NAWI Graz
Natural Sciences

UNI GRAZ

TU Graz

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NAWI Graz BEST PRACTISE OF UNIVERSITY COOPERATION

Since its start as a cooperation project that was mainly dedicated to make use of synergies in teaching and to foster existing research collaborations in 2004, NAWI Graz continually has been extending its scope. The cooperation strategically bundles 36 institutes of both universities with 1,100+ FTE personnel in the areas of Bioscience, Chemistry, Earth, Space and Environmental Science (ESES), Mathematics and Physics and keeps on further developing in the three main pillars NAWI Graz research, NAWI Graz teaching and NAWI Graz organisation.

As of 2023, we are very proud to oversee 21 common study programmes with more than 5,000 bachelor/master students, 33 jointly nominated professors, 150+ jointly used instruments and 20 inter-university central labs/core facilities. But this is definitely not the final phase: More projects are to be realised in the upcoming years and there still are many prospective ideas to be considered for the future. Most prominently, the six Physics institutes will merge in a common building to become the Graz Center of Physics. The 357 Million Euro project will be realised by 2030. In addition to that the Geoscience/Geotechnical groups strive to become united in a future NAWI Graz Geocenter building.

This entire process did not go unnoticed, as there have been several inquiries on how to implement a strategic cooperation of this kind. Moreover, inter-university collaboration has become a basic requirement for infrastructure funding programmes by the federal ministry.

Concluding, we like to express our gratitude and would like to thank everyone who has been contributing to NAWI Graz!

Stefan Vorbach and Joachim Reidl
Chairpersons of the NAWI Graz Steering Committee

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Vice Rector, TU Graz

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Vice Rector, University of Graz

NAWI Graz CENTERS

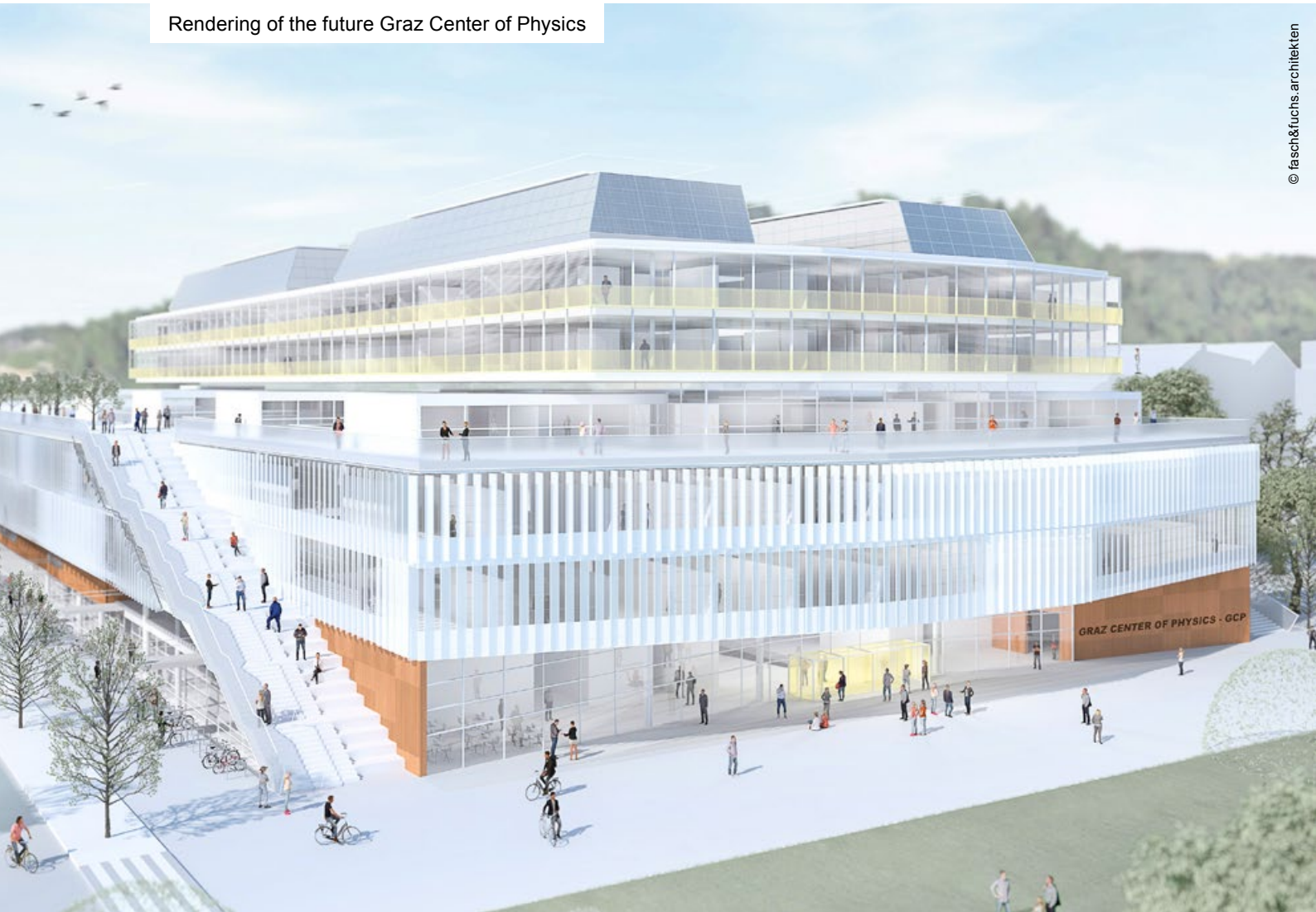
After years of successful cooperation in research and teaching some NAWI Graz areas felt the need for further intensification: With the aim of making the best use of synergies in research, teaching and administration and to increase international visibility as a larger entity, the Physics group (6 institutes) and Geology/ Geotechnical Engineering group (4 institutes) plan to merge into inter-university centers located in common buildings in future.

GRAZ Center of Physics

The NAWI Graz Center of Physics (GCP) represents a unique opportunity for the development and strengthening of physics research in Graz and Austria. Within the GCP, synergies in research, teaching and infrastructure will be further enhanced and optimally used, and a distinctive physics research profile developed, which will make the GCP and Graz a location with international visibility in Physics.

The innovative research profile of the GCP will be centered around the common physics research focus of both universities - nano and quantum materials -, which includes the fields condensed matter physics and interfaces, materials physics, nanoanalytics and nanooptics,

Rendering of the future Graz Center of Physics



atoms, molecules and optics, and computational physics. This expertise is complemented by the thematic complexes of astrophysics, climate physics and space sciences, elementary particle physics, and physics didactics, which by themselves are competence centers of national and international rank, and extend the GCP to a center offering research and education in physics in its entire.

The GCP research topics directly contribute to solution approaches connected with the grand challenges, where, among others, energy, sustainability, environment, climate, digitalization, and health are recognized as the research fields of utmost societal importance. And finally, the role of physics didactics in schools is important for the development of a knowledge-based and technology-oriented society.

Within the GCP the communication and networking between the different working groups and the use of common infrastructure will be further enhanced and contribute to increased efficiency and new synergies. Access to core research facilities such as nanolithography and electron microscopy will become easier. Moreover, the merger under a common roof allows the formation of thematic laboratory clusters (e.g. nanofabrication, optics) and facilitates the establishment of new core facilities and central labs. In combination with the spatial and organizational linkage of the research groups an interactive and creative environment with high identification potential is created, which contributes to strengthen and strategically advance the common research profile.

