

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, Dan Frost, and Tomoo Katsura. The following is a list of scientists actively involved in research at the Geoinstitut at the beginning of 2021.

Sumith Abeykoon (M.Sc. 2018, Bayreuth)

Oxybarometry and thermobarometry based on accessory phases

Alena Aslandukova (M.Sc. 2020, Moscow)

Metal hydrides at high pressure

Andreas Audéat (Ph.D. 1999, Zurich)

Geochemistry of melts and fluids, igneous petrology, ore deposits

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

Solid solutions, cation ordering, HP/HT phase transitions in minerals

Dmitry Bondar (M.Sc. 2017, Moscow)

Water partition coefficients between upper mantle minerals and melts

Audrey Bouvier (Ph.D. 2006, ENS Lyon)

Chemical and isotopic compositions of planetary materials. Origins of the solar system and planetary formation and differentiation

Jia Chang (Ph.D. 2019, Wuhan)

Genesis of magmatic-hydrothermal ore deposits

Artem Chanyshv (Ph.D. 2017, Novosibirsk)

Rheology in the Earth's interior; high-pressure chemistry of bridgmanite; development of a multianvil beam line in a synchrotron

Laura Cialdella (M.Sc. 2018, Padova)

Solubility and partitioning of nitrogen in the Earth's interior

Giacomo Criniti (M.Sc. 2019, Bayreuth)

Elasticity of mantle minerals at HP/HT

Laura Czekay (M.Sc. 2019, Tübingen)

Al,Si-interdiffusion in bridgmanite (silicate perovskite) and the viscosity of the lower mantle

Danilo Di Genova (Ph.D. 2012, Roma)

Physical and chemical processes leading to volcanic eruption and magma fragmentation

Jonathan Dolinski (M.Sc. 2019, Tempe)

Stress measurements with piezoelectric crystals in high pressure experiments

Serena Dominijanni (M.Sc. 2018, Roma)

Probing mantle oxygen fugacity through experiments and natural samples

Leonid Dubrovinsky (Ph.D. 1986, Moscow)

Phase transformations, chemical reactions and crystallography at ultra-high P/T

Lisa Eberhard (M.Sc. 2017, Bern)

Carbonate stability and decarbonation reactions at high pressure

Jing Fang (Ph.D. 2019, Sanya)

Molybdenum complexation in magmatic-hydrothermal fluids and Mo partitioning between aqueous fluids and silicate melts

Hongzhan Fei (Dr. rer. nat. 2013, Bayreuth)

Electrical conductivity of mantle minerals; mineral physics; rheology in the Earth's interior

Michaela Flanigan (M.Sc. 2017, Canberra)

Partitioning of helium between mantle minerals and melt at high pressure

Daniel Frost (Ph.D. 1996, Bristol)

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

Gregor Golabek (Ph.D. 2010, ETH Zürich)

Numerical modelling of Earth and planetary interiors

Florian Heidelbach (Ph.D. 1994, Berkeley)

Rock deformation experiments and textures

Remco Hin (Ph.D. 2013, ETH Zurich)

Chemical and isotopic evolution of planetary bodies during their formation and differentiation

Christopher Howard (Ph.D. 2019, London)

Crystallography of planetary ices under extreme conditions

Takayuki Ishii (Ph.D. 2015, Gakushuin University)

Phase relations of mantle minerals and rocks under upper and lower mantle conditions using multianvil HP apparatus

Tomoo Katsura (Ph.D. 1991, Okayama)

Physics and chemistry of the Earth's interior; HP mineral physics

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

Experimental geochemistry and geophysics

Eun Jeong Kim (Ph.D. 2019, Seoul)

Phase relations of lower mantle minerals; distribution of volatile elements in the mantle

Alexander Kurnosov (Ph.D. 2004, Novosibirsk)

HP/HT elasticity of minerals

Dominic Langhammer (M.Sc. 2020, Bayreuth)

Physical properties of silicate solids and liquids to the TPa range from ab-initio calculations

Dan Liu (M.Sc. 2017, Wuhan)

Water solubility in majorite; HP/HT spectra of hydrous minerals and nominally anhydrous minerals

Siqi Liu (M.Sc. 2017, Beijing)

Fluids, partial melting and metal transport in the mantle

Lianjie Man (M.Sc. 2019, Hefei)

Chemical differentiation of early Earth

Catherine McCammon (Ph.D. 1984, Canberra)

Physics and chemistry of minerals

Thomas Meier (Dr. rer. nat. 2016, Leipzig)

Nuclear magnetic resonance at extreme conditions; electronic and magnetic properties of correlated electron systems at HP

Caterina Melai (M.Sc. 2017, Bayreuth)

Fractionation processes affecting volatile-bearing fluids and melts in the deep mantle

