

Department of Geosciences

University of Oslo

<http://www.geo.uio.no>

Organisation of the Department

The Department of Geosciences was formed in 2003 as a merger between the three earth sciences departments at the University of Oslo: the Geology Department, the Department of Physical Geography and the Department of Geophysics. In parallel to this there was a delineation of the geoscience activities at the Faculty of Mathematics and Natural Sciences and those at the Geological Museum (now part of the Museum of Natural History). The outcome of this was the transfer of three research positions, three technical support positions and infrastructure, from the Museum to the Department. These reorganisations were to a large extent based on the recommendations of the Evaluation of Basic Research in Earth Sciences in 1997/98. In 2003 a research group consisting of scientists from the Geosciences and Physics departments was awarded status as Centre of Excellence (CoE) status by the Norwegian Research Council and organised directly under the Faculty of Mathematics and Natural Sciences as the CoE Physics of Geological Processes - PGP. Four researchers from the Department of Geosciences were included in as UiO support to the Centre.

The Department is organised in five research sections and an administrative/technical support unit, led by the Head of Office. The research sections are:

- Meteorology and Oceanography
- Physical Geography
- Tectonics, Petrology and Geochemistry
- Petroleum Geology and Geophysics
- Environmental Geology and Hydrology

The three first are organised mainly along disciplines, the two last more thematically. However, the disciplinary-organised sections also have thematic foci: Meteorology and Oceanography - earth systems modelling; Physical Geography - cryosphere research; Tectonics, Petrology and Geochemistry - lithosphere dynamics. Geohazards, CO₂ sequestration and Climate Change are major cross-cutting themes at the Department.

In addition to PGP, which has been awarded the status of Top Tier Research Group by the Faculty of Mathematics and Natural Sciences, the Department hosts two Emerging Top Tier Research Groups: “Water as a Regulator in Biogeochemical Cycles” (core group at the Meteorology and Oceanography Section) and “Petroleum Systems and Basin Development” (core group at the Petroleum Geology and Geophysics Section). The Department is partner in the CoE “International Centre for Geohazards” (ICG), and also hosts the Oslo node of the Research Centre for Environment Friendly Energy “SUCCESS” (subsurface CO₂ storage).

The basis for the research group organisation in the context is the sections, with one exception – the geoscience part of the CoE Physics of Geological Processes is treated as a separate group, in line with how it was handled in the Physical Sciences Evaluation in 2009. The rationale for this is that the CoE has its own leadership and strategy. PGP is not formally a part of the Department, but most of the tenured positions within geoscience are on the departmental payroll. The staff participates in the teaching at the Department, and will return to their full positions at the Department by the end of the CoE period (2013). It should be noted that as the geoscience

personnel contribution to PGP stems from the Section for Tectonics, Petrology and Geochemistry, this has left the latter section as a truncated group with only three tenured positions.

The technical support staff of the laboratories have up till now been organised as a sub-section of the administrative/technical section, led by a senior engineer. This position is now vacant due to retirement, and the Department is working with a reorganisation that appoints one of the tenured scientific staff in charge of the laboratory infrastructure and technical staff, reporting to the Department Head, in line with the research sections.

The organisation of the Department in research sections carries a lot of historic ballast, and it is appropriate to look into whether the present organisation is optimal for the future, in the light of the increasing need for interdisciplinary research and for interplay between field/lab competence and modelling competence. The phasing in of two CoEs in the coming years will further emphasise the need for an evaluation of the present organisation. This process is in its initial phase and will accelerate as the results of the present evaluation process become available.

Leadership of the research

The departments of the Faculty of Mathematics and Natural Sciences have considerable leeway in choice of organisational structure and leadership. The Department of Geosciences chose after internal discussion a model with appointed head with four year fixed term contract, with a possible extension of one period, in both cases with external announcement of the post. It is the only Department at the Faculty of Mathematics and Natural Sciences to have an elected Department Advisory Board with elected chair and no external members. The other departments have Department Boards with the Department Head (elected or appointed) acting as Chair. The mandate of the board is found on the Department intranet. This organisation came into function in 2005. An (overdue) evaluation of the leadership structure is planned. Professor Nils Roar Sælthun, recruited from the Norwegian Institute of Water Research was appointed as head and is now in his second contract period. The Deputy Head, which also acts as Head of Education, is internally appointed and the position is presently held by Professor Valérie Maupin.

