UNIVERSITÄT
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Two professorial positions at the Division of Space Research and Planetary Sciences of the University of Bern: Additional Information

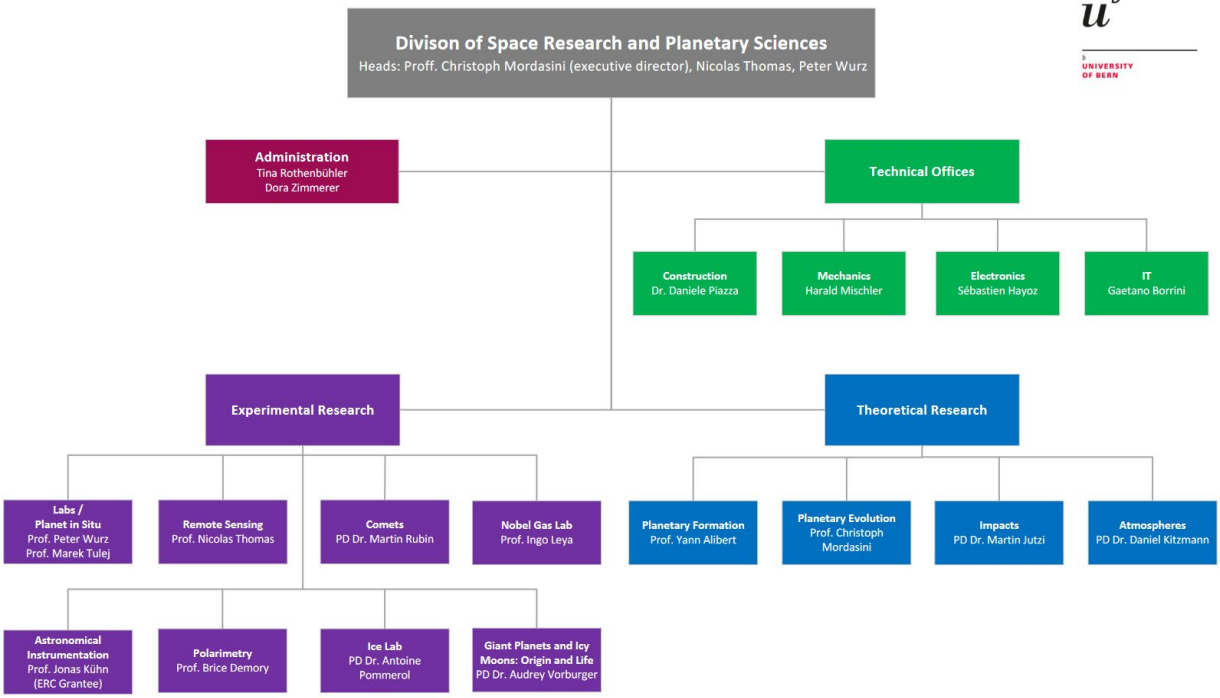
Context, structure, and projects

The University of Bern is one of the leading universities in Switzerland and currently ranked 116 in the Times World University Rankings (2024). It is located in the center of the capital of Switzerland almost directly above the main railway station allowing very easy access to the Swiss and European transport network. Within the University strategy (Strategy 2030) there are five major scientific themes (https://www.unibe.ch/university/portrait/strategy/strategy_2030/index_eng.html) including "Matter and the Universe" which is seen as a particular strength and strategic focus of the University, underlining the importance of space research in Bern. Physics in general and the Division of Space Research and Planetary Sciences contribute critically to this (and other themes) within the University strategy.

The successful candidates will be members of the Division of Space and Planetary Sciences (Weltraumforschung und Planetologie, WP) within the Physics Institute and will be the successors of Prof. Nicolas Thomas and Prof. Peter Wurz. WP is the leading planetary sciences institute in Switzerland (http://space.unibe.ch) and participates in a large number of ESA and NASA missions. The division has a long history of successful experimentation extending back to the provision of the Solar Wind Foil experiment on Apollo 11. Involvements have recently expanded to include participation in JAXA and ISRO missions.

Two large experimental groups are led by full professor Nicolas Thomas (remote sensing experiments) and full professor Peter Wurz (in situ neutral and ion mass spectrometers). These groups focus on the development and exploitation of novel experiments for flight on the spacecraft missions of several agencies. The remote sensing experiments provide access to information about the surfaces and interiors of planets, planetary satellites, and small bodies. The mass spectrometers are used to determine the composition of planetary atmospheres and surface materials, planetary and satellite exospheres, cometary outgassing, and interstellar gas. These two experimental groups tightly collaborate with the theoretical team led by the third full professor at the Division, Christoph Mordasini, which models aspects of the observations and places them in the context of their implications for the formation, evolution, and habitability of our Solar System and extrasolar systems.

