five universities in Norway that provide PhD education within petroleum related disciplines. Education of petroleum researchers at Norwegian universities benefits from coordinated, interdisciplinary collaboration between the Norwegian universities graduating PhD's in petroleum related scientific disciplines.

The Petroleum Research School of Norway was established to provide a national tool to improve the PhD education within petroleum in Norway. This is achieved by coordinating lectures given by the different universities and providing intensive courses, seminars and conferences for all PhD students in Norway with research projects related to petroleum. The objective is also to establish discussion groups, collaborating opportunities and interdisciplinary meeting places for PhD students and their supervisors; for more information please see www.NFiPweb.org.

A database of 123 PhD students related to upstream petroleum technology at the participating universities has been established in 2014 by the Petroleum Research School of Norway; including University of Bergen, University of Stavanger, University of Oslo, Norwegian University of Science and Technology (NTNU), University of Tromsø and the University Center at Svalbard (UNIS).

Over the last three years ca 400 PhD students have participated in NFiP activities; in 2014 a total of 74 PhD- and Master Students participated in the NFiP activities.

***2014 courses/seminars:***

*Geological field trip to South of England: Oct 20-24th*

Emphasizing sandstone and chalk reservoirs and also including immature source rocks and oil seeps

- **7** students participated (NTNU, UoB, UoT )

*Geological Field Trip to the Pyrenees: PYREX: Nov 10-14th*

- **8** students participated (UoB, NTNU, UNIS )

*Fifth Annual PhD seminar at Norwegian Petroleum Museum in Stavanger: Nov. 24th*

"*Emphasizing More Sustainability in Upstream Petroleum Activities* ", Nov. 24th, 2014.

- **59** PhD and master students (UoS, NTNU, UoO, UoB, UoT ) participated at the Norwegian Petroleum Museum in Stavanger; for program see Appendix 1.

***Student exchange 2014:***

- PhD student Kiran Sathaye from UT Austin spent 3 months at UiO/SINTEF in Oslo from May-July 2014
- PhD student Zachary Alcorn from Univ. of North Dakota spent three months at UiB from Sept-Dec, 2014
- Five students from University of North Dakota (UND) spent five weeks at UiB on intensive core analysis course as part of MoU with UND.
- 3 students from NTNU and UiB participated in Nano Summit in Houston, Oct. 12-14th

***Meetings and events in 2014 provided by Petroleum Research School of Norway (NFiP):***

*- Hosted Argentinean Petroleum Delegation, lead by Argentina's ambassador to Norway, in Bergen May 9th, 2014: "Collaborative Academic Mission: Argentina – Norway", (Program in Appendix 2)*

- *Signed MoU with University of Houston, TX, USA, January 2014*
- *Signed MoU with University of Southern California, CA, USA, September 2014*
- *Hosted reciprocating UND delegation as MoU visit June 2014*

**Presentations/participation by Chairman of the Executive Board of Petroleum Research School of Norway:**

- IEA GOTIA, Florence, Italy, April 7-10th, 2014
- 18th Annual meeting of the Rice University Consortium for Processes in Porous Media, April 21, 2014:
    - Arne Graue: "The NorTex Collaboration"
- Norway-USA Bilateral Fossil Energy meeting, United States Energy Association (USEA) Washington DC, USA, April 22nd, 2014
- Carbon Capture Utilization and Storage (CCUS) site visits in Texas, Mississippi and Alabama with United States Department of Energy (USDOE) and Norway's Ministry of Petroleum and Energy (MPE), April 23-25th, 2014
- Norway-USA Bilateral Fossil Energy meeting, CO2 Capture and Storage, Bergen, May 5-8th, 2014
- OG21 & Climit seminar: "CO2 EOR Workshop", Bergen, May 7th, 2014
    - Arne Graue: "CO2 Foam EOR – Upscaling from Lab to Field Pilot in Texas "
- IEA GOTIA, Denver, CO, USA, Oct. 28-30th, 2014

***Board Meetings 2014:***

- January 9th, 2014: Board meeting by phone conference
- December 17th, 2014: Board meeting by phone conference

NFiP Coordinator Assoc. Prof. Martin Fernø has been in charge of the NFiP secretariat at Department of Physics and Technology, UiB.

***Arne Graue***
***Chairman Executive Board***

**Appendix 1**

# PETROLEUM RESEARCH SCHOOL OF NORWAY

**Annual Petroleum Research School of Norway (NFiP) PhD Seminar November 24th, 2014:**

**1. Topic: Emphasizing More Sustainability in Upstream Petroleum Activities**
**2. Topic: PhD to PhD presentations, all topics**

***Provided by:*** *Petroleum Research School of Norway (NFiP)*
***Place:*** *Norwegian Petroleum Museum, Stavanger*
***Time:*** *Monday November 24th, 2013*

**Program:**

09:30 *Registration and Coffee*
10:00 "Welcome", Prof. Merete Madland, Board Member Petroleum Research School of Norway (NFiP) and Director of The National IOR Centre of Norway
10:15 "Energy Perspectives", NN, MPE, (TBC)
10:45 "Need for Increased Sustainability in NCS Operations?", Eva Halland, NPD
11:15 "Martin Linge – Preparing for the future", Per Grinde, Development Director , Total Norge
11:45 "Understanding Biodiversity Protection Opportunities in the Oil and Gas Industry", John Candler, Director Environmental Chemical Services, Schlumberger

12:15 *Lunch*

13:15 "Energy Needs and Environmental Challenges in Petroleum Activities", NN, Shell (TBC)
13:45 "Reduction in Flaring", Philip Fusacchia/NN, GE (TBC)
14:15 "Designer Water", Prof. Torleiv Bilstad, Univ. of Stavanger

14:45 *Coffee*

15:30 **PhD to PhD presentations**

- "Safe long term storage sealing of CO2 in hydrate", NN, UiB (Supervisor Prof. Bjørn Kvamme)
- "3D elastic time-lapse full waveform inversion", Espen Raknes, NTNU (Supervisor: Prof. Børge Arntsen)
- ""Smart Water" in Sandstone Reservoirs Preflooded with Seawater", Zahra Aghaeifar, UiS
- "Well Test Analysis - Application to Thermal Recovery Processes for Reservoir Characterization", Ashkan Jahanbani Ghahfarokhi, NTNU (Supervisors: Prof. Tom Aage Jelmert & Prof. Jon Kleppe)

16:15 *Break*

16:30 Guided tours of the Norwegian Petroleum Museum
18:00 Dinner at Bølgen & Moi, Norwegian Petroleum Museum

**Appendix 2.**

**Petroleum Research and Education Delegation from Argentina.**
**Program for *May 9th, 2014* in Bergen; hosted by Petroleum Research School of Norway:**

# *Collaborative Academic Mission: Argentina - Norway*

Venue: University of Bergen
Address: Muséplassen 1
Meeting room: Kollegierommet

09:00 Bus transport from Bergen Airport Flesland to University of Bergen

09:45 Welcome to Bergen
Prof. Arne Graue and Rector Dag Rune Olsen
09:55 Incentives for international petroleum collaboration - IEA GOT IA
Senior Advisor Jostein Dahl Karlsen, Norway's Ministry of Petroleum and Energy
10:10 Collaborative Opportunities at University of Bergen
Rector Dag Rune Olsen
10:20 Academic Mission: Argentina - Norway
Director Emanuel Damoni, Argentina Ministry of Education
10:30 Petroleum Research at the Faculty of Mathematics and Natural Sciences
Dean Helge Dahle
10:40 Student/Researcher Exchange Opportunities
Vice Rector Anne Chr. Johannessen or Head of International student office NN/ Eli Neshavn Høie/ Kristin Kvale (TBC)
10:50 Petroleum Research at Dept. of Geosciences
Prof. Ritske Huismans, Dept. of Geosciences
11:00 Petroleum Research School of Norway
Chairman Executive Board, Prof. Arne Graue
11:10 Petroleum Research and Oil and Gas Commercial Interests in Bergen
- CMR, President and CEO Arvid Nøttvedt (TBC)
- Bergen Chamber of Commerce, Director International Relations Solveig Holm
- Business Region Bergen, Project Manager Henriette Munthe-Kaas
11:50 Petroleum Education at Bergen University College - HIB
Rector Ole-Gunnar Søgnen