The sections are led by Section Heads appointed by the Department Head after internal consultations, and there is a functional description of their responsibilities on the Department intranet.

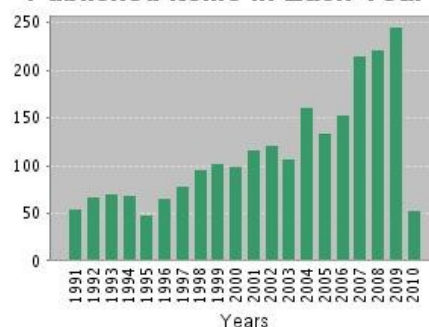
The Department is managed through weekly meetings of the Management Group, which consists of the Section Heads, the Head of Office, the Deputy Head, and the Department Head. The agenda and minutes are published on the intranet. The Advisory Board has a mainly strategic role and advises on all strategic matters including announcement of positions. It meets four to six times a year, and the Head of the Board is invited as observer to the Management Group. The Board and the Management Group meet for a strategy seminar once a year. Information to the staff is handled through intranet minutes, staff meetings, Department blog and bi-weekly Department email letters. Throughout the organisation the leadership focus is on strategic issues, in the recognition that innovation in research originates at the researcher level.

The strengths and weaknesses of the Department

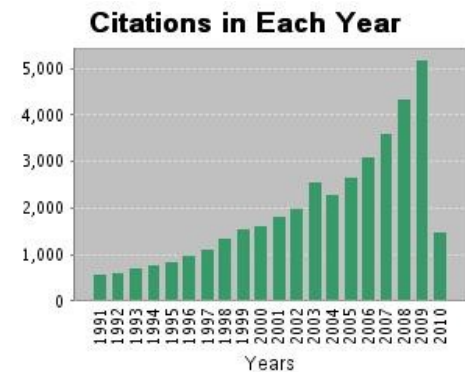
Strengths:

- High quality research, rapidly increasing productivity measured by publications (figures shows all geoscience publications from the University of Oslo);
- Excellent international academic networks and co-operation;
- Well positioned *vis-à-vis* the major challenges facing modern society (energy, climate, resources, pollution, geohazards);

Published Items in Each Year



- Good and strategically focused portfolio of external projects;
- Well established co-operation with industry;
- Strong disciplinary competence gives a good base for rapid adjustment to changing external demands and emerging scientific challenges;
- Solidly research based education, especially on the masters and Phd levels. Wide coverage of the geosciences.



Weaknesses:

- Still unleashed potential in interdisciplinary co-operation, both internally and externally;
- Struggles to maintain high quality laboratory infrastructure;
- Sub-optimal administrative and technical support to research;
- Less visibility than desirable;
- Substandard sample archiving and research documentation;
- Increasing, but still too low student recruitment – in particular national recruitment.
- Ageing demographic profile – too slow recruitment of young scientists.
- Still potential for improved HR capability.

Recruitment and mobility of researchers

As pointed out below, under “General conditions for research”, the recruitment to tenured positions is lower than what could be expected by a Department with a “mature” age structure. From 2003 to 2009 there has been 12 permanent scientific staff retirements. The full recruitment history of the Department for permanent scientific positions is as follows:

- 2004: Professor Andreas M. Kääb (geomatics, cryosphere)
- 2005: Professor ChongYu Xu (hydrology)
- 2006: Professor Roy H. Gabrielsen (petroleum geology) (by calling)
- 2007: Professor Joseph H. LaCasce (dynamic meteorology/oceanography)
- 2007: Associate professor Thomas V. Schuler (cryosphere, modeling)
- 2008: Professor Terje K. Berntsen (atmospheric chemistry)
- 2009: Professor Trond H. Torsvik (geodynamics) (by calling)

The positions held by Kääb, Xu and Gabrielsen are in fields recommended as priority areas by the Evaluation of Basal Research in Norwegian Earth Sciences, and funded by the Norwegian Research Council for three years as strategic realignment support. They are now on department payroll. The position of Torsvik is funded by Statoil for a transitional period, also to be taken over by the Department.