Nobuyoshi Miyajima (Ph.D. 1997, Hokkaido)

High pressure mineralogy, TEM studies

Adrien Néri (Ph.D. 2019, Toulouse)

Acoustic wave velocities in partially molten systems relevant to the Earth's mantle

Sergey Ovsyannikov (Ph.D. 2004, Ekaterinburg)

Phase transitions in oxide systems at HP/HT conditions

Esther Posner (Dr. rer. nat. 2017, Bayreuth)

Transport and elastic properties of minerals and melts at high pressure

Narangoo Purevjav (Ph.D. 2017, Okayama)

Incorporation of hydrogen in anhydrous minerals of the deep Earth as studied by neutron diffraction

Marija Putak Juriček (M.Sc. 2016, Zagreb)

Behaviour of water in the upper mantle

David Rubie (Ph.D. 1971, Leicester)

Physical and chemical processes of accretion; core formation and differentiation in planetary bodies

Greta Rustioni (Dr. rer. nat. 2020, Bayreuth)

Trace element mobility in subduction zone fluids; nitrogen solubility in lower mantle minerals

Gerd Steinle-Neumann (Ph.D. 2001, Ann Arbor)

Computational mineralogy, structure of Earth's interior

Marcel Thielmann (Dr. sc. ETH 2014, Zürich)

Numerical modeling of rock deformation and strain localization on all scales from the grain scale to the lithosphere

Kirill Vlasov (M.Sc. 2018, Moscow)

Electrical conductivity of upper mantle and crustal fluids

Lin Wang (Dr. rer. nat. 2018, Bayreuth)

Rheological properties of lower mantle minerals through diffusion experiments, phase relations in the lower mantle minerals, core formation mechanism

Anthony Withers (Ph.D. 1997, Bristol)

Origin, incorporation, storage, and processing of volatile elements in terrestrial planets

Longjian Xie (Ph.D. 2018, Okayama)

UHP and UHT generation in multianvil press, viscosity of magma ocean

Jie Yao (M.Sc. 2016, Perth)

Thermodynamics of silicate melts at high pressure and magma ocean processes

Liang Yuan (Ph.D. 2019, Sendai)

Computational and experimental mineral physics with applications to the structure and composition of the Earth's interior

The present scientific staff of the Geoinstitut are supported by four electronic/computer engineers/technicians, two sample preparation technicians, four chemical lab technicians, five machinists, one administrative officer and two secretaries.

The following equipment is available at the Bayerisches Geoinstitut:

I. High-pressure apparatus

- 15 MN/1500 tonne Kawai-type multianvil high-pressure apparatus (40 GPa, 2000 K)
- 6 x 8 MN/6x800 tonne independently acting-anvil press (25 GPa, 3000 K)
- 50 MN/5000 tonne multianvil press (25 GPa, 3000 K)
- 12 MN/1200 tonne multianvil press (25 GPa, 3000 K)
- 10 MN/1000 tonne multianvil press (25 GPa, 3000 K)
- 5 MN/500 tonne multianvil press (20 GPa, 3000 K)
- 5 MN/500 tonne press with a deformation DIA apparatus
- 5 piston-cylinder presses (4 GPa, 2100 K)
- Cold-seal vessels (700 MPa, 1100 K, H₂O), TZM vessels (300 MPa, 1400 K, Ar), rapid-quench cold-seal vessels (400 MPa, 1200 K, H₂O)
- Internally-heated autoclave (1 GPa, 1600 K)
- High-pressure gas loading apparatus for DAC

II. Structural and chemical analysis

- 1 X-ray powder micro-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 (TEM), 200 kV analytical, with EDS
- FEG scanning TEM, 80-200 kV analytical, with 4-SDDs EDS and post-column energy filter (EFTEM/EELS)
- FEG scanning electron microscope (SEM) with BSE detector, EDS, EBSD and CL
- Dual beam device, focused ion beam (FIB) and FEG SEM. *In situ* easy-lift manipulator, STEM, EDS and EBSD detectors, and beam deceleration option
- 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
- Water content determination by Karl-Fischer titration
- GC/MS-MS for organic analyses
- Confocal 3D surface measurement system
- 1.4 Tesla sweepable ESR magnet
- Solid state 300 MHz NMR spectrometer

III. *In situ* determination of properties

- Diamond anvil cells for powder and single crystal X-ray diffraction, Mössbauer, IR, Raman, optical spectroscopy, NMR spectroscopy, electrical resistivity measurements over 200 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
- Freezing-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 pulsed laser heating system for DAC

The Geoinstitut maintains a well equipped machine shop, an electronic workshop and sample preparation laboratories. It has access to supercomputing resources at the University and Leibniz computer centres.

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. 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



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