NAWI Graz Geocenter

Building on their long-term cooperation in research and teaching, the four geosciences and geotechnical engineering institutes of the University of Graz and TU Graz established a virtual interdisciplinary Geocenter in 2015. An eventual common faculty building will further enhance existing cooperation, increase visibility and effectiveness, and leverage synergies in terms of research, teaching and administration.

With the merger of 4 institutes of TU Graz and Uni Graz, the following subject disciplines are represented within the NAWI Graz Geocenter: Mineralogy and Hydrogeochemistry, Engineering Geology, Soil Mechanics, Foundation Engineering and Computational Geotechnics, Rock Mechanics and Tunnelling, Hydrogeology, Petrology und Geochemistry, Geology, Palaeontology und Stratigraphy. These disciplines contribute to the field of excellence “Climate Change Graz” (Uni Graz) and the fields of expertise “Advanced Materials Science” and “Sustainable Systems” (both TU Graz).

Major steps in the implementation process so far were:

• **Teaching related:** The former BSc Geosciences curriculum has been revised to enhance attractiveness and to integrate appropriate geotechnical content. The MSc Geosciences curriculum was revised to enhance mobility through a new modular format in the English language. In 2019, a marketing campaign for both of these programmes was initiated.

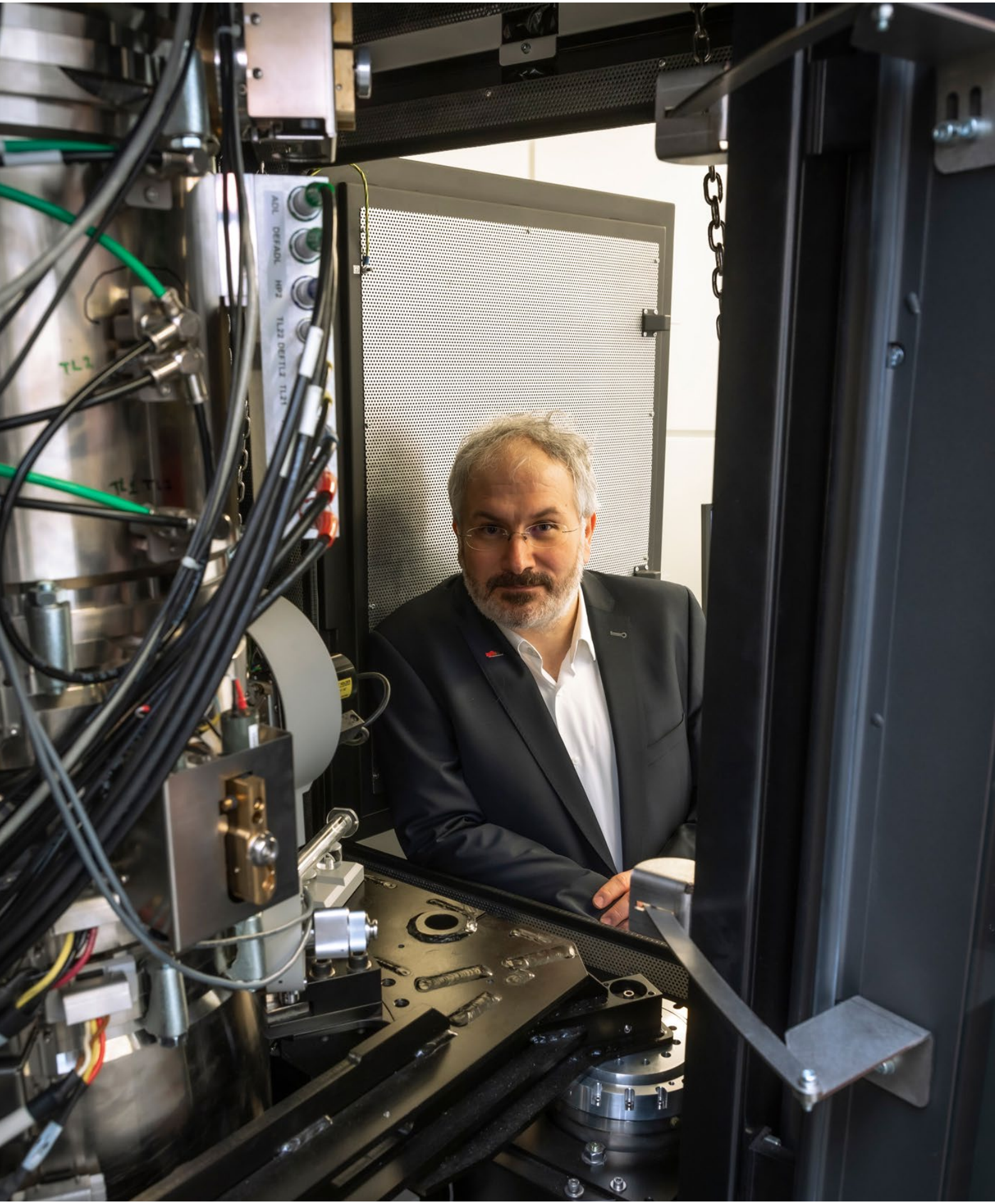
• **Research related:** Joint NAWI Graz facilities as the Field Emission Microprobe and the Stable Isotope Lab and the NAWI Graz Central Lab Water, Minerals and Rocks provide a boost to research activities across the universities. Moreover, a research strategy has been devised to make best uses of synergies.

JOINT NOMINATIONS OF PROFESSORS

Appointing a new professor is always a major decision for a university. It has a significant effect on how a particular subject is represented in terms of research and teaching on a long-term basis. In the case of NAWI Graz, the two universities have agreed to align future professorships located in the five NAWI Graz areas. This ensures that each discipline is represented comprehensively, while both universities are able to stay future-oriented when deciding who to appoint.
Extending the existing practise of coordinating future nominations of professors in the area of natural sciences, both universities started to conduct the joint nomination of professors in 2010. Appointment committees in this nomination procedures consist of members from both universities. All further professorships according to § 99 University Act are aligned in the NAWI Graz Steering Committee. Using this approach, all respective experts are involved in the process of finding the best scientist for an open position, and as a result, the professors nominated are perfectly integrated into the NAWI Graz cooperation right from the start.

As of December 2022, the following 49 NAWI Graz Professors pursuant to § 98 and § 99 University Act have been nominated jointly. Further inter-university nomination procedures for NAWI Graz professors are currently in progress. ►