There have been very few female applicants for the advertised positions. An exception is the post in dynamic meteorology, where the first choice was a female applicant who withdrew.

Presently we have four positions under appointment. These are for:

- Professor/associate professor in marine geophysics. Well qualified applicants, including female.
- Professor/associate professor in geomechanics. Well qualified associate professor applicants, including female.
- Associate professor in micropalaeontology/biostratigraphy. 3 yr partial transitional funding by Shell. First announced as full professorship only. Offered to the only qualified female applicant, who withdrew. Re-advertised as associate professor
- Associate professor in sedimentology. First announced as a professor/associate professor post. Few applicants, now being re-advertised.

According to our long-term budget, we expect four additional positions to be announced up to 2014. Our present policy is to advertise the positions mainly as associate professorships, to improve the opportunity for young researchers and female researchers.

In PhD and postdoctoral fellowships, two thirds of the persons appointed applied from abroad. Even though the quality of the applications varies, and many of the positions are re-advertised to ensure top candidates, we are generally highly satisfied with the candidates appointed. About one third of the fellows are female. The highly diversified international background of the candidates is no drawback, but the very low proportion of Norwegian applicants is a disturbing signal of the lack of interest amongst Norwegian youth to pursue an academic career in science.

Previous evaluation of basic research in Earth Sciences

The major recommendations from the former national evaluation and the national follow-up plan have been carried out, both when it comes to structural measures like the merging of the former departments into one, and the focusing on high quality research. The follow-up plan has more than 20 recommendations for the geoscience institutions at the University of Oslo, and 10 suggestions for supporting measures from the Research Council. The majority of these suggested actions and measures have been carried out. The only major deviation from the plan is that staff has not been physically moved from Oslo to Bergen, as was suggested for seismology and experimental oceanography. This concerns a couple of individual researchers who are well established in Oslo and play an important role as interdisciplinary bridge builders in their present environment.

Strategy and plans for the future

The following excerpt is from the Research Strategy for the Department of Geosciences 2009-2013¹:

“Breadth and focus. The Department covers all the Geoscience disciplines as defined in the “Norwegian classification of scientific disciplines” by the Council for Universities and Colleges, with respect both to academic education and research. The Department can thus be characterised as a broad-based geoscience institution, well qualified across a wide range of subjects.

Achieving high standards throughout this diversity of disciplines is fundamental to the Department’s long-term profile, while developing areas of interdisciplinary teamwork is both the present and future focus of research. A typical timeframe for an interdisciplinary programme is ten years. With such a strong subject foundation the Department has the great advantage of being able to quickly change and adapt the focus of research as new challenges arise.

The following research groups with an interdisciplinary structure have been, or are in the process of being, established:

- Cryosphere research
- Environmental geology, including natural hazards and CO₂ storage
- Petroleum systems and basin development
- Water as a regulator of biogeochemical cycles

The latter two were selected as development areas at faculty level. The Department also participates in one of the Faculty’s top research programmes, the Centre of Excellence “Physics of Geological Processes”.

Although formal groups have not been established, the Department has considerable research activity and is internationally recognised within the following interdisciplinary fields:

- Climate systems and climate change
- Water resources

The Department is also highly competent in key disciplines related to lithosphere research, geological dating techniques, solid earth physics, and tectonics. A potential strategic area is therefore

- Lithosphere dynamics in time and space, geodynamics

The Department has also built up an expertise in geoscience modelling and remote sensing over a wide spectrum of disciplines, while its joint research partners are specialists in computer simulation techniques.

¹ Full text: <http://www.geo.uio.no/shortstrat.pdf>

However, at present there is little contact and idea sharing between the established disciplines with respect to these themes. This situation highlights an urgent need to establish a new interdisciplinary programme:

- Remote sensing, computer simulation and modelling

Aims for research activity at the Department of Geosciences. The Department of Geosciences places quality and originality as the overriding criteria guiding its research activities. The research must be free, pure research oriented and subject to criteria which ensure the highest ethical standards. In the geosciences it is natural to define pure research as that which seeks to understand the underlying physics and processes, and to monitor and reveal the results of such processes.