As a large unit with in total close to 100 employees, the Division has the critical mass to play a central role in space research and especially in space instrumentation. The division is structured as shown in the figure.



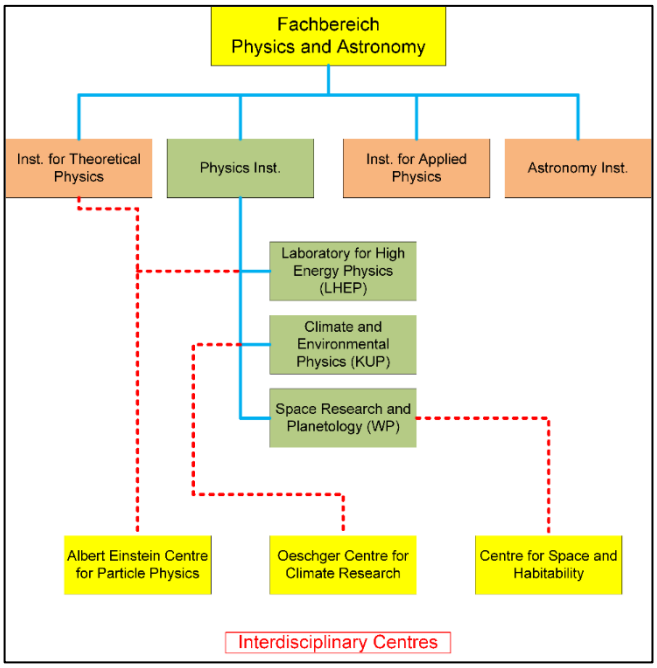
The experimental research pillar consists of the research groups of the following permanent WP staff: Labs/Planets in Situ (Prof. Peter Wurz, Prof. Marek Tulej), Remote Sensing (Prof. Nicolas Thomas), Comets (PD Dr. Martin Rubin), Nobel Gas Lab (Prof. Ingo Leya), Astronomical Instrumentation for exoplanets (ERC Grantee Prof. Jonas Kühn), Polarimetry and Exoplanet Observations (Prof. Brice Demory), Ice Lab (PD Dr. Antoine Pommerol), and Giant Planets and Icy Moons (PD Dr. Audrey Vorburger). The theoretical research pillar consists of: Planetary Formation (Prof. Yann Alibert), Planetary Evolution (Prof. Christoph Mordasini), Impacts (PD Dr. Martin Jutzi) and Atmospheres (PD Dr. Daniel Kitzmann). This significant group of researchers addressing many different aspects of space research and planetary sciences offers a vibrant environment for fruitful scientific exchange and many collaborations and joint projects.

The successful candidates will become members of the common division lead. In case of an appointment as an assistant professor tenure track, the position is initially limited to three years and can be converted into a permanent position if the qualification criteria are met. The subsequent promotion from associate to full professor is also subject to fulfillment of qualification criteria.

The Division is currently engaged in developing and building hardware for ESA's Comet Interceptor mission and NASA's Artemis mission, having its instruments on the BepiColombo mission on its way to Mercury and on JUICE on its way to the Jovian system. It currently operates the CaSSIS instrument on the Trace

Gas Orbiter at Mars and the CHEOPS exoplanet satellite for which WP is the PI institute (PI Prof. em. Willy Benz). It analyses these data and data from the HiRISE (MRO), IBEX, ROSINA (Rosetta), and OSIRIS (Rosetta), HIS (Solar Orbiter) experiments. It is preparing for future space missions and instrumentation such as Europa Clipper to the Jupiter system, IMAP to explore the interstellar medium, PLATO (exoplanet survey), the Uranus Orbiter and Probe, missions searching for life in the Solar System as well as ground-based instruments to study extrasolar planets (NIRPS, RISTRETTO, ANDES).

WP is strongly linked to the University of Bern's Center for Space and Habitability (www.csh.unibe.ch). The CSH supports and exploits interdisciplinary activities in adjacent fields such as machine learning, biomedical applications, internal geodynamics, and philosophy. The University of Bern / WP is also the leading house of the NCCR PlanetS (http://nccr-planets.ch), whose Director is Prof. Nicolas Thomas and Co-Director is Prof. Stephane Udry (University of Geneva). The NCCR, which is a flagship funding instrument of the Swiss National Science Foundation SNSF, is concerned with research about the formation and architecture of (exo)planetary systems, the physics, search, and characterisation of (exo)planets, and the habitability and the search for life. As legacy of the NCCR PlanetS, being completed in 2026, a new Swiss Institute of Planetary Sciences (SIPS) is currently in preparation, and we would expect the new professors to participate in the design and implementation of SIPS. The surrounding structure and configuration of the units in Bern is shown in the figure.



