

The Bayerisches Geoinstitut at Bayreuth invites applications from junior as well as senior scientists to participate in experimental research in geoscience. Experiments under extreme conditions of pressure and/or temperature combined with an atomistic approach to properties and processes are central to most studies. The Geoinstitut is a center for the study of processes and material properties in the Earth and planetary interiors using advanced technologies.

The Geoinstitut consists of a group of scientific, technical and administrative staff under the leadership of Hans Keppler, Tomoo Katsura and Dan Frost. The following is a list of scientists actively involved in research at the Geoinstitut at the beginning of 2012.

**Vladislav Alexandrov** (M.Sc. 2005, Sofia)

Numerical modelling of geophysical processes

**Andreas Audétat** (Ph.D. 1999, Zurich)

Geochemistry of melts and fluids, igneous petrology, ore deposits

**Christopher Beyer** (M.Sc. 2011, Münster)

Elastic and excess properties of silicate solid solutions

**Stephan Blaha** (M.Sc. 2011, Vienna)

Temperature dependence of dislocation creep rate of mantle minerals

**Tiziana Boffa Ballaran** (Ph.D. 1997, Pavia)

Solid solutions, cation ordering, high-pressure and high-temperature phase transitions in minerals

**Ana Cernok** (M.Sc. 2011, Vienna)

Experimental studies on high-pressure silica polymorphs

**Thomas Chust** (Dipl.-Geophys. 2009, München)

Computational thermodynamics and mantle convection

**Leonid Dubrovinsky** (Ph.D. 1986, Moscow)

Phase transformations, chemical reactions and crystallography at ultra-high pressures and temperatures

**Ahmed El Goresy** (Dr. rer. nat. 1961, Heidelberg)

Mineralogical and isotopic studies of meteorites; terrestrial impact craters

**Martha Evonuk** (Ph.D. 2006, UCSC Santa Cruz)

Numerical modeling of giant planets and the Earth's core

**Hongzhan Fei** (B.Sc. 2008, Zhejiang University)

Hydrogen diffusion, Si self-diffusion and dislocation creep of mantle minerals

**Daniel Frost** (Ph.D. 1996, Bristol)

Phase relations of the Earth's deep interior; thermodynamic properties of minerals, fluids at HP/HT

**Mattia Giannini** (M.Sc. 2009, Pavia)

XRD and TEM studies of hibonites, implications for redox conditions during solar nebula condensation

**Huiyang Gou** (Ph.D. 2009, Yanshan University)

Computational study and synthesis of transition metal borides and boron-rich compounds

**Dennis Harries** (Dipl. in Geosciences 2008, Göttingen)

TEM studies of microstructures in pyrrhotites, their phase relations and alteration behaviors

**Florian Heidelbach** (Ph.D. 1994, Berkeley)

Textures and microstructures of deformed rocks

**Tomoo Katsura** (Ph.D. 1991, Okayama)

Physics and chemistry of the Earth's interior, high-pressure mineral physics

**Hans Keppler** (Dr. rer. nat. 1988, Karlsruhe)

Experimental geochemistry and geophysics

**Stefan Keyssner** (Dr. rer. nat. 1992, Aachen)

Scientific administration; ore petrology

**Ilya Kupenko** (M.Sc. 2009, Moscow)

Studies of materials in laser-heated DACs by nuclear resonance methods

**Alexander Kurnosov** (Ph.D. 2004, Novosibirsk)

Structural features of volatile compounds under high pressure

**Linda Lerchbaumer** (Mag.rer.nat. 2008, Vienna)

Metal partitioning in two-phase fluids; synthetic fluid inclusions

**Yuan Li** (M.Sc. 2009, Bayreuth)

Nitrogen solubility in silicate melts, mantle minerals and the core

**Geeth Manthilake** (Ph.D. 2008, Okayama)

Transport properties of mantle minerals

**Catherine McCammon** (Ph.D. 1984, Canberra)

Physics and chemistry of minerals

**Nobuyoshi Miyajima** (Ph.D. 1997, Hokkaido)

High pressure mineralogy, TEM studies

**Yoichi Nakajima** (Ph.D. 2009, Tokyo Tech.)

Element partitioning between metal and silicates at high pressure during formation of the Earth's core

**Huaiwei Ni** (Ph.D. 2009, Michigan)

Properties of silicate melts and hydrothermal fluids

**Davide Novella** (M.Sc. 2010, Bayreuth)

Silicate mineral and melt interactions with reduced volatile phases in the Earth's mantle

**Mezhoura Oussadou** (M.Sc. 2008, Algiers)

Magnetic and structural properties of minerals at high pressure

**Sergey Ovsyannikov** (Ph.D. 2004, Ekaterinburg)

Transport properties of materials of the Earth's mantle and the D" layer

**Martha Pamato** (M.Sc. 2010, Bayreuth)

Elasticity of mafic crust in the Earth's lower mantle

**Clemens Prescher** (Dipl.-Min. 2009, Jena)

Chemistry of the Earth's lower mantle

**David Rubie** (Ph.D. 1971, Leicester)

Physical and chemical processes of accretion, core formation and differentiation in planetary bodies; diffusion, rheology, and reaction kinetics at HP

**Henri Samuel** (Ph.D. 2003, Paris)

Numerical and analytical modeling of geodynamic processes in terrestrial planets

**Svyatoslav Shcheka** (Dr. rer. nat. 2006, Tübingen)

Carbon and noble gases in the Earth's mantle, diamond formation, thermal conductivity of mantle minerals