The Department will use and develop the potential represented by the great breadth of its disciplines and the opportunities for integration of various research disciplines to be found amongst its partners. The Department will continue to develop its existing contacts and work towards establishing new ones with relevant external groups and institutions, in order to further strengthen interdisciplinary co-operation where this can be of benefit.

The cutting edge expertise of the individual researcher and research group, together with the Department's breadth of knowledge, provide the best possible basis for meeting the challenges of society's need to identify and resolve major practical problems associated with Earth processes, as well as the on-going requirement to acquire more knowledge to drive geoscience-related innovation."

The main challenges for the Department in the coming years are:

- Develop a strategy adjusted to the situation where the importance of the geosciences in society increases, while the number of tenured positions is decreasing;
- Recruitment of high quality young researchers to cover the loss of expertise and capacity that follows the retirement of key senior researchers;
- Uphold the basic academic research in a time when most external pressures and funding instruments drive the research in the direction of applied research with short term spin-off. Nurture curiosity-driven innovation in research – encourage scientific risk taking ("blue sky research");
- Combine focus on excellence with the broad disciplinary coverage that is a necessary part of education and interdisciplinary research in an academic institution.
- Preserve central components of expertise developed in the CoEs and other top quality research groups in a period with shrinking base-funding.
- Uphold laboratory and field activities in education and research, in spite of funding models that discourage such activities.
- Increase the visibility and recruitment potential of the Department through effective outreach activities.
- Establish effective systems for research documentation and sample archiving.
- Better support systems for project managers.

Infrastructure (including major pieces of equipment)

The main research infrastructure of the Department comprises laboratories, high performance computing equipment and field research equipment. The high performance computing consists of a shared ownership of the 4600 CPUs in the UiO Titan cluster which enables very computing intensive parallelised code to be run. The field equipment covers a wide range of sampling equipment, sensors, georadar and safety equipment.

The main laboratory infrastructure at the Department consists of:

Multiple-Collector ICPMS. (Tom Andersen) Nu Instruments high resolution multiple collector inductively-coupled plasma mass spectrometer. The plasma instrument is equipped with 12 Faraday Cups and 3 electron multipliers allowing the simultaneous measurement of numerous isotopes. New in 2005, needs quadrupole upgrade.

Thermal ionization mass spectrometry (TIMS). (Fernando Corfu) Finnigan MAT 262 TIMS with eight Faraday collectors and secondary electron multiplier ion counter. Supporting equipment, clean room etc. Old equipment that is vital to highly productive research at TPG and PGP. In need of maintenance/upgrade at a cost of 1.8 mill NOK.

Organic geochemistry laboratory. (Dag A. Karlsen/Kristian Backer Owe) Latroscan MK-5 TLC-FID thin layer chromatograph with flame ionization detector. Various Fisons and Varian gas chromatographs, including autosampler and SPME equipment. Old equipment, sentral to the unique research in petroleum geochemistry, in need of upgrade (cost approximately 2 mill NOK).

Electron microprobe. (Muriel Erambert) Cameca SX100. Upgraded EDS and software 2010.

Scanning electron microscope (SEM). (Berit Løken Berg) JEOL JSM 6460LV LINK INCA EDS - (Energy Dispersive X-ray System).

Experimental fluid-rock reaction lab. (Per Aagaard) Equipped with four titanium Parr (C) reactors equipped with heaters, controllers and high-pressure pumps for flow-through and batch reactions for temperatures up to 250-300C and pressures up to 160 bars. Two titanium column reactors with heaters certified for 300C, 150-200 bars. Low-temperature equipment. There are plans for expanding the lab with multiphase flow-cells within FME SUCCESS.

X-Ray Equipment. Philips PW2400 X-ray fluorescence spectrometer, Philips X'Pert MPD, X-ray diffractometer. Not producing publishable major and trace-element data at the moment – expertise upgrade needed.