Name	*Area / Subject Allocation*	*Home University / Institute of …*	*Start/ Year*
Christoph Sensen	Bioscience / Computational Biotechnology	TU Graz / Computational Biotechnology	2014
Ronald Kühnlein	Bioscience / Biochemistry 1	Uni Graz / Molecular Biosciences	2016
Karl Gruber	Bioscience / Biocomputing	Uni Graz / Molecular Biosciences	2016
Robert Kourist	Bioscience / Molecular Biotechnology	TU Graz / Molecular Biotechnology	2017
Tomas Werner	Bioscience / Molecular Plant Physiology	Uni Graz / Biology	2017
Bettina Weber	Bioscience / Botany	Uni Graz / Biology	2019
Sandro Keller	Bioscience / Biophysics	Uni Graz / Molecular Bioscience	2020
Tomas Werner	Bioscience / Plant Physiology	Uni Graz / Biology	2021
Leonhard Grill	Chemistry / Physical Chemistry	Uni Graz / Chemistry	2013
Adrian Daniel Boese	Chemistry / Computational Physical Chemistry	Uni Graz / Chemistry	2014
Paolo Falcaro	Chemistry / Bio-based Materials Technology	TU Graz / Physical and Theoretical Chemistry	2016
Martin Wilkening	Chemistry / Solid State Chemistry of modern Energy Storage Systems	TU Graz / Chemistry and Technology of Materials	2016
Tim Zeiner	Chemistry / Process Systems Engineering	TU Graz / Chemical Engineering and Environmental Technology	2016
Paul Hartmann	Chemistry / Nanomaterials Technologies	TU Graz / Chemistry and Technology of Materials	2018
Wolfgang Kroutil	Chemistry / Biocatalysis	Uni Graz / Chemistry	2018
C. Oliver Kappe	Chemistry / Organic Synthesis Technology	Uni Graz / Chemistry	2018
Gregor Trimmel	Chemistry / Chemistry and Technology of Organic Materials	TU Graz / Chemistry and Technology of Materials	2019
Karin Stana-Kleinschek	Chemistry / Chemistry and Technology of Biobased Organic Materials	TU Graz / Chemistry and Technology of Biobased Systems	2019
Katalin Barta Weissert	Chemistry / Organic Chemistry / Renewable Resources	Uni Graz / Chemistry	2019
Erich Leitner	Chemistry / Analytics of Food and Food Contact Materials	TU Graz / Analytical Chemistry and Food Chemistry	2019
Ulrich Hirn	Chemistry / Pulp Fibre Technology	TU Graz / Bioproducts and Paper Technology	2019
Tanja Wrodnigg	Chemistry / Carbohydrate Chemistry	TU Graz / Chemistry and Technology of Biobased Systems	2020
Jörg Feldmann	Chemistry / Analytical Chemistry/ Environmental Analytics	Uni Graz / Chemistry	2020
Eva Roblegg	Chemistry / Development and manufacturing of drug-delivery systems	Uni Graz / Pharmacy	2021
Viktor Hacker	Chemistry / Hydrogen Fuel Cells	TU Graz / Chemical Engineering and Environmental Technology	2022



Torsten Mayer-Gürr	ESES / Theoretical Geodesy and Satellite Geodesy	TU Graz / Geodesy	2015
Thomas Marcher	ESES / Rock Mechanics and Tunnelling	TU Graz / Rock Mechanics and Tunnelling	2018
Christoph Hauzenberger	ESES / Petrology and Geochemistry	Uni Graz / Earth Sciences	2018
Philipp Berglez	ESES / Navigation	TU Graz / Geodesy	2021
Christiane Helling	ESES / Space Science	TU Graz / Theoretical and Computational Physics	2021
Klemens Fellner	Mathematics / Mathematics – Computational Sciences	Uni Graz / Mathematics	2011
Karin Baur	Mathematics / Algebra	Uni Graz / Mathematics	2011
Jussi Behrndt	Mathematics / Differential Equations	TU Graz / Computational Mathematics (Math D)	2011
Michael Kerber	Mathematics / Computational Topology and Geometry	TU Graz / Geometry	2015
Gunther Leobacher	Mathematics / Stochastics	Uni Graz / Mathematics	2017
Siegfried Hörmann	Mathematics / Applied Statistics	TU Graz / Statistics	2017
Bernd Thaller	Mathematics / Educational Mathematics	Uni Graz / Mathematics	2018
Daniel Smertnig	Mathematics / Algebra	Uni Graz / Mathematics	2019
Christoph Aistleitner	Mathematics / Mathematics	TU Graz / Analysis and Number Theory	2020
Christian Clason	Mathematics / Mathematical Optimisation	Uni Graz / Mathematics	2021
Axel Maas	Physics / Theoretical Physics 2 (Nonperturbative Quantum Field Theory)	Uni Graz / Physics	2014
Martin Sterrer	Experimental Physics 1 (Surface Physics)	Uni Graz / Physics	2014
Claudia Haagen-Schützenhöfer	Physics / Physics Didactics	Uni Graz / Physics	2017
Martin Schultze	Physics / Experimental Physics with special emphasis on Optics and the Science of Light	TU Graz / Experimental Physics	2019
Astrid Veronig	Physics / Solar Physics	Uni Graz / Physics	2019
Gerald Kothleitner	Physics / Electron Microscopy	TU Graz / Electron Microscopy and Nanoanalysis	2020
Peter Banzer	Physics / Experimental Physics – Optics of Nano and Quantum Materials	Uni Graz / Physics	2020
Thomas Weiss	Physics / Theoretical Nanophysics	Uni Graz / Physics	2021
Birgitta Schultze-Bernhardt	Physics / Experimental Physics	TU Graz / Experimental Physics	2022

FULBRIGHT-**NAWI Graz** PROFESSORS

Concerted actions regarding the nomination of visiting professors also have a long tradition in Graz. For this reason, both universities have begun a cooperation with the Fulbright Commission, in order to establish the “Fulbright-NAWI Graz Visiting Professors in the Natural Sciences”. This programme aims to bring distinguished researchers from the United States to Graz for teaching as well as for research. Each Fulbright NAWI Graz professorship is funded for a four-month period. Fulbright-NAWI Graz Visiting Professors are integrated into research and teaching at both universities, which makes the programme highly beneficial for students and researchers. Students attend lectures given in English by native speakers and researchers get the chance to start new partnerships.

Since the programme’s start in 2010, the following Fulbright NAWI Graz Professors have provided highly valuable additions for NAWI Graz teaching and research:

Name	*Subject Allocation*	*Home University / Institute USA*	*Acad. Year*
William W. Woessner	Hydrogeology	University of Montana, Missoula, MT / Geosciences	2010-11
Edina Harsay	Molecular Biosciences	University of Kansas, Lawrence, KS / Molecular Biology	2011-12
Nicholas Baeth	Algebra	University of Central Missouri, Warrensburg, MO / Mathematics	2012-13
Karin Ruhlandt	Inorganic Chemistry	Syracuse University, Syracuse, NY / Chemistry	2013-14
Wayne Becker	Molecular Biology	University of Wisconsin-Madison, WI / Botany	2014-15
Andrew Proctor	Chemistry	University of Arkansas-Fayetteville, AR / Food Science	2015-16
John Shervais	Geo Sciences	Utah State University, Logan, UT / Geology	2016-17
Reuben Hudson	Green Chemistry	Colby College, Waterville, ME / Chemistry	2017-18
Irena Swanson	Algebra	Reed College, Portland, OR / Mathematics	2018-19
Vladimir Tsukruk	Materials Science	Georgia Institute of Technology / Atlanta, GA / Materials Science and Engineering	2019-20
Z. Vivian Feng	Chemistry	Augsburg University / Minneapolis MN / Analytical / Material Chemistry	2020-21
John Schmitt	Algebra	Middlebury College / Middlebury VT / Department of Mathematics	2021-22

▲ Fulbright NAWI Graz Visiting Professors

NAWI Graz ADVANCED SCHOOL OF SCIENCE

Training of the next generation of excellent scientists and highly qualified executives for science and industry is carried out within the framework of the NAWI Graz Advanced School of Science (GASS). In 2006, both universities established doctoral schools that cooperate very closely based on inter-university statutes. High quality standards are maintained, since the doctoral training at both universities complies with the Salzburg Principles (e.g. doctoral students are to be considered as early-stage researchers, and are involved in actual research projects; training agreements are compulsory). Furthermore, as doctoral training and research are interlinked very closely, the doctoral training is also subject to the quality criteria of research funding agencies. Doctoral candidates are members of the inter-university Doctoral Schools and benefit from the support of teachers and researchers from both universities. Joint programmes such as DocDays – mini-congresses, organised by doctoral students – not only introduce doctoral students to various research questions, but also enhance students' organisational and presentational skills. Funds provided for the NAWI Graz Doctoral Schools can be used to partially cover costs for doctoral students to participate in congresses abroad (if they give their own presentation), as well as for special lectures provided by visiting scientists. The number of doctoral students in the five NAWI Graz areas has risen to around 630 students in the past ten years.