12:00 Lunch

13:00 Meeting moves to Dept. of Physics and Technology, Allegaten 55, room 546
13:15 Research at Dept. of Physics and Technology
Deputy Head of Dept. Kjartan Olafsson
13:30 Research and education within Petroleum and Process Technology
Head of PPT Research Prof. Arne Graue
13:45 Process Technology and Thermodynamics
Prof. Bjørn Kvamme (TBC)
14:00 Improved Oil Recovery and Reservoir Physics
Assoc. Prof. Martin Fernø
14:15 Hydrate Technology
Assoc. Prof. Geir Ersland
14:30 Gas Process Technology and Safety
Prof. Alex Hoffman and Assoc. Prof. Bjørn Arntzen
14:50 BS and MS programs in Petroleum and Process Technology
Senior Advisor Student Programs Terje Finnekås
15:00 Tour of Petroleum Laboratories
15:30 Bus transport to the Dinner Event

16:30 Dinner at "Fløyen"
19:00 Bus transport to Bergen Airport Flesland

# 2013 Annual Report

# Petroleum Research School of Norway;

# *Nasjonal forskerskole i petroleumsfag (NFiP*)

## *1. Activities*

Petroleum Research School of Norway (NFiP) includes PhD students from all of the five universities in Norway that provide PhD education within petroleum related sciences. Education of petroleum researchers at Norwegian universities will benefit from coordinated, interdisciplinary collaboration between the Norwegian universities graduating PhD's in petroleum related scientific disciplines.

The Petroleum Research School of Norway was established to provide a national tool to improve the PhD education within petroleum in Norway. This is achieved by coordinating lectures given by the different universities and providing intensive courses, seminars and conferences for all PhD students in Norway with research projects related to petroleum. The objective is also to establish discussion groups, collaborating opportunities and interdisciplinary meeting places for PhD students and their supervisors; for more information please see www.NFiPweb.org.

A database of 187 PhD students related to upstream petroleum technology has been established by the Petroleum Research School of Norway from the participating universities; including University of Bergen, University of Stavanger, University of Oslo, Norwegian University of Science and Technology (NTNU), University of Tromsø and the University Center at Svalbard (UNIS).

A total of 147 PhD- and Master Students participated in the NFiP 2013 activities; during the last two years more than 300 PhD students have participated in NFiP activities.

<u>The research school has provided 7 different events from January to November 2013:</u>

- Geological field trip to Møn, Denmark, related to the chalk reservoirs on the Norwegian Continental Shelf
  - 3 students from Norway and 6 students from Denmark (UoS, UNIS )
- Geological field trip to South of England, emphasizing sandstone and chalk reservoirs and also including immature source rocks and oil seeps
  - 6 students participated (NTNU, UoB, UoT )
- Geological Field Trip to the Pyrenees: PYREX
  - 11 students participated (UoB, NTNU )
- Applied Reservoir Modeling Course, Bergen, Jan 28th-Febr. 3rd, 2013
  - 14 students from 6 universities in Norway (NTNU, UoB, UoS, UoT, UoO, UNIS)

- 1 short course in Trondheim
  " *Advanced Gas Condensate* ", Febr. 11-15th, 2013
  - 5 students participated (UIS,NTNU,UIB )
- Annual PhD seminar in Stavanger
  "*EOR in Mature Oil Fields – Technological, Economical and Climatic Aspects*", Oct. 21st, 2013.
  - 65 students (UoS, NTNU, UoO, UoB, UoT ) participated at the Norwegian Petroleum Museum in Stavanger; for program and presentations: www.NFiPweb.org
- EOR-conference: "CO2 for EOR as CCUS", Houston Nov. 19th-21st, 2013.
  - 42 students participated, 19 students from Norway (UoB, UoS,UoO,UoT,NTNU) 23 from US universities (Rice U., UT Austin, Texas A&M, Kansas U, Colorado School of Mines, Stanford, University of Houston, University of North Dakota )
  - Totally 106 participants from 14 Universities and 17 oil companies; for program and published presentations: www.NorTexpetroleum.org

The chairman of the Executive Board of Petroleum Research School of Norway has participated/presented at:
- IEA/GOTIA Global Launch of IEA/GOT in Rockefeller Center, New York, Sept. 25th, 2013
  Arne Graue: "*Global Knowledge Exchange between Governments, Academia and Industry - Key Challenge in New Energy Mix"*
- NFiP was presented for the Royal Norwegian Crown Prince couple and the Norwegian Minister of Petroleum and Energy at OTC in Houston, May 2013.
- Energy Delegation to North Dakota, Sept. 23-27th, 2013
- Signing of MoU, U. of North Dakota (UND)
- Signing of MoU, Colorado School of Mines (CSM)

A NFiP secretariat has been established at Department of Physics and Technology, UiB, with NFiP Coordinator Martin Fernø and secretary Nina Bang Larsen.

***Arne Graue***

***Chairman of the Executive Board***

# Preliminary 2012 Annual Report:

# Petroleum Research School of Norway;

# *Nasjonal forskerskole i petroleumsfag (NFiP*)

## *1. Activities*

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A database of 213 PhD students related to upstream petroleum technology have been established by the Petroleum Research School of Norway from the participating universities; including University of Bergen, University of Stavanger, University of Oslo, Norwegian University of Science and Technology (NTNU), University of Tromsø and the University Center at Svalbard (UNIS).

A total of 153 PhD- and Master Students have participated in the NFiP 2012 activities.

The research school has provided 7 different events from June to November 2012:

- Geological field trip to Møn, Denmark, related to the chalk reservoirs on the Norwegian Continental Shelf
- Geological field trip to South of England, emphasizing sandstone and chalk reservoirs and also including immature source rocks and oil seeps
- 2 short courses in Trondheim
  "*Dual Porosity*", November 2012 and " *Advanced Gas Engineering* ", May 2012
- Joint research schools meeting with a Lecture Week in Bergen
  20 international students participated in Joint Research School meeting between IRTG and NFiP; for program see www.NFiPweb.org:
  "*Measurements and sensor operation in harsh and remote environments*"
  Several presentations from NFiP PhD students and by The Chairman of the Board of NFiP were provided in addition to presentations by IRTG participants.
- Annual PhD seminar in Stavanger

"*Environmental Concern & EOR Processes on NCS* ", Nov. 2nd, 2012, 40 students participated at the Norwegian Petroleum Museum in Stavanger; for program see www.NFiPweb.org

- Transatlantic Student Workshop at the 2012 Science Week Conference in Houston, TX, USA; http://www.forskningsradet.no/no/Nyheter/Studentdebut_pa_Science_Week/1253981538902?lang=no
http://www.forskningsradet.no/no/Nyheter/_Godt_samarbeid_mellom_mus_og_elefant/1253981553969?lang=no

84 students participated, 30 students from Norway

One American PhD student and one Norwegian PhD student won 3 months research terms in their counterpart country

For the special student program see www.transatlanticscienceweek.com

The chairman of the Executive Board of Petroleum Research School of Norway has also participated/presented at:

- IEA/OGTI Workshop on CO2 at Statoil, Trondheim, March 5th, 2012

Arne Graue: "*Novel Reservoir Technologies for Maximum Recovery of Conventional and Unconventional Oil and Gas"*

- Carbon Capture and Sequestration Leadership Forum, Bergen, June 2012
- IEA Working Program for Fossil Fuels, Praha, August 2012
- CO2 Forum at NPD, September 11th, 2012

Arne Graue: "*CO2 Storage in Hydrates with Associated Methane Production* "

- Science Week, Houston Nov. 12-16th, 2012

MoU between Univ. of Texas at Austin and NFiP was signed at the Science Week; with Minister of Education and Research Kristin Halvorsen, Norway's Ambassador in the USA and Director General of the Ministry of Petroleum and Energy present.

A NFiP secretariat has been established at Department of Physics and Technology, UiB, with NFiP Coordinator Martin Fernø and secretary Nina Bang Larsen.