**Ryosuke Sinmyo** (Ph.D. 2010, Tokyo Tech.)

Phase equilibria of lower mantle minerals under high pressure using laser heated diamond anvil cell

**Vincent Soustelle** (Ph.D. 2010, Montpellier)

Experimental deformation of mantle rocks

**Gerd Steinle-Neumann** (Ph.D. 2001, Michigan)

Computational mineralogy, structure of Earth's interior

**Dmytro Trots** (Ph.D. 2007, Darmstadt)

Single crystal X-ray diffraction combined with Brillouin scattering spectroscopy

**Vojtech Vlcek** (M.Sc. 2011, Bayreuth)

Band structure and radiative thermal conductivity for silicates and oxides through density functional theory computations

**Antje Vogel** (Dipl.-Min. 2010, Köln)

Metal/silicate element partitioning at high pressures and temperatures

**Nicolas Walte** (Dr. rer. nat. 2005, Mainz)

Setup of a high-pressure neutron facility at FRM II; experimental rock deformation

**Xaozhi Yang** (Ph.D. 2008, Hefei and Nancy)

Geochemistry and mineral physics of the lower continental crust

The present scientific staff of the Geoinstitut are supported by 4 electronic/computer engineers/technicians, 2 sample preparation technicians, 2 chemistry-lab technicians, 5 machinists, 1 administrative officer and 2 secretaries.

The following equipment is available at Bayerisches Geoinstitut:

#### I. High-pressure apparatus

- 6x800 tonne independently acting-anvil press (25 GPa, 3000 K)
- 5000 tonne multianvil press (25 GPa, 3000 K)
- 1200 tonne multianvil press (25 GPa, 3000 K)
- 1000 tonne multianvil press (25 GPa, 3000 K)
- 500 tonne multianvil press (20 GPa, 3000 K)
- 500 tonne press with a deformation DIA apparatus
- 4 piston-cylinder presses (4 GPa, 2100 K)
- Cold-seal vessels (700 MPa, 1100 K, H<sub>2</sub>O), TZM vessels (300 MPa, 1400 K, gas), rapid-quench device
- Internally-heated autoclave (1 GPa, 1600 K)
- High-pressure gas loading apparatus for DAC

#### II. Structural and chemical analysis

- 1 X-ray powder diffractometer
- 1 X-ray powder diffractometer with furnace and cryostat
- 2 automated single-crystal X-ray diffractometers
- High-brilliance X-ray system
- Single crystal X-ray diffraction with super-bright source
- 1 Mössbauer spectrometer (1.5 - 1300 K)
- 3 Mössbauer microspectrometers
- 2 FTIR spectrometers with IR microscope
- FEG transmission electron microscope, 200 kV analytical, with EDS and PEELS
- FEG scanning electron microscope with BSE detector, EDS, EBSD and CL
- 3 Micro-Raman spectrometers with ultraviolet and visible lasers
- Tandem-multipass Fabry-Perot interferometer for Brillouin scattering spectroscopy
- JEOL JXA-8200 electron microprobe; fully-automated with 14 crystals, 5 spectrometer configuration, EDX, capability for light elements
- 193 nm Excimer Laser-Ablation ICP-MS
- ICP-AES sequential spectrometer
- Water content determination by Karl-Fischer titration
- GC/MS-MS for organic analyses
- Confocal 3D surface measurement system

#### III. *In situ* determination of properties

- Diamond anvil cells for powder and single crystal X-ray diffraction, Mössbauer, IR, Raman, optical spectroscopy and electrical resistivity measurements up to at least 100 GPa
- Facility for *in situ* hydrothermal studies in DAC
- Externally heated DACs for *in situ* studies at pressures to 100 GPa and 1200 K

- 1-atm furnaces to 1950 K, gas mixing to 1600 K, zirconia  $fO_2$  probes
- 1-atm high-temperature creep apparatus
- Gigahertz ultrasonic interferometer with interface to resistance-heated diamond-anvil cells
- Heating stage for fluid inclusion studies
- Impedance/gain-phase analyser for electrical conductivity studies
- Apparatus for *in situ* measurements of thermal diffusivity at high P and T
- Laser-heating facility for DAC
- Portable laser heating system for DAC

#### IV. Computational facilities

- 9 node linux cluster (2x3.0 GHz Xeon Woodcrest Dual Core, 8 Gb memory), InfiniBand
- 8 node linux cluster (16x2.83 GHz Xeon 5440 Quad Core, 64 Gb memory), InfiniBand
- RAID System (6 + 7 Tb storage)

The Geoinstitut is provided with well equipped machine shops, an electronic workshop and sample preparation laboratories. It has also access to the university computer centre.

The Geoinstitut welcomes applications for visiting scientist positions. The duration of such positions can range from two weeks up to two years or more. Longer-term appointments are usually for 2.5 years with the possibility of extension up to a maximum of five years total. Decisions concerning long-term appointments are normally made three times per year, in January, May and September. Applications may be submitted at any time to the Director, at the address given below, and should consist of a *curriculum vitae*, list of publications, a short statement of research interests and details of three referees.

Other fellowships including AvH, DAAD, DFG, EU can be utilized at the Geoinstitut. The institute may give assistance in applications for such funding.

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# Bayerisches Geoinstitut Bayreuth



## Visiting Scientist Program of the Bayerisches Forschungsinstitut für Experimentelle Geochemie und Geophysik



Foto: A. Türk

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