Thin section equipment. Well equipped, but closed due to HES problems. Common solution with the Natural History Museum is being explored.

Other support labs. Chemistry, sediment analysis, geophysics, micropaleontology/palynology.

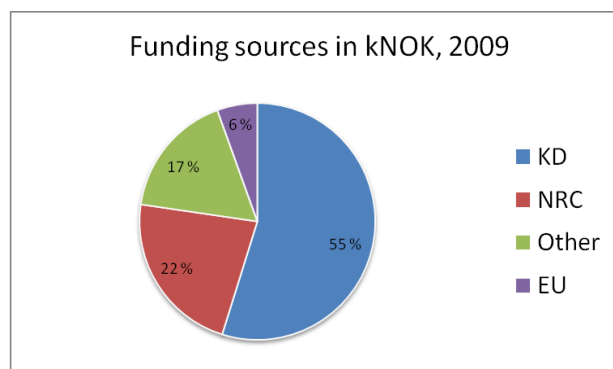
The number of technical staff operating the laboratories is presently 6, two down from “normal” operating level. This has resulted in reduced service level and competence coverage the last couple of years.

ALOMAR- Arctic Lidar Observatory for Middle Atmosphere Research. The Department is partner and owner in the ALOMAR facility at Andøya.

Planned: Palaeomagnetic laboratory. (Trond H. Torsvik) Necessary equipment for the research in geodynamics – not in place. Necessary investment approx. 5-7 mill NOK.

General conditions for research

The general development of the personnel situation of the Department of Geosciences is typical of most natural sciences university departments in Norway; the number of tenured research position is decreasing, while the number of temporary positions, in particular PhDs and postdocs, is rapidly increasing. This is a result of the political and strategic changes in research funding from base funding to project, programme and centre funding. This tendency is augmented by the increasing demands on all levels of the university structure for administrative control and reporting, which changes the balance between scientific and administrative positions. In 2003 the Department of Geosciences was created with a tenured staff of 40 positions. Our long term budget (up to 2014) sets the sustainable number of tenured positions to 36, a reduction of 10%. Even though there is a fairly high rate of retirement, the number of positions to be announced is therefore limited. This is particularly worrying given that this period sees the phaseout/phasein of our two closest CoEs; PGP and ICG, and the Department faces challenges and expectations to preserve some of the expertise developed by these centres, competence that is presently represented by postdocs and researchers in temporary positions.



The figure shows the funding of the Department by source. It should be noted that PGP projects are not included. As shown, the level of external funding is on par with the internal funding (tagged KD in the graph). Since at least half of the internal funding is used for teaching, it means that two thirds of the research activities are funded

externally, and most of the internal part is tied up as internal contributions to external projects. With the prevailing cost/funding structure of external projects (EU, Research Council, industry contributory project), this means that the Department is reaching its capacity for taking on such projects, and further expansion of the activity through external projects is hardly possible. The heavy reliance on external projects with short funding horizon makes the activity level of the Department vulnerable to political changes and strategical reprioritisation by the funding agencies..

The one possibility to increase capacity for research is to reduce the workload in teaching. There is still potential for this, both in better co-ordination within the Department, co-operation with other departments at UiO, and increased external co-operation, especially on the masters and PhD level. It should be noted, however, that throughout the period of decreasing staff, the researchers at the department have been able to sustain and increase its scientific productivity, as seen from the publication records and citation indexes, and simultaneously increase the number of students on all levels.

Other information of relevance to the evaluation

Building. The Geology Building that houses the larger part of the Department has its qualities, but also has its deficiencies in supporting modern earth science research. The main drawbacks are lack of flexibility, poor suitability for laboratory operations and lack of project areas. The latter is accentuated by the pressure created by centre establishment, like the new SUCCESS node (CO₂ sequestration in geological formations) and the high influx of guest researchers. Neither does the building have space for proper integration of the Masters students in the research teams, an important element in research-based education.

ISI Publications 2005-2009

The figure below shows the development of publication activity over the last five year, by research group. The selection is based on the staff as included in the self-evaluations, and only publications with affiliation UiO is included. The citation counts are limited to the publications included (2005-2009).