***Arne Graue***

***Chairman of the Executive Board***

**An Integrated Geological and Mathematical Framework for the Characterization, Modelling and Simulation of Fractured Geothermal Reservoirs (ANIGMA)**

| | |
|---|---|
| Research Council Program | ENERGIX |
| Partners | UiB-Geo, UiB-Math, Uni Research |
| Prosjekt leader | Atle Rotevatn |
| PIs | Atle Rotevatn (prosjektleder, UiB-Geo), Inga Berre (UiB-Math), Eirik Keilegavlen (UiB-Math), Eivind Bastesen (Uni-CIPR) |
| Research education | Two PhD students (alternatively 1 PhD and 1 post doc) will be educated in the project. |

**Budget**

| | |
|---|---|
| Industry funding | 1928 |
| Research Council | 7705 |
| **Total** | **9633** |

**Short description**


The ANIGMA project will focus on developing a fully integrated geological-mathematical approach to the characterization, modelling and simulation of fractured geothermal basement reservoirs. The framework will be tailored to the specifics of flow and heat extraction from fractured geothermal basement reservoirs.

Specifically, the project aims to

[O1] Identify data types and formats that are suitable for both the representation of le geological properties of fractures and fracture networks with respect to flow, and inclusion of fractures in a simulation model. Deterministic and stochastic representations will simultaneously be considered, honoring the multiscale natu fractures.

[O2] Evaluate the sensitivity of simulated energy extraction to how geology is reporte type, format and accuracy) to the simulator, and optimize routines for data collec light of the results.

[O3] Establish seamless, two-way communication between geology and simulation and open the possibility for an interactive exploration of feasible concepts for simulat models and the impact of fracture configuration on fluid flow.

The main deliverables of the project are:

[D1] Optimized geological data types and formats and best-practice workflow for colle geological data that provide the most direct route to realistic prediction of flow properties.

[D2] Simulation models based on optimized geological input that accounts for the topo characteristics of fracture networks.

[D3] A fully integrated geological-mathematical framework for reservoir characterizat flow simulation for geothermal basement reservoirs.

# An Integrated Geological and Mathematical Framework for the Characterization, Modelling and Simulation of Fractured Geothermal Reservoirs (ANIGMA)

*Contact: Prof. Atle Rotevatn, University of Bergen, E-mail: atle.rotevatn@geo.uib.no*

## PART 1: Knowledge needs

### 1. Knowledge needs

Production of geothermal energy from resources that lack sufficient fluid and/or permeability can be achieved by engineering of the subsurface to create an Enhanced Geothermal System (EGS). Such systems enable production of geothermal energy from resources that are otherwise not economical, and the technology has the potential to significantly enlarge the geothermal resources amenable to energy production.

Enhanced geothermal systems in crystalline rock are based on circulation of fluids in fracture networks, or the ability to create such networks by hydraulic stimulation. Fractures are planar or sub-planar discontinuities along which a rock has been broken, and represent important conduits for fluid flow. This is of particular importance for geothermal reservoirs, as primary (matrix) porosity and permeability is generally on a negligible scale. Furthermore, fractures increase the contact surface between rocks and fluids, facilitating a crucial contribution to heat transport by conductive heat exchange between fluids and the surrounding rock mass. Distributed and connected networks of fractures enable production from large reservoir volumes, but fractures may also result in significant water losses and decrease of sweep efficiency due to water short-circuiting between injectors and producers.

Fractures exist everywhere in the brittle crust and form in response to geological processes (e.g. tectonic stresses, crustal uplift, cooling); fractures may be separated into shear fractures (slip surfaces, faults) and opening mode fractures (joints, fissures and veins). The ANIGMA project is concerned with all of these fracture types as they all dominate fluid flow. A range of scales need to be considered since pore volumes and flow are affected by both reservoir-scale fault and fracture zones as well as networks of fractures at a scale down to the scale of individual crystals/grains.

Characterization of fractures with the aim to understand fluid flow generally involves collection and identification of a range of different fracture data types such as orientation, displacement, aperture, length, aspect ratio and more. Based on the fracture data, simulation models are constructed with the aim of identifying the fracture network's impact on reservoir dynamics. Geological modeling and simulation are hence both crucial ingredients for assessing the commercial viability of production strategies for fractured geothermal reservoirs. The current practice of the techniques is however hindered by the following obstacles:

- Despite a global wealth of knowledge of fractured reservoirs, it is unclear which set of fracture parameters (type, level of detail, scale, accuracy) that provide the most direct route to realistically predicting flow properties.
- Computational efficient simulation tools that also preserve a necessary level of geological detail (e.g. fractures) are still to be developed
- The above points can only be addressed by combining advancement within characterization *and* simulation of fractured media; however, state of the art within the two fields advance separately, and advancement in one only slowly spills into the other.

In this project, we will overcome these difficulties by developing an integrated geological and mathematical framework for collection and mutual transfer of data between geological and simulation models for EGS. The framework will be tailored to the specifics of flow and heat extraction from fractured geothermal basement reservoirs, and will also provide the foundation for

further use in modelling of hydraulic stimulation for permeability enhancement of geothermal reservoirs.

## PART 2: The knowledge-building project

### 2. Objectives

The main aim of the project is to develop a fully integrated geological-mathematical approach to the characterization, modelling and simulation of fractured geothermal basement reservoirs. This will be grounded in natural outcrop examples as we specifically aim to:

[O1] Identify data types and formats that are suitable for both the representation of leading geological properties of fractures and fracture networks with respect to flow, and the inclusion of fractures in a simulation model. Deterministic and stochastic representations will simultaneously be considered, honoring the multiscale nature of fractures.

[O2] Evaluate the sensitivity of simulated energy extraction to how geology is reported (data type, format and accuracy) to the simulator, and optimize routines for data collection in light of the results.

[O3] Establish seamless, two-way communication between geology and simulation and thus open the possibility for an interactive exploration of feasible concepts for simulation models and the impact of fracture configuration on fluid flow.

The main deliverables of the project are:

[D1] Optimized geological data types and formats and best-practice workflow for collection of geological data that provide the most direct route to realistic prediction of flow properties.

[D2] Simulation models based on optimized geological input that accounts for the topological characteristics of fracture networks.

[D3] A fully integrated geological-mathematical framework for reservoir characterization and flow simulation for geothermal basement reservoirs.

### 3. Frontiers of knowledge and technology

Available data to characterize fractures and fracture networks include mainly outcroup data, seismic data and borehole data. Since fractures generally fall below the resolution of seismic data, and since information from boreholes is spatially restricted, data from geologically analoguous outcrops are widely used to provide additional geological input ‘by proxy’. Such data may provide information on the sub-seismic fracture networks and improve the interpretation of subsurface reservoir geology. Following traditional geological data collection techniques, fractures in a region are classfied in different sets of fracture types that are mechnically and geologically consistent [Berkowitz, 2002]. A quantitative description of each set in terms of statistical parameters describing orientation, length, density and aperture as a function of location is then determined based on available data, to build a representative geological model incorporating information at different scales (seismic to borehole). This model is then upscaled to a reservoir flow model, typically based on single and dual continuum models [Berkowitz, 2002; Pruess and Narasimhan, 1983; Pruess and Wu, 1993; Cacas et al, 2001], which describe rock properties through effective upscaled parameters, to simulate leading physical processes in stimulation and operation of the geothermal reservoir. Alternatively, discrete fracture network (DFN) models, which solely accounts for explicitly localized fractures [Berkowitz, 2002] are applied [see, e.g., Watanabe and Takahashi, 1995; Bruel and Cacas, 1992; Hayashi et al., 1999]. However, as fractures in crystalline rocks can dominate flow patterns as well as occur on a range of scales far beyond what is possible to account for explicitly in numerical simulations, methods have emerged that combine explicit representation of fractures dominating flow and heat transport with an upscaled description of the remaining rock to arrive at discrete fracture matrix (DFM) models [Dietrich et al, 2005; Reichenberger et al, 2006; Martin et al, 2005]. Recent improvements, amongst others published by PIs in this proposal [Karimi-Fard et al., 2004; Sandve

et al 2012; Sandve et al, 2014], reduce the need for grid refinement close to fractures and handles fracture intersections by numerical approaches that substantially increase computational efficiency, while enabling explicit representation of fractures that dominate characteristics of dynamic reservoir processes.