Research projects in NAWI Graz areas

Research cooperation in the areas of natural sciences between Graz University of Technology and the University of Graz has a very long tradition. Indeed, research cooperation and especially inter-university research projects are an important nucleus for the implementation and further development of NAWI Graz, as these projects have fostered many new partnerships between scientists. Since the beginning, NAWI Graz has placed strong emphasis on inter-university research projects located at the interface between fundamental and applied research, in order to support these in the best possible way. As a result,

scientists have based on successful small-scale research projects in the early days of NAWI Graz - started to apply for collaborative projects like DKs and SFBs, which are carried out in a much larger context. NAWI Graz has been focusing on such collaborative research projects since 2010. As these are subject to strict evaluation criteria, they strive for very high-quality standards. Furthermore, collaborative research projects have a long-term perspective and bring together researchers from both universities and often from various disciplines. Examples of NAWI Graz collaborative research projects: *doc.funds CATALOX* (Bioscience/Chemistry), *DK Molecular Enzymology (Bioscience/ Chemistry), DK fForte – FreChe Materie (Chemistry/Bioscience), DK Numerical Simulations in Technical Sciences (Mathematics/Engineering), DK Discrete Mathematics (Mathematics), DK/IGK Optimization and Numerical Analysis for Partial Differential Equations with Nonsmooth Structures (Mathematics), DK Hadrons in Vacuum, Nuclei and Stars (Physics), SFB Mathematical Optimization and Applications in Biomedical Sciences (Mathematics) and, SFB Lipotoxicity: Lipid-induced Cell Dysfunction and Cell Death (Bioscience).* The success of NAWI Graz in terms of research is reflected in the development of third-party funding. Starting with 15.6 million Euro in 2006, the annual third-party income increased to 35.6 million Euro in 2022. A total of 450 research projects are conducted in the NAWI Graz areas of TU Graz and the University of Graz per year. Along with the NAWI Graz Scientific Advisory Board, the five NAWI Graz work groups identified emerging research areas. We are looking forward to many more highly visible research projects in future.

NAWI Graz CENTRAL LABS AND CORE FACILITIES

The objective of the NAWI Graz Central Labs/Core Facilities programme is to acquire cost-intensive scientific instruments for which there is considerable demand. Central Labs bundle thematically related equipment at one location. As this equipment is open for use by all NAWI Graz researchers, utilisation of instruments is optimised and measuring periods can be kept short. Core Facilities are single pieces of high-performance equipment, which are urgently needed by several research groups. NAWI Graz Central Labs/ Core Facilities can be funded by up to 50% of the purchase/ installation price. As the implementation of the Central Labs/ Core Facilities is complex and requires various aspects to be taken into consideration, there is a multi-tier approval procedure that starts with a proposal from an inter-university group. Once a proposal has been accepted, it will be developed further together with the NAWI Graz Steering Committee. Currently, there are the following NAWI Graz Central Labs/ Core Facilities:

Central Lab Water, Minerals and Rocks. This lab's research focuses on the creation and decay of minerals, but also on the age and chemistry of the earth by investigating geochemical processes in the biosphere, lithosphere, pedosphere, hydrosphere and atmosphere. The analyses of these highly sensitive samples with the help of HR-MS requires state-of-the-art cleanroom technology.

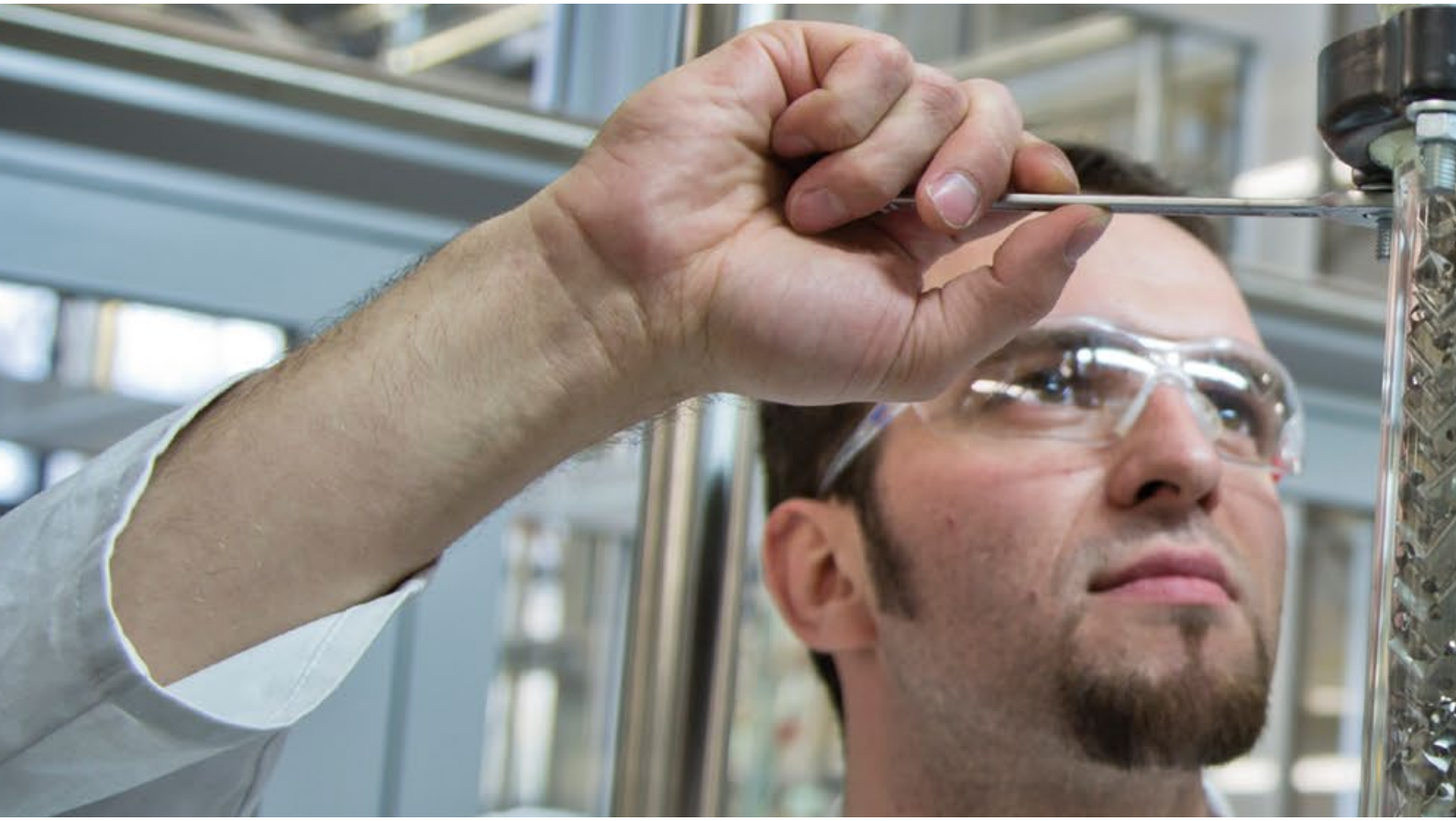
Central Lab Graz Cell Informatics and Analyses (GRACIA). By bundling a high-throughput cell analysis, a cell sorter and server systems, more efficient screening methods for bioactive substances can be conducted. Overall, this Central Lab provides a great platform to conduct systems biology research at a functional level.