Workshop and Design Office

With the Mechanische Werkstatt für Physik und Astronomie (MWPA), WP has access to an excellent state-of-the-art mechanical workshop, which is, together with the design office, of central importance for the construction of instrumentation for space exploration. The workshop has modern machinery and experienced staff. The machinery includes computer-controlled milling machines, lathes, spark erosion

machines, welding machines, and vacuum equipment. Importantly, it is at a standard sufficient to manufacture components for space missions. The parts can be cleaned, assembled, and tested according to the requirements set by ESA and other space agencies. The machines represent an investment of 400 kCHF in the past 18 months alone and a continuously high investment in the past decades from internal and university resources.

WP also hosts a design office with 12 workstations, 3-dimensional CAD/CAM/CAE system (CATIA V5), and specialized software packages for structural and thermal simulations of space hardware. Such a design office is a key asset for WP's experimental groups.

Laboratories and equipment

Very well-equipped laboratories are another central feature of the division. WP laboratories can integrate, qualify, and calibrate instruments for space missions. WP currently maintains the following laboratories:

- The Grosslabor (Large Laboratory), which houses our vibration test facility (simulating instrument vibration load during rocket launch), a thermal-vacuum chamber with state-of-the-art equipment, and the CASYMIR neutral beam facility for mass spectrometer calibration.
- The CHEOPS lab is an ISO-5 cleanroom housing our state-of-the-art thermal-vacuum chamber.
- The CaSSIS lab, an ISO-5 cleanroom equipped for the integration of optical flight instruments.
- A large ISO-5 cleanroom, housing workstations for flight instrument integration, as well as the CASYMS ion beam facility for mass spectrometer calibration.
- A cleaning lab (as a ISO-5 cleanroom) for preparation of components prior to their integration.
- The MEFISTO lab, which houses the MEFISTO ion beam facility for mass spectrometer calibration.
- The Meteorite Laboratory, which houses mass spectrometers for noble gas analysis.
- Lab B28, which houses cleanroom benches and the laser ablation mass spectrometer test area.
- Laboratory B33, which houses the CLEOPATRA facility for detector characterization.
- The CoCoNUT facility for THz measurements in vacuum.
- A state-of-the-art Chemistry Lab for astrochemistry and biochemistry preparation.
- The Biology Lab for searching for life on samples via in situ measurements.
- The Electronics Lab, which includes offices and clean workbenches for integrating and testing flight electronics for space missions.
- The ice lab, which includes equipment for making ice samples and characterizing them in vacuum using numerous in situ and remote sensing techniques.
- The laboratory with an optical table for the development and integration of the light distribution point LDP of the ANDES spectrograph for the ESO Extremely Large Telescope.

WP currently has the following equipment:

- Two large thermal vacuum chambers for environmental testing of space experiments
- Vibration test facility to simulate loads during rocket launch
- CASYMIR calibration facility with gas mixing system for mass spectrometers

- Large ultra-high vacuum ion mass spectrometer calibration facility CASYMS
- Ion mass spectrometer calibration facility MEFISTO, with ECR and high temperature ion sources.
- Laser mass spectrometry laboratory
- Dedicated lab for lunar research
- Highly sensitive high-voltage partial discharge measuring system
- High precision integrating sphere for flat field, linearity, and intensity calibrations
- Monochromator with halogen illumination
- Lens-based collimator with 1 m focal length and 100 mm aperture
- Optical benches with large (>80 cm diameter) mirrors for test purposes
- Thermal test chambers including the SCITEAS-2 ice simulation chamber
- A low-temperature photogoniometer system, an optical coherence tomography instrument, a pycnometer, and an infrared spectral imaging system for ice characterization
- A high-performance computer cluster with about 5000 cores and Infiniband network

Internal cooperation in the relocation of resources in line with needs is a key component of WP's activities contributing to its success.

Teaching

The amount of teaching required is usually modest compared to some other universities. Bachelor courses are taught in German while Master courses are typically taught in English. It should be noted that there are a significant number of courses for non-physics majors (e.g. chemistry or medicine students) that need to be serviced with service lectures. Typically, there would be 2 hours per week per semester plus contributions to administration of, for example, lab courses, tutorials or exams. The various teaching contributions are discussed annually, and the successful candidates will have to participate in these discussions and to execute the resulting teaching duties. Non-German speakers will of course be given time to become sufficiently proficient so that they can teach basic courses in German.

WP has excellent permanent staff to support administrative activities (including administration of teaching but also IT and general administrative tasks) and is supported by professional personnel within the NCCR, CSH, and the University for media relations and outreach activities. WP is one of the major contributors to media relations and outreach at the University of Bern and well-known in the general public.