At the same time, novel applications [Nixon, 2013] of existing concepts of fracture topology [e.g. Huseby et al. 1997] in geological characterization of fracture networks, aid the characterization of connectivity within fracture networks. Constraining fracture network connectivity is paramount for quantifying flow properties of the network, and a topology-focused approach thus offers a more direct route: instead of assessing network connectivity indirectly from probabilistic distributions of geometric fracture data (fracture length, orientation), fracture network topology quantifies fracture connectivity directly [see Nixon, 2013; Adler and Thovert, 2013]. While outcrop characterization is generally focused on the collection of geometric fracture data, combining this traditional approach with outcrop-based topological analysis of fracture networks may significantly amplify the advantages of data input from outcrop analogues to fractured reservoirs.

Integrating i) topology-focused approaches [Nixon, 2013] in geological characterization of fractured reservoirs with ii) the advancements of DFM simulation tools [e.g. Sandve et al, 2012], has the potential to bring substantial improvements to methodologies and workflows for forecasting flow and heat transport in fractured geothermal reservoirs. It is the goal of the ANIGMA project to realize this potential.

**4. Research tasks and scientific methods**

The use of effective, cell-based properties (permeability) as a means to communicate geological information to simulation models hinders both understanding of the interplay between geology and fluid flow and the design of efficient simulation tools. To overcome this barrier we will develop a revised workflow in which simulations are run in tandem with data analysis and, ultimately, data collection. The key to achieve this goal is to preserve fracture information throughout the workflow, and amend the data structure with cell-based parameters only when a simulation tool which requires such information, in our case a DFM model, is invoked. The shared data representation facilitates both the construction of geologically sound simulation models, and the direct interpretation of simulation results in light of geological observations. The seamless, two-way communication between geology and simulation thus opens the possibility for an interactive exploration of the impact of fracture configuration on fluid flow.

While the present project focuses on fracture data obtained directly from outcrops, the workflow developed can readily be extended to include data from other sources, including stochastic realizations based on statistical input from outrcrop analogies as well as seismic and borehole data. Similarly, although the all-important issue of upscaling of small-scale fractures is not an explicit part of this project, the discrete fine-scale models constructed herein form an excellent starting point for applying both standard upscaling, and advanced methods tailored to exploit information on the fracture geometry [Sandve et al., 2013, Sandve et al., 2014].

We divide our research into two main work packages (WPs). In WP1, we investigate and develop the approaches and methods for seamless collection and transfer of geological data into reservoir simulation models, and in WP2, we apply the approaches to test and investigate the chief controls in terms of geology, scale and data format on simulated transport.

**WP1 Geological data collection strategy and transfer to simulation models**

This work package aims to develop methods for obtaining geological input to simulation models that minimize the averaging of properties, and which aim to more directly target the input needed for simulation models to give accurate estimates of flow through fracture zones. While the acquisition of geological information often is concerned with the collection of spatial fracture data and properties separately, we aim to develop a more focused work flow for data collection that is dedicated to i) the critical parameters for flow, and ii) the input needs of the reservoir simulator. Whilst in this proposal we focus on fractured ‘basement’ rocks in geothermal systems, the

methods will be equally transferable to fractured oil and gas reservoirs as well as contaminant transport.

From a geological perspective, individual fractures and fracture networks are well understood, but their arrangement (topology) and the resulting effect on flow and transport within networks is less clear. In general, topology describes the geometrical relationships between different elements of a network. Connectivity is a critical topological parameter for understanding flow in fractured reservoirs and essential for evaluating fluid flow and transport properties [see Adler and Thovert, 1999]. Adding topological analysis will complement fracture characterization, and will be used to more directly analyse connectivity than through an indirect assessment based on conventional geospatial fracture data alone. Consequently, we will develop a data collection and transfer protocol, in which topological analysis to characterize fracture networks and assess connectivity is key [cf. Nixon 2013].

A topological characterization involves looking at the fracture network as a series of nodes that are connected by branches; nodes represent fracture terminations (I-nodes), branch points (Y-nodes) and intersections (X-nodes), and the proportion of different node types is a quantifiable measure of the interconnectedness (connectivity) of a fracture network [Nixon, 2013]. To obtain this basic network topology, state-of-the-art digital spatial acquisition methods will be employed on outcrop analogues representing key EGS features; techniques such as laser scanning [lidar; Buckley et al., 2008] and photogrammetry, including from unmanned aerial vehicles [UAVs/drones; Buckley et al., 2014] have the advantage of being able to capture outcrop geometry in three dimensions, with high resolution. This in turn allows geospatial and topological properties to be extracted (digitised) with ease, and directly input into the later modelling stage [cf. Rotevatn et al., 2009; Buckley et al., 2010]. Data collection will be performed at highly relevant outcrops in Western Norway (fractured granitic gneiss outcrops in Fjell, Sund and Øygarden municipalities) that are analogous to typical fractured granitic reservoir rocks of EGS systems. Information from multiple scales is critical to correctly assess flow properties in EGS (and other) reservoirs; data will therefore be acquired at a range of scales, choosing the technique according to the scale and orientation of the exposures under study: e.g. ground-based lidar or photogrammetry for the highest level of detail (sub-cm over 100s m) and vertical cliff orientations; UAV photogrammetry for the intermediate scale (cms over c. 1 km) and aerial or satellite imagery for regional characterisation (0.1-0.5m resolution over tens of km).

Sub-tasks are iterative, and geologists and mathematicians will work in a team to gain insights into different stages of the characterization and modelling process:

[WP1ST1] Integrated data collection at field sites involving geologists and reservoir modellers (mathematicians)
[WP1ST2] Integrated processing and extraction of geospatial and topological data
[WP1ST3] Integrated process of data transfer and construction of reservoir models

The main deliverable of WP1 will be an efficient, robust and seamless approach to geological data collection data transfer to reservoir models. WP1 will further lead to 3-4 journal papers and the education of one PhD candidate.

**WP2: Simulation – data sensitivity and simulation tools**

The routines for data communication described above form the basis for a tight integration of geological observations and simulations to gain a deep[er] understanding of transport of thermal energy in crystalline rocks as applied to energy recovery. As discussed in WP1, the workflow will consider a richer set of data than commonly employed when describing fracture zones. To realize the potential of the integrated framework, it is therefore necessary to understand how the geological data is best applied to assess the potential for geothermal energy extraction. This can only be answered by applying simulations to determine which data gives the best representation of energy transport by a combination of fracture flow and conduction in the rock

matrix. Two aspects will be investigated. First, the type and accuracy of field observations that are necessary to obtain reliable estimates of energy recovery will be considered. This involves both combining traditional geometric fracture data with topological information, under the hypothesis that the latter may contribute more information on percolation properties of the network. Second, the simulations will be performed with both DFM and DFN models, with the aim of assessing the reliability of the latter as an efficient screening tool in data processing.

The investigations will be carried out in two stages, covering deterministic and stochastic representation fractures, respectively. In the first stage, fractures that feasibly can be mapped in field observations will be amended with synthetic smaller-scale fractures created in accordance with known scaling properties of fracture distributions [e.g. Bonnet et al. 2001] to create explicit and highly detailed representations of fracture networks. Fractures that cannot reasonably be resolved with a given resolution will be represented by an effective matrix permeability using effective medium methods [Sævik et al., 2013]. Within these networks, sensitivities of transport mechanisms and energy recovery rates to both geometric (apertures) and topological (connectivity) features will be investigated.In the second stage, the consequences of moving from a deterministic to a stochastic description will be investigated. Although a statistical framework is the only practical means to describe large numbers of fractures, it is not clear which data representation best preserves the flow properties of fracture networks. In particular, in light of the critical role played by percolation properties, parameterizations that include topological information can be expected to be superior to purely geometric representations. To clarify the relative performance of the different data representations, domains with deterministic fractures will be used as base cases for calculating statistics, after which ensembles of corresponding stochastic fractures will be generated. Simulations will then be used to test under which conditions ensembles reproduce the deterministic behavior. We identify the following iterative subtasks of WP2:

[WP2ST1] Adaption of existing in-house simulation tools to the integrated workflow by the implementation of a DFN solver, automatic gridding and import of relevant data formats.
[WP2ST2] Evaluation of routines for geological data collection based on sensitivity analysis.
[WP2ST3] Establish best practice for construction of simulation model, including type of geological data and numerical method.