Central Lab Environmental, Plant & Microbial Metabolomics. This Central Lab's aim is the structural elucidation of microbial and herbal substances, and investigations into their metabolism as well as their biological effect and impact on the environment. Its main instrument is a HRMS, capable of both quantification and accurate mass measurements, coupled to an UHPLC.

Central Lab Biobased Products. The main objective of this lab is the development and implementation of new technologies for the production and isolation of natural substances (e. g. flavourings, colourings), active substances (e. g. insecticides, fungicides) and bulk products (e. g. ethanol, furfural) from lignocellulose-based materials.

Core Facility Teaching Centre Mathematics. Installing the joint bachelor's programme in Mathematics required many investments, like the expansion of one lecture hall. Moreover, learning spaces for students and a comprehensive virtual library for students and also teachers were established.

Core Facility Nanolithography. This Core Facility filled an important instrumental gap by funding a modern system for nano structuring with electron beam lithography. The new Core Facility with its system's resolution <10 nm enables the exploration of new frontiers in research. Furthermore, the new system is able to structure bigger areas (cm^2).

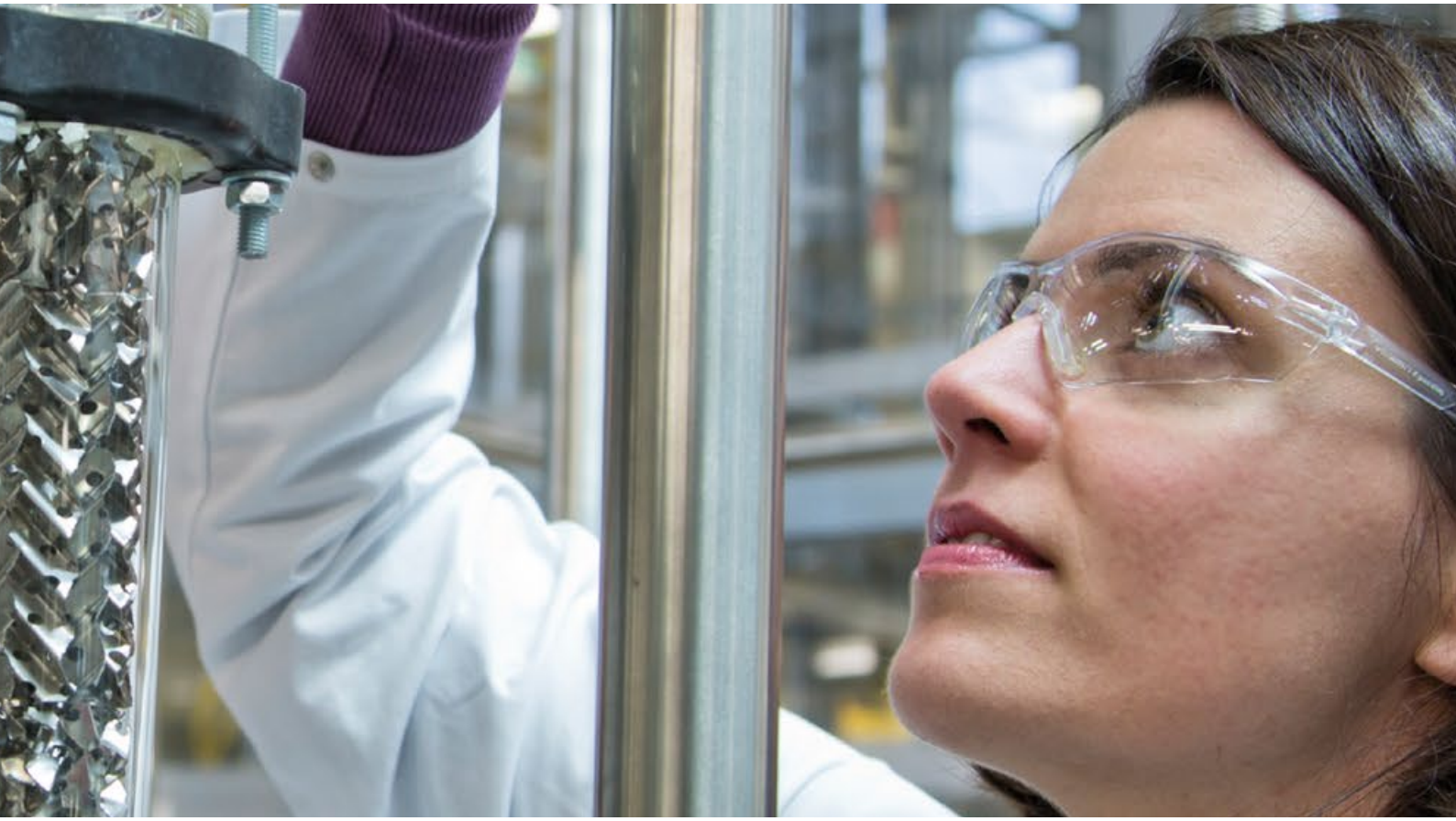


Core Facility Spectropolarimeter. The existing pool of instruments used in Biophysical Methods was enhanced with a highly advanced CD-Spectropolarimeter, which is used for the characterisation of macromolecules, such as proteins, peptides and nucleic acids.

Core Facility STRONG MB. STRuctural Optimisation of NAWI Graz – Molecular Biosciences. Moving a research group from TU Graz to University of Graz and installing a drosophila lab were the first milestones of STRONG MB. This initiative was further enhanced with the joint nomination of a professorship in Biochemistry.

Core Facility Vacuum Suitcase. Investigating samples thoroughly often implies having them measured by different instruments. The CF Vacuum Suitcase enables researchers to measure in an ultra-high vacuum and also guarantees that the samples will not be contaminated or altered in any way when changing instrument or location.

Core Facility Elemental Analysis. For more than 15 years, TU Graz has provided classical C/H/N/S elemental analysis as a service within the greater area of Graz. By updating an existing and purchasing a new instrument, this lab could be converted into a NAWI Graz Core Facility.



Core Facility Field Emission Electron Microprobe. The accurate analysis of mineral compositions and high-resolution imaging capabilities provided by an electron microprobe are nowadays fundamental to Geoscience research. The new field emission microprobe provides a quantum leap in sub-micron range spatial resolution, whilst maintaining accurate quantitative analysis. This precision will open up new fields of research in Geology, Chemistry, Material Science, Archaeology and related fields. As it is an electron beam-based instrument, it is a game-changing addition to the existing NAWI Graz Central Lab for Water, Minerals and Rocks.

Core Facility Photoemission Electron Microscope. Building on the existing expertise in electron microscopy and nanostructuring, the Photo Emission Electron Microscope is a fantastic add-on in order to determine and control the chronological sequence of processes on the lateral nanoscale. This core facility strengthens basic research on nano and quantum materials and helps answering questions as e.g.: How fast is light irradiation on a nanostructure transformed into others forms of energy? Or: How fast can a nano-structured catalyst transfer electrons to a docked molecule?

Central Lab Analytic Methods for Bio-Molecular Interactions“ (AMBIO). The origin of diseases, the way drugs work, or the efficiency of enzymes in biotechnology are determined by the interactions of proteins, nucleic acids, enzymes and their substrates and other biomolecules. The central lab AMBIO combines novel optical and thermodynamic methods for the investigation of the interactions of biomolecules.