The simulations will be carried out in close interaction with the data processing effort in WP1, so as to both gain the best understanding of the fracture networks, and to expose the workflow to practical usage. As WP2 will run simultaneously with WP1, the development phase will be performed using existing data from the project partners, which will in time be replaced with direct observations coming from WP1. WP2 will lead to the education of one PhD student, and the publication of 3-4 journal papers.

**5. Organisation and project plan**

This is a project by the University of Bergen (UoB), Department of Earth Science (UoB-GEO) and Department of Mathematics (UoB-Math). The principal investigators (PIs) include two geologists (GEO-PIs), Prof. Atle Rotevatn (UoB-GEO, project leader), Dr. Eivind Bastesen (Uni Research CIPR/UoB-GEO), and two applied mathematicians (Math-PIs), Dr. Eirik Keilegavlen and Assoc. Prof. Inga Berre (both UoB-Math). Jointly, the PIs have expertise in geological analysis of geothermal reservoirs, rock fractures, fractured basement rocks, as well as simulation of flow in fractured porous media, multiscale modeling and simulation, upscaling, and linear and nonlinear solvers. This constellation of researchers has over the past two years established a fruitful collaborative unit, resulting in peer-reviewed output [Rotevatn et al. 2013; Zuluaga et al., in review], and collaboration in publicly funded and industry sponsored projects.

The GEO-PIs are members of the petroleum geoscience group at the department, which is an international research group working in the fields of reservoir geology, structural geology,

sedimentology and reservoir geophysics. The MATH-PIs are members of the porous media group at the department, which recently was awarded the top score in the Research Council of Norway's evaluation of Mathematical Sciences in Norway [RCN 2012]; their research focuses on modeling and simulation of subsurface flow that consider applications related to $CO_2$ sequestration, geothermal and hydrocarbon resources, water management and subsurface energy storage. The PIs and their research groups have all been strongly involved in the Norwegian Centre of Excellence Centre for Integrated Petroleum Research (2003-2013), in addition to being involved in several other publicly funded centers for dedicated research (ARCEX, SUCCESS, CGER).

Co-I Dr. Simon Buckley (Uni Research) brings world-leading expertise in digital data acquisition, processing and utilization to the project, including lidar, hyperspectral scanning, photogrammetry and the use of unmanned aerial vehicles for outcrop mapping, interpretation and visualization. Significant synergy can be expected between the current project and other related NFR projects that Buckley is involved with (VOM2MPS 234111/E30; TriasNorth 234152).

There will be two PhD students allocated to the project. The PhD student in WP 1 will be advised by PI Rotevatn, with PIs Keilegavlen and Bastesen as co-advisors. The WP2 PhD student will be advised by PIs Keilegavlen, with PIs Berre and Rotevatn as co-advisors. Also, the project team will offer multiple projects for master students through the master programs in Energy, Geology and Applied and Computational Mathematics at the Faculty of Mathematics and Natural Sciences.

The industrial partner will participate actively in this basic research project, facilitating continuous knowledge transfer between the research and industry partners. The project will also draw upon the experience of designated scientific advisors; see Section 9.

**Project plan**

| No. | Main activity, objectives and deliverables | Cost (NOK 1000) | Responsible partner | Participating partners |
|---|---|---|---|---|
| 1 | WP1* | 5500 | UoB | Uni Research, UoA |
| 2 | WP2* | 4134 | UoB | Uni Research, UoA |
| | | | | |

*Detailed descriptions of the WPs are given in Section 4.

**6. Key Milestones**

The project is planned to run for 3.5 years, starting in April 2015. The main period will follow the 3 year timescale of the PhD positions, with time allocated for recruitment and final reporting.

| | |
|---|---|
| Apr 2015 | Kick-off meeting between partners, project planning in place |
| Jul 2015 | Recruiting complete; PhD students in place in host institutes |
| Nov 2015 | Assessment of input needs of simulator complete; input to field acquisition design |
| Feb 2015 | Design and planning of topological field data acquisition complete |
| May 2016 | First phase field data acquisition complete; data processing underway |
| Sep 2016 | First phase processing complete; simulation model underway |
| Jan 2017 | WP1 PhD, first paper draft written. |
| Jan 2017 | First phase flow simulation and feedback to data acquisition strategy complete |
| Feb 2017 | WP2 PhD, first paper draft written |
| May 2017 | Data acquisition strategy modified; second phase of field data acquisition complete |
| Sep 2018 | Second phase data processing complete; simulation model underway |
| Jan 2018 | Second phase flow simulation and feedback to data acquisition strategy complete |
| Mar 2018 | Fully integrated framework for characterization, modelling and simulation in place |
| Jul 2018 | Testing and quality assurance of the new framework complete |
| Jul 2018 | PhD theses submitted; remaining papers submitted. |
| Sep 2018 | Final reports and deliverables complete; final partner meeting |

*Note that progress meetings with the industrial partner are key milestones for the project, but are not included here for the sake of brevity, and do not affect scientific progression.*

**7. Costs incurred by each research-performing partner (NOK 1 000)**

| Research-perform. Partner | Payroll and indir. exp. | Equipm. | Other op. exp. | Sum |
|---|---|---|---|---|
| University of Bergen | 7051 | 0 | 654 | 7705 |
| Uni Research | 1778 | 0 | 100 | 1878 |
| University of Aberdeen | 0 | 0 | 50 | 50 |

The payroll and indirect expenses at the University of Bergen covers one researcher in 30% position[1] (Keilegavlen), and two Ph.D. students. The payroll and indirect expenses at Uni Research covers two researchers in 25% and 10% positions[1], respectively (Bastesen and Buckley). Note that the costing of the researchers is based on 3 years, following the timescale of the PhD positions, whereas the total project period is 3.5 years (see section 6 - Milestones). Other operating expenses include expenses for fieldwork, travel and overseas research visits for the PhD students. The University of Aberdeen collaboration, which has been allotted 50 KNOK mainly for travel, is described in section 9 - Other collaboration. Internal funding covers the payroll and indirect expenses for faculty at UoB-GEO and UoB-MATH (Rotevatn and Berre).

**8. Financial contribution from industrial partners or other users (NOK 1 000)**

| Industrial partner or other user | Cash financing |
|---|---|
| Industry partners | 1928 |
| From Research Council | 7705 |
| | |
| **Sum** | **9633** |

**9. Other collaboration**

The project team will also have strong contact with individual national and international collaborators. In particular Professor John Howell, University of Aberdeen (UK), will serve as a scientific advisor and key collaborator for the project based on his international leadership in the field of digital data collection and handling. Along with Co-I Buckley, Prof. Howell has pioneered the field of virtual outcrop geology and has a strong track record of delivering geomatics solutions to applied problems in the oil and gas industry.

The University of Bergen and Uni Research are part of a large European geothermal energy research initiative through the European Energy Research Alliance Joint Program Geothermal Energy (EERA-JPGE), which has status as the leading platform for networking and cooperation on geothermal energy research in Europe. The project is aligned with the research priorities of EERA-JPGE, and EERA-JPGE will be an important forum for communication and discussion of research findings, as well as facilitating future international research collaboration based on the results of the project.

Long-term collaboration with the Institute for Computational and Mathematical Engineering (ICME) and the Department of Energy Resources Engineering (ERE) at Stanford University will be utilized in the project. ERE is internationally renowned for its leading expertise in reservoir simulation, geomechanics, geostatistics, geothermal engineering and enhanced oil recovery (gas injection and thermal processes). Professor Margot Gerritsen (ICME/ERE) having an adjoint position at the Math-UoB, will facilitate the collaboration. Recently this collaboration has also been further strengthened by the joint project “Advancing graduate education in computational mathematics applied to the earth sciences”, which is led by PI Inga Berre. In

[1] See attachement for specification of payroll and indirect costs for the three researcher positions in 30%, 25% and 10%, respectively (Keilegavlen, Bastesen and Buckley). The attachment also specifies how the time of the researchers funded over the budget will be spent.

addition, the group has been active in international researcher education, both by participating in the NUPUS (Nonlinearities and Upscaling in Porous Media) International Research Training Group, 2011-2015) and, recently, by submitting a H2020 ITN proposal on subsurface energy storage with European partners. The applicants are also involved in activities targeted towards Horizon2020 with international collaborators; see section 17.

## PART 3: Project Impact

### 10. Importance for national knowledge base

Deep geothermal energy provides new market opportunities for Norwegian industry based in the petroleum sector, as well as beeing a national source for energy in the future [Energi 21, 2011] This has recently been acknowledged by the parliament, which in a 2012 white paper stated that a national research center for environmentally friendly energy should be established within geothermal energy [Innst.390S, 2012]. The project is placed within the core of the strategic framework of all institution levels at the University of Bergen and is strongly supported by the Faculty of Mathematics and Natural Sciences. The project will ensure the continuation of research activity on characterization, modeling and simulation of deep geothermal systems by the involved researchers at the Faculty of Mathematics and Natural Sciences at the University of Bergen. The PhD and Master students educated in the project will gain a solid, highly integrated, mathematical-geological background for working with geological characterization, reservoir modeling and simulation within industry or academia.

### 11. Relevance for Norwegian Industry

Based in expertise from oil and gas, Norwegian industry has the potential for taking a leading role in the exploitation of unconventional geothermal resources worldwide. As optimally integrated reservoir characterization, modelling and simulation in fractured basement reservoirs is a key part of unconventional geothermal energy exploitation, expertise on this process is a prerequisite for successful operations.

Although the project considers mainly geothermal reservoir systems, there are strong synergies to fractured oil and gas reservoirs. This includes fractured carbonate reservoir rocks, where flow in fractures may be particularly important where matrix porosity is very low. Additionally, recent finds at basement highs (Utsira High) makes fractured basement reservoirs a subject of importance also in a petroleum exploitation setting.

## PART 4: Other aspects

### 12. Other socio-economic benefits

Geothermal energy can be one of a range of renewable energy sources contributing in mitigating climate change. Geothermal energy has the potential of providing base-load power at capacity factors of approximately 90% [IPCC, 2011], based on local resources and with a minimum environmental footprint. IPCC [2011] have projected that geothermal energy can provide 1266 TWh electricity and 2184 TWh for heating purposes by 2050. In particular, geothermal energy has a high potential in several developing countries, which have a high geothermal gradient but limited infrastructure for electricity. Already today, 10 of the 15 countries with highest geothermal electricity production are developing countries. Exporting technology from industries and academia, may aid developing countries realizing more of their geothermal energy potential thus contribute to replacing carbon-intensive energy sources globally.

### 13. Dissemination and communication of results

There are three main user groups of the proposed activities in the project: (1) scientists and engineers, (2) current and potential operators of unconventional geothermal energy systems, and (3) policy and decision makers and the public.To reach these groups, results from the project will

be dissiminated through several channels: Peer-reviewed *journal publications* is the most important for communication with the scientific community, and we envison that the project will produce a minimum of 6 papers. The PI´s and PhD student will participate in *international conferences* and *national meetings*. Furthermore, we will continue to participate in the *public debate* as all the PIs have a strong record on giving popular seminars, writing feature articles, and communicating research results in the media. These dissemination goals are fully consistent with the consistent track record of the PIs for international scientific dissemination and public outreach.

**14. Environmental impact**

Results from the project will be important in further developments of unconventional geothermal energy technology, which is one of the few renewable energy resources that can provide continous base-load power with minimal environmental impacts. Geothermal systems have a small areal footprint and virtually no emissions. Still, in general terms, the reservoir stimulation process in EGS systems may require large volumes of water, which may have negative impact on the ecosystem. In addition, induced seismicity from reservoir stimulation is a concern. This demands monitoring and control of the reservoir stimulation process, in which the results of the projects will contribute.

**15. Ethical perspectives**

The project will follow the guidelines of the National Committee for Research Ethics in Science and Technology. The water requirements in deep geothermal systems and the risk of larger damaging seismic events rise rise ethical dillemmas on energy needs versus environmental footprint and risk.

**16. Gender issues**

The female-male ratio of the project is 1:3, with one female PI. Both the reservoir mechanics group (UoB-MATH) and the petroleum geoscience research group (UoB-GEO) has the last decade had nearly equal gender distribution among graduate students, and we will work actively to have female applicants for the position in this project.

**17. Additional information specifically requested in the call for proposals**

In the thematic guidelines is stated that a priority is given for ”deep geothermal projects where applicants demonstrate they are part of a strong consortium involved in activities targeted towards Horizon 2020”. The applicants are currently part of two project proposals submitted to Horizon 2020: the GEOPRISM project (Call: H2020-FETOPEN-2014-2015-RIA, Topic: FETOPEN-1-2014; coordinating partner: INRIA, France), which will provide improved numerical tools for process forecasting and risk assessment for processes in fractured reservoirs, and the EGS-UPD Enhanced Geothermal System United Downs Project (Call: H2020-LCE-2015-1, Topic: LCE-02-2015; lead partner: Geothermal Engineering Ltd, UK), which aims to develop and validate new exploration methods based on state of the art geological and geophysical techniques to identify, target and enhance structures of pre-existing natural permeability in geothermal EGS environments.

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## Akademiaavtalen

| | |
|---|---|
| **Gammel overføring *** | **3 068 702** |
| **Akademia 1** | **40 000 000** |
| **Tilleggsavtale **** | **1 800 000** |
| **Akademia 2** | **55 000 000** |
| **Totalt avtalebeløp** | **99 868 702** |

**Aktivitet avsluttet, budsjett redusert og restmidler overført til 1.7 udisponert**
**Aktivitet skal avsluttes og restmidler overføres 1.7 (eventuelt overforbruk tilbakeføres)**