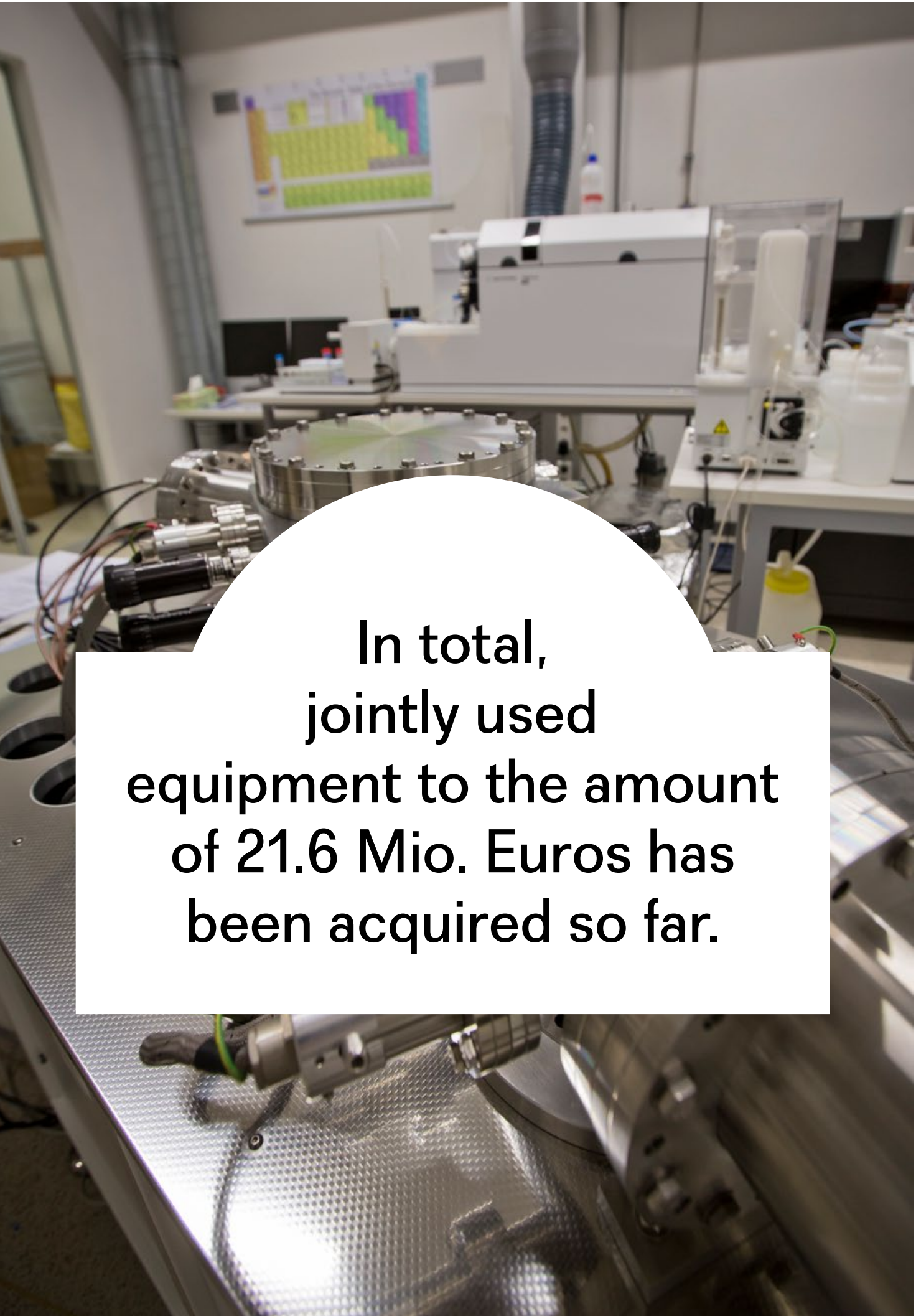
Core Facility CRYO TEM. The upgrade of the existing TEM to a Cryo-TEM including a HR CMOS-camera enables both the investigation and documentation of biological samples (e.g. proteins/protein complexes, virus particles, 2D-crystals) at almost native conditions at low temperatures without chemical modifications of the samples. The Cryo-TEM-system allows the testing of different sample preparation methods (e.g. buffer- and freezing conditions) of plunge frozen samples on site.

Core Facility NAWI Graz Ultrafast Microscope. This core facility combines ultra-fast laser spectroscopy with optical microscopy, in order to investigate nano- and quantum-materials with femtosecond resolution and nanometer scaling. Understanding ultra-fast processes in condensed matter is a prerequisite for the development of applications such as solar energy harvesting by means of “green” hydrogen gas production through photocatalytic water splitting.

NAWI Graz Core Facility Stable Isotopes. The core facility will integrate analysis capabilities of continuous flow and elemental analyser isotope ratio mass spectrometry to analyse stable isotope ratios of Hydrogen, Carbon, Oxygen, Nitrogen, and Sulfur. The facility will investigate stable isotopes in various geological, hydrological, and biological samples. The laboratory will provide the capabilities to explore geochemical, biochemical, hydrological, and climatic processes in basic and applied research within the earth-, environmental-, and climate sciences.

NAWI Graz Core Facility Vibrating Sample Magnetometer. The Vibrating Sample Magnetometer operates in a field range ± 3.2 T and combines high sensitivity and rapid measurement speed. Magnetization measurements can be performed in dependence on the applied field and the temperature, respectively. Sample temperature can be varied in the broad range from from 4.2 – 1273 K, while sample magnetization can be measured simultaneously parallel and perpendicular to the applied field as well as in dependence on the rotation angle. Moreover, magnetoresistance measurements in a temperature range between 100 and 673 K are possible.

NAWI Graz Core Facility Laser Ablation ICPMS. (jointly acquired with GeoSphere Austria and the Austrian Archaeological Institute of the Austrian Academy of Sciences)Due to the high demand for age dating, a Laser Ablation ICPMS was purchased. Laser Ablation - Inductively Coupled Plasma - Mass Spectrometry") is a sensitive analytical method for rapid multi-element determination in the trace and ultra-trace range. This is also a great enrichment for the already existing Central Lab Water, Minerals and Rocks.



In total,
jointly used
equipment to the amount
of 21.6 Mio. Euros has
been acquired so far.

NAWI Graz INFRASTRUCTURE FUNDING

According to the existing practise of third-party funding agencies, such as the Austrian Science Fund and the Austrian Research Promotion Agency (FFG), research funds can be used for staffing or material expenditure, but only in rare cases for the procurement of scientific equipment. In order to ensure the availability of the equipment required for joint research projects and to provide a good position for the acquisition of third-party funds, the NAWI Graz infrastructure funding and the NAWI Graz Central Labs/Core Facilities were established as subsidy programmes. Via the NAWI Graz infrastructure funding programme (2008–2015), single pieces of new equipment and appropriate additions to existing equipment were funded up to 50% of the purchase price. To procure the new equipment, two or more researchers from both universities had to file a joint application. Aspects that were taken into account approving decisions included, for instance, existing joint publications/research activities and the availability of other infrastructure that is required for the operation of the desired instrument (e.g. vibration-free installation location). Between 2008 and 2015, more than 150 instruments could be acquired for joint use. By co-financing 3.1 million Euro, equipment to the amount of 7.1 million Euro could be purchased.

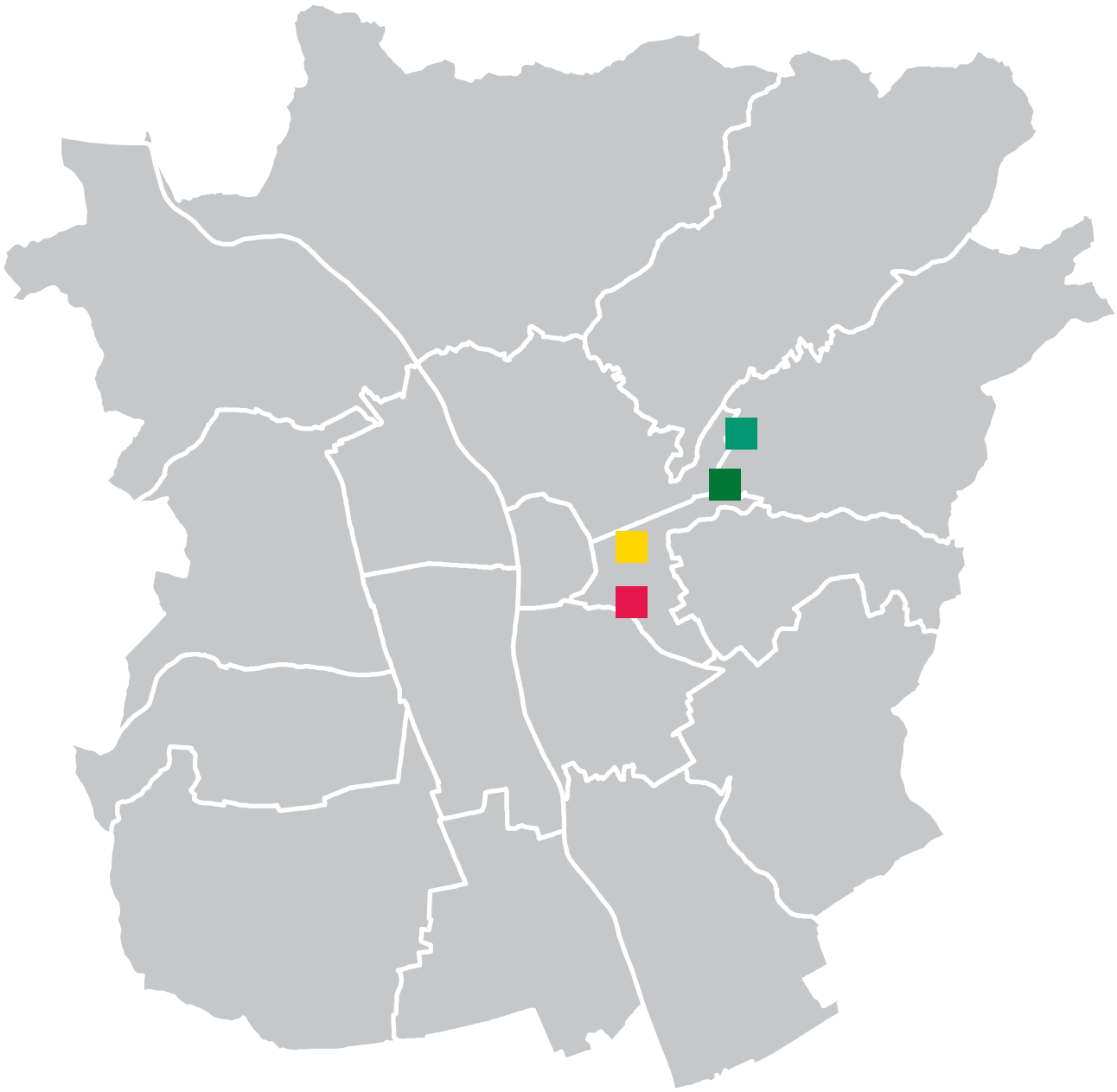
INFRASTRUCTURE MAPS

Making equipment available to all NAWI Graz members is one of the basic ideas behind the cooperative NAWI Graz infrastructure funding. To further enhance the benefits of existing infrastructure, information related to these instruments has to be made visible. For this reason, NAWI Graz has started to create infrastructure maps that can be obtained from www.nawigraz.at. At present, two such maps dedicated to high-resolution mass spectroscopy (MS) and nuclear magnetic resonance (NMR) spectroscopy show: which instruments are available in Graz, and how these are configured; which measurements can be carried out, and who can be contacted for further information.

As a valuable addition, the infrastructure maps also include equipment that is located at the Medical University of Graz.

Label	University / Research Organisation	HRMS – Ionisation techniques	NMR – MHz
	University of Graz	APCI, ESI, EI/CI/DCI	300 – 500 MHz, 700 MHz
	TU Graz	ESI, MALDI, LDI, EI/CI/DCI, FD/FI	200 MHz (2), 300 MHz (5), 500 MHz (6)
	Meduni Graz	APCI, ESI (2), MALDI	600 MHz
	Joanneum Research	APCI, ESI	

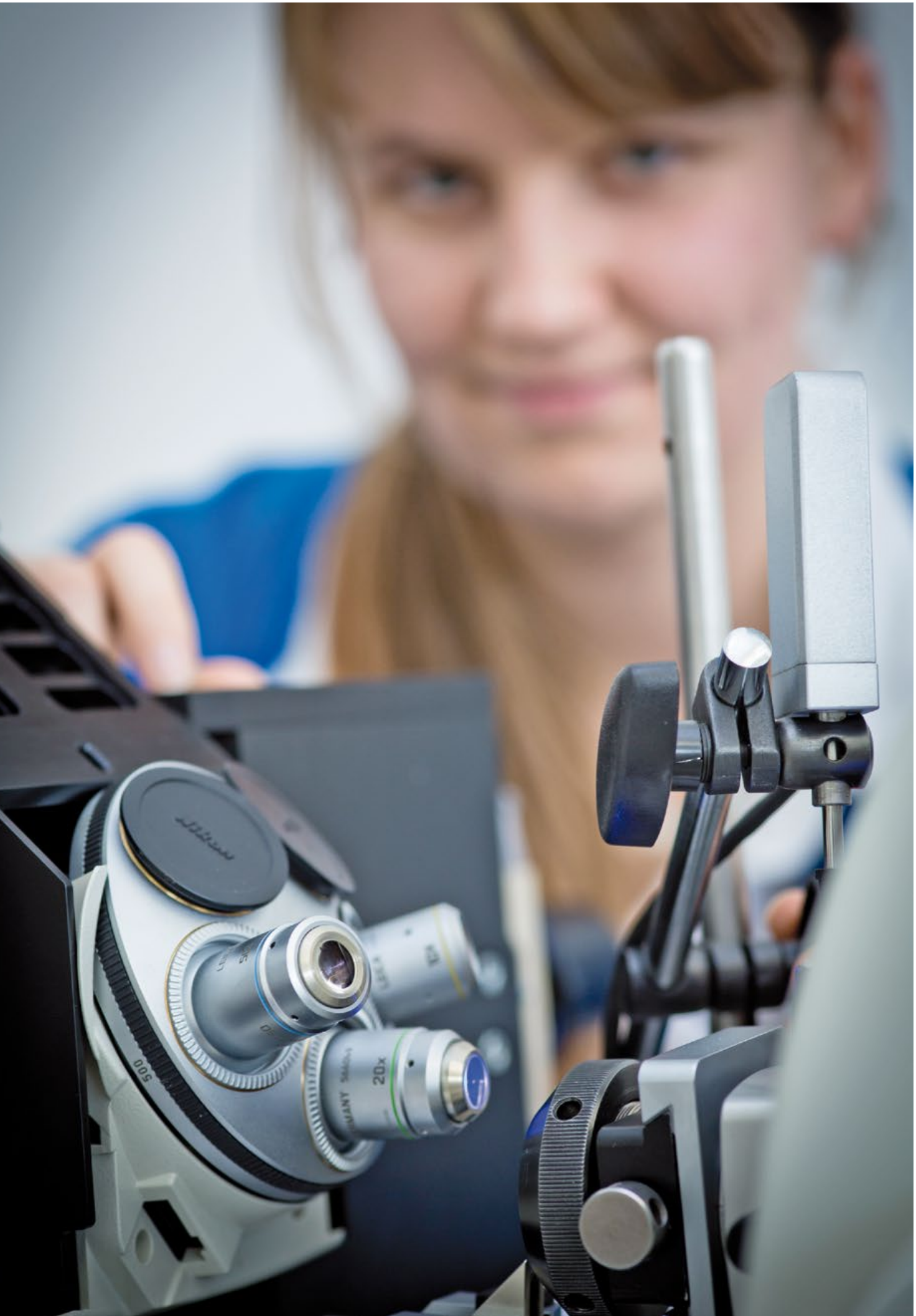
▲ Stock High-Resolution Mass Spectrometry (HRMS) and Nuclear Magnetic Resonance (NMR) in Graz



NAWI Graz
offers backfiles for
637 different journals
online.