| | | | | **Status pr 31.12.2014** | | | |
|---|---|---|---|---|---|---|---|
| **Aktivitet** | **Navn** | **Institutt** | **Totalt bevilget pr 31.12.14** | **Bevilgning** | **Kostandsført** | **Disponibel Rest** | **Kommentarer** |
| 1.1.1 Stip. Destruktiv ledelse | Leo Kant | Ferdig -Psykologi | 1 812 123 | 1 812 123 | 1 812 123 | 0 | |
| 1.1.2 Stip. Flerskalametoder | Andreas Sandvin | ferdig (Matematisk) | 1 125 859 | 1 125 859 | 1 125 859 | 0 | |
| 1.1.3 Stip. Geotermi | Tor H. Sandve | Ferdig - Matematisk | 2 495 000 | 2 495 000 | 2 382 622 | 112 378 | Avsluttes, midler overføres til udisponert |
| 1.1.4 Stip. Visualisering | S-A Grundvåg | Ferdig - Geovitenskap | 2 439 567 | 2 439 567 | 2 439 567 | 0 | |
| 1.1.5 Stip. Visualisering | Lidal/Johannesen | Ferdig - Informatikk | 2 793 000 | 2 793 000 | 2 807 896 | -14 896 | Overforbruk, styringsgruppen må ta stilling til om midler skal tilbakeføres av inst |
| 1.1.6 Stip MI Res.dyn. | Selvik | Matematisk | 2 684 000 | 2 684 000 | 1 944 210 | 739 789 | Ansatt til 31.08.2015 |
| 1.1.7 Stip IFT Måling | Haukalid | IFT | 2 687 000 | 2 687 000 | 2 412 641 | 274 359 | Skal sannsynligvis avsluttes-avventer tilbakemelding fra instituttet |
| 1.2.1 Postdoc Strukturgeologi | Rajeev Kumar | Ferdig - Geovitenskap | 2 432 000 | 2 432 000 | 2 432 000 | 0 | |
| 1.2.2. Postdoc Seismisk reservoar | Kenneth Bredesen | Geovitenskap | 600 000 | 600 000 | 599 200 | 800 | Ansatt til 14.10.15 |
| 1.3.1 Prof II Reservoargeofysikk | Brevik & Gjøisdal | Ferdig - Geovitenskap | 1 350 000 | 1 350 000 | 1 469 259 | -119 259 | Overforbruk, styringsgruppen må ta stilling til om midler skal tilbakeføres av inst |
| 1.3.2 Prof II Mat/CIPR | Edel Reiso | ferdig (Matematisk) | 635 948 | 635 948 | 635 948 | 0 | |
| 1.3.3 Professor i ESM | Patience Cowie | Geovitenskap | 5 500 000 | 5 500 000 | 4 822 416 | 677 584 | Bevilgning ikke brukt opp pga langtidssykemelding |
| 1.3.4 Professor II i energi | Ubesatt | samarb. HiB | - | 0 | 0 | 0 | |
| 1.3.5 Postdoc | | ferdig (Geofysisk) | 140 000 | 140 000 | 140 000 | 0 | |
| 1.3.6 Forsker | | ferdig (IFT) | 223 650 | 223 650 | 223 650 | 0 | |
| 1.3.7 Prof. II | Magne Skarestad | Ferdig - Kjemisk | 720 000 | 720 000 | 779 825 | -59 825 | Overforbruk, styringsgruppen må ta stilling til om midler skal tilbakeføres av inst |
| 1.3.8 Res.dyn | Gerritsen | Matematisk | 580 000 | 580 000 | 610 128 | -30 128 | Overforbruk, styringsgruppen må ta stilling til om midler skal tilbakeføres av inst |
| 1.3.9 Måling | Thorn | IFT | 600 000 | 600 000 | 574 025 | 25 975 | Avsluttes-midler overføres til udisponert |
| 1.3.10 Prof. II invers modellering | Mannseth | Matematisk | 750 000 | 750 000 | 563 363 | 186 637 | Avsluttes - Ansatt til 31.12.2014, restmidler tilbakeføres |
| 1.3.11 Prof. II økt utvinning/eklipsekurs | Pettersen | Matematisk | 750 000 | 750 000 | 533 957 | 216 043 | Avsluttes -budsjett reduseres midler overføres til udisponert |
| 1.3.12 Prof. II | Pop | Matematisk | 750 000 | 750 000 | 500 568 | 249 432 | Ansatt til 31.5.15. Fått utbetalt for lite lønn i 2014, instituttet sjekker hvorfor |
| 1.3.13 Profrssor/førsteaman teoretisk geofysikk | | Geovitenskap | 2 931 000 | 2 931 000 | 19 939 | 2 911 061 | Overføring behandles på styringsgruppemøte 4.2.15 |
| 1.3.14 Førsteamanuensis reservoarfysikk/ga | Ersland | IFT | 4 039 000 | 4 039 000 | 1 999 625 | 2 039 375 | Ansatt til 30.11.16 |
| 1.3.15 Prof/Førsteaman. Overflate og kolloid | Spildo | Kjemisk | 4 008 000 | 4 008 000 | 1 840 744 | 2 167 256 | Ansatt til 31.12.16 |
| 1.3.16 Prof.II post CIPR, master og phd veil. | Fotland | Kjemisk | 750 000 | 750 000 | 396 816 | 353 184 | Ansatt til 30.11.15 |
| 1.3.17 Prof.II/førsteaman. II post CIPR , mas | Djurhuus | Kjemisk | 750 000 | 750 000 | 426 697 | 323 303 | Ansatt til 30.4.15 |
| 1.3.18 Forsker 1 el.2, integrerte operasjoner | Kaland | IFT | 375 000 | 375 000 | 222 222 | 152 778 | Ansatt til 31.3.15 |
| 1.3.19 Prof.II integrert sedimentologi/struktur | Sharp | Geovitenskap | 750 000 | 750 000 | 481 418 | 268 582 | Ansatt til 31.5.15 |
| 1.3.20 Prof.II knyttet til PTEK programmet | | Geovitenskap | 750 000 | 750 000 | 191 137 | 558 863 | På listen over prof.II, behandles på styringsgruppemøte 4.2.15 |
| 1.3.21 Forsker, modellering av CO2 lagring | | Matematisk | 1 070 600 | 1 070 600 | 0 | 0 | Hele bevigning overført til Matmora prosjektet etter avtale med Statoil. |
| 1.4.1 Faglig utveksling/Mob.** | Komité | FA | 6 043 155 | 6 043 155 | 3 009 153 | 3 034 002 | Restmidler til fordeling, aktivitet pågår til 2018 |
| 1.4.2 Faglig utveksling/Mob.** | | Geovitenskap | 383 890 | 383 890 | 155 573 | 228 317 | |
| 1.4.3 Faglig utveksling/Mob.** | | Informatikk | 77 925 | 77 925 | 58 872 | 19 053 | |
| 1.4.4 Faglig utveksling/Mob.** | | IFT | 155 800 | 155 800 | 91 221 | 64 579 | |
| 1.4.5 Faglig utveksling/Mob.** | | MBI | 16 640 | 16 640 | 15 199 | 1 441 | |
| 1.4.6 Faglig utveksling/Mob.** | | Matematisk | 187 590 | 187 590 | 89 416 | 98 174 | |
| 1.4.7 Faglig utveksling/Mob.** | | Biologi | 25 000 | 25 000 | 24 891 | 109 | |
| 1.4.8 Faglig utveksling/Mob.** | | Kjemisk | 25 000 | 25 000 | 24 923 | 77 | |
| 1.4.9 Faglig utveksling/Mob.** | | Geografi | 63 000 | 63 000 | 8 952 | 54 048 | |
| 1.4.10 Faglig utveksling/Mob.** | | Geofysisk | 22 000 | 22 000 | 0 | 22 000 | |
| 1.5.1 Feltaktivitet | | Geovitenskap | 10 500 000 | 10 500 000 | 6 470 189 | 4 029 811 | Aktivitet pågår til 2018 |
| 1.6.1 IKT | | ferdig (Geovitenskap) | 328 391 | 328 391 | 328 391 | 0 | |
| 1.6.2 Petr. | | ferdig (FA) | 80 262 | 80 262 | 80 262 | 0 | |
| 1.6.3 Konf. | | ferdig (Informatikk) | 60 000 | 60 000 | 60 000 | 0 | |
| 1.6.4 Diverse engangsbevilgninger* | | ferdig | 84 000 | 84 000 | 84 000 | 0 | |
| 1.6.5 (+1.6.6) MI Radu+Startpakke | | Matematisk | 500 000 | 500 000 | 249 435 | 250 565 | Avklare om det faktisk er gitt bevilgning også til lønn på kr 250 000 for Radu på |
| 1.6.7 Forskerskole i petroleumsteknologi | | IFT | 900 000 | 900 000 | 798 281 | 101 719 | Forskerskolen fortsetter, instituttet ønsker å overføre restmidler til 2015 |
| 1.6.8 Geostim | | Matematisk | 1 000 000 | 1 000 000 | 8 023 | 991 977 | Bevilget til 31.12.16 |
| 1.6.9 Protec | | UniR/Matematisk | 805 000 | 805 000 | 82 614 | 722 386 | Bevilget til 31.12.17 |
| 1.6.10 Energiomstilling | | Geografi | 4 600 000 | 4 600 000 | 346 053 | 4 253 947 | Bevilget til 31.12.18 |
| 1.6.11 Energiomstilling | | Økonomi | 400 000 | 400 000 | 0 | 400 000 | Bevilget til 31.12.18 |
| 1.6.12 Fagseminar Reservoarpred | | Geovitenskap | 60 000 | 60 000 | 0 | 60 000 | Avholdes i januar 2015 |
| 1.7 Udispondert Akademia 2 | | FA | **26 887 916** | 26 887 916 | 0 | 26 887 916 | |
| 1.7 Udisponert Akademia 1 | | FA | **171 386** | 171 386 | 0 | 171 386 | |
| **SUM** | | | **99 868 702** | **99 868 702** | **46 373 303** | **52 424 799** | |
| **Midler som skal tilbakeføres til 1.7 Udisponert Akademia 1** | | | **591 283** | | | | |

*** Gammel overføring**

| | |
|---|---|
| Overført fra GEO-2008 | 1 192 934 |
| Overført fra CIPR-2008 | 1 875 768 |
| Sum overført | 3 068 702 |

**** Tilleggsavtale (tilskudd til aktivitetene 1.3.10-1.3.20)**

| | |
|---|---|
| Fakturert 2013 | 9 800 000 |
| Gammel avtale 2013 | 8 000 000 |
| Tillegg til Akademia 1 | 1 800 000 |

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denne aktivitetei

UNIVERSITETET I BERGEN
*Det matematisk-naturvitenskapelige fakultet*

Styringsgruppen for Akademiaavtalen
v/Anne Lise Fimreite

Dato
14.01.2015

**Forslag til rangering av prioriterte II-stillinger i Akademiaavtalen**

Vi viser til møte i styringsgruppen for Akademiaavtalen 10. desember 2014 der Strategiutvalg for energiforskning (SEF), på vegne av Det matematisk-naturvitenskapelige fakultet (MN-fakultetet), fikk i bestilling å rangere II-stillinger, som ønskes finansiert gjennom Akademiaavtalen. I møte i SEF 6. januar 2015 ble forslag til rangering av aktuelle II-stillinger gjennomgått og diskutert.

MN-fakultetet er for tiden i en prosess med utvikling av en strategiplan for perioden 2016-2020. Energi er, og vil fortsatt være, ett av fakultetets profilområder, og en helhetlig energistrategi er under utarbeidelse.

Bruk av II-stillinger bidrar til forskningssamarbeid, næringslivskontakt og veiledning av ph.d.-kandidater, og er svært viktige for at fakultetet skal kunne oppnå våre strategiske målsettinger innen en rekke områder.

Rangeringen som er foretatt av SEF er gjort ut fra stillingenes faglige innretning og merverdi for de aktuelle fagmiljøene, men også med tanke på utvikling av energiforskingen ved fakultetet i kommende strategiperiode. II-stillinger finansiert gjennom Akademiaavtalen vil kunne gi fakultetet viktige bidrag for videreutvikling av energiforskingen, blant annet inn mot områder knyttet til energiomstilling. SEFs rangering, der hensyn er tatt både til bredden innen fakultetets energiforskning og til en fremtidsrettet dreiing av aktiviteten, er som følger:

1. **1.3.8 Professor II Matematikk (reservoardynamikk/geotermi):** Barbara Wohlmuth (Technische Universität München). Omr. 1 og 4
2. **1.3.20 Professor II Geovitenskap (reservoargeofysikk):**Professor Leiv Gelius (UiO) er ønsket i en II-stilling ved instituttet. Omr**.** 1 og 4
3. **1.3.16 Professor II Kjemi (reservoarkjemi):** Per Fotland (Statoil). Omr.1 og 2
4. **1.3.9 Professor II Fysikk og teknologi (målevitenskap og instrumentering):** Kjetil Folgerø (CMR). Omr. 1 og 3.
5. **1.3.4 Professor II Fornybar energi:** HiB er i ferd med å tilsette i et professorat innen fornybar energi. II-stilling ved ett av instituttene ved MN-fakultetet vil bidra til å gjøre stillingen mer attraktiv og bidra til samarbeidet omkring masterprogrammet i fornybar energi.
6. **1.3.19 Professor II Geovitenskap (integrert sedimentologi/strukturgeologi):** Ian Sharp (Statoil) Omr. 1 og 4

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Norge

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Allégaten 41
Bergen

7. **1.3.12 Professor II Matematikk (reservoar karakterisering):** Sorin Pop (Eindhoven University of Technology). Omr**.** 1 og 3
8. **1.3.17 Professor II/førsteamanuensis II Kjemi (fysikalsk kjemi og reservoarkjemi):** Ketil Djurhuus (Uni Research). Omr**.** 1
9. **1.3.18 Forsker I/II Fysikk og teknologi (integrerte operasjoner, boring og produksjon):** Thorbjørn Kaland (Halliburton). Omr**.** 1
10. **1.3.10 Energimeteorologi**: Geofysisk institutt
11. **1.3.11 II-stilling innen energiomst**illing – med fokus på tverrfakultært samarbeid

Med vennlig hilsen

Helge K. Dahle
dekan

Kopi:
Institutt for fysikk og teknologi
Institutt for geovitenskap
Kjemisk institutt
Matematisk institutt
Geofysisk institutt
Institutt for biologi
Molekylærbiologisk institutt
Institutt for informatikk

Emne:  FW: Overgangsstilling ved institutt for geovitenskap

From: Gunn Mangerud
Sent: Saturday, January 10, 2015 11:01 AM
To: Kristin Hansen
Cc: Helge K. Dahle
Subject: Overgangsstilling ved institutt for geovitenskap

Bakgrunn for sak til Akademia styret (som forespurt)

Bakgrunn
Instituttet fikk i 2012 innvilget en 2-årig brofinansiering for en geofysiker (førsteamanuensis) og lyste umiddelbart ut stillingen. Ved første gangs utlysing fikk vi ingen kvalifiserte søkere, mens det ved annen gangs utlysing gikk tilbud til en meget god kandidat. Av familiære grunner kunne ikke kandidaten starte før i august 2014 og da dette er et svært konkurranse utsatte fagområde godtok vi dette. Dessverre sa kandidaten opp like før han skulle tiltre. Det var ingen signal som så langt hadde tilsagt at det skulle skje.

Målsettingen med brofinansieringen var å styrke den vitenskapelige staben innen teoretisk geofysikk.

Da det har vist seg svært vanskelig å rekruttere til teoretisk geofysikk, (det er et meget konkurranseutsatt felt) har vi i mellomtiden endret stillingsinnholdet noe og lyst ut en stilling i marin/polar teoretisk geofysikk. Stillingen vil i stor grad dekke de samme undervisningsfeltene og også i stor grad overlappe de faglige forskningsfeltene som var dekket i første utlysing, dog med et større regionalt perspektiv for forskningen. Det har gjort at vi mener det er noe lettere å tiltrekke oss sterke søkere. Denne gangen var det 3 kvalifisert søkere til stillingen.

Vi er derfor allerede i prosess med intervju og håper å ha en kandidat på plass fra 1.7.2015. Vi jobber videre med planer for ytterligere en stilling, men trenger tid for å tenke rundt bruk av andre, ekstern rekrutteringsmekanismer for å få en best mulig kandidat der (BFS?).

Vi ber derfor om at den 2 årige brofinansieringen fra Akademia flyttes til denne stillingen. Vi mener stillingen er forskningsstrategisk svært viktig, også i sammenheng med samarbeid både mot  institutt sektoren og industri.

Gunn

==========
Gunn Mangerud
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Phone: +47 55 58 36 00 (Department)
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==========

UNIVERSITETET I BERGEN
*Universitetsledelsen*

Statoil ASA
Postboks 8500
4035 STAVANGER

| Deres ref | Vår ref | Dato |
|---|---|---|
| | 2009/4636-MOV | 13.01.2015 |

## Akademiaavtalen - Oppnevning av ny representant i styringskomiteen

Vi viser til signert avtale om forskningssamarbeid, akademiaavtalen. Dekan Helge K. Dahle, Det matematisk-naturvitenskapelige fakultet, erstatter professor Lise Øveraas som representant i styringskomiteen.

Vennlig hilsen

Dag Rune Olsen
Rektor

Kjell Bernstrøm
universitetsdirektør

*Dokumentet er elektronisk godkjent og har derfor ingen håndskrevne signaturer.*

Kopi:
Helge Ketil Dahle

Kontaktinformasjon Dahle:
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E-post: helge.dahle@math.uib.no