NAWI Graz
VIRTUAL LIBRARY

The NAWI Graz virtual library is a very good example of how to make best use of synergies beyond research and teaching. As a result of negotiations with publishing houses, the University of Graz and Graz University of Technology were given the opportunity to jointly purchase literature for both universities at particularly favourable conditions.
The range of the NAWI Graz virtual library comprises 437 different journals by Elsevier and a further 200 journals by Wiley-Blackwell, covering all disciplines within the five NAWI Graz areas, each journal available from year one to the mid-nineties. The e-journals can be accessed via the Electronic Journals Library (EJL) as full papers. For many of these journals, more recent issues are also available through regular subscription by the university libraries.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NAWI Graz
GENDER PROJECTS

Starting in 2010, many gender related activities were initiated in order to support young female scientists. These mainly focused on support for initial research results which would then be the basis for own competitive project funding applications. As a result, a number of scientific careers benefited from different types of research grants for instance for buying instruments or staffing.

Building on these projects, the NAWI Graz Steering Committee decided to establish the Fulbright NAWI Graz Role Models programme in 2018, which pairs highly qualified U.S. academics and professionals with students and researchers to share their expertise. The NAWI Graz Fulbright Role Models will visit Graz for teaching and also advising. We expect this annual programme to provide a significant boost in awareness in highly interesting cross-cutting topics between natural sciences and gender related aspects for students as well as for faculty members. The first NAWI Graz Fulbright Role Model was Dr. Eva Hayward from the University of Arizona.

NAWI Graz JOINT STUDY PROGRAMMES AND MORE

In the days prior to NAWI Graz, both universities offered their study programmes separately, with almost no permeability between them. This changed fundamentally with the start of the cooperation when Graz University of Technology and the University of Graz started to merge study programmes in Bioscience, Chemistry, Earth, Space and Environmental Sciences, Mathematics and Physics from 2006 on. The main decision within this process was to offer duplicate lectures only once in Graz.
By thus, a large amount of teaching capacity (up to 40 %) could be transferred to small group lab training, providing a boost in the programmes' quality. With joint programmes, students also benefit from both universities' expertise.

How does it work?
NAWI Graz curricula are developed by an inter-university committee and approved by the senates of both universities. This includes that the universities have to agree, which share of teaching is provided by which university. According to the university act, NAWI Graz students are enrolled at the university of their choice and will also be automatically co-registered at the partner university. There are no advantages/disadvantages resulting from choosing the admitting university. During their studies, they are trained at both universities and are able to choose supervisors for bachelor's and master's theses from the university of their choice, without changing the university at which they are registered.

Benefits of the NAWI Graz study programmes: *higher quality of study programmes; eliminating duplicate lectures; increased permeability of the study programmes, larger choice of possibilities for bachelor's and master's degree students, new and well-matched master's programmes, of which several are taught exclusively in English, and Joint diplomas.*

MSc Chemistry[1]	MSc Geosciences[1]	Dipl.-Ing. Mathematics[1]	MSc Molecular Microbiology	MSc Physics[1]
Dipl.-Ing. Technical Chemistry[1]	MSc Geospatial Technologies[2]		MSc Biochemistry and Molecular Biomedical Science	Dipl.-Ing. Technical Physics[1]
Dipl.-Ing. Chemical and Pharmaceutical Engineering[1,2]	Dipl.-Ing. Space Sciences and Earth from Space[2]		Dipl.-Ing. Biotechnology[1]	Dipl.-Ing. Advanced Materials Science[1,2]
	MSc Environmental Systems Sciences / Climate Change and Environmental Technology[1,2]		MSc Plant Sciences	
BSc Chemistry	BSc Geosciences	BSc Mathematics	BSc Molecular Biology	BSc Physics
	BSc Environmental System Sciences/ Natural Sciences-Technology[2]			

▲ [1] NAWI Graz studies including English taught NAWI Graz master programmes
[2] Study programme with interdisciplinary NAWI Graz contributions

English NAWI Graz master's programmes. The internationalisation strategy of NAWI Graz has led to the further development of selected NAWI Graz master's study programmes. After a complete revision, the ten NAWI Graz master study programmes Advanced Materials Science, Biotechnology, Chemical and Pharmaceutical Engineering, Chemistry, Environmental System Sciences/ Climate Change and Environmental Technology, Geosciences, Mathematics, Physics, Technical Chemistry and Technical Physics are offered exclusively in English.

Joint graduation ceremonies. Students in the NAWI Graz programme study at two universities and choose electives or supervisors from either of both houses, so why should graduation ceremonies be limited only to the university awarding the degree? Since July 2015, joint graduation ceremonies have been conducted.

NAWI Graz alumni network. In 2014, NAWI Graz established its own alumni service, enabling graduates to stay in touch with both universities and to take part in events organised by the universities' alumni organisations.

NAWI Graz ORGANISATION

In its first 11 years, NAWI Graz was implemented through different projects. Since 2016 NAWI Graz has been fully integrated into the line organisations of both universities and acts as a strategic cooperation of University of Graz and Graz University of Technology. Ending the state of a project required a change of the governing bodies. As a new executive body, the NAWI Graz Steering Committee bundles all deans responsible for NAWI Graz areas and also two vice rectors as chairpersons. This board guarantees that all decisions are made within line functions and furthermore are aligned with the respective dean from the partner university.

NAWI Graz Scientific Advisory Board

The recommendations from the NAWI Graz evaluation also included the implementation of an external Scientific Advisory Board (SAB). Since its start in 2012, the SAB has provided external expertise, not only in scientific matters but also in central questions of the cooperation's strategic development. For instance, it has been deeply involved in the strategic development and further improvement of NAWI Graz. In order to strengthen the alignment with the industry, the board has been expanded by a respective member.

Name	*Function and Responsibility*	*University*
Stefan Vorbach	Vice Rector; Chairman	TU Graz
Joachim Reidl	Vice Rector; Deputy Chairman	Uni Graz
Steffen Birk	Vice Dean of Studies; Responsible for ESES and teaching	Uni Graz
Klemens Fellner	Dean; Responsible for Mathematics, Bioscience and organisation	Uni Graz
Scott Kieffer	Vice Dean; Responsible for ESES and research	TU Graz
Astrid Veronig	Vice Dean; Responsible for Chemistry, Physics and research	Uni Graz
Frank Uhlig	Dean, Responsible for Bioscience, Chemistry and organisation	TU Graz
Roland Würschum	Dean, responsible for Mathematics, Physics and teaching	TU Graz

Name	*Expertise*	*Organisation*
Evamarie Hey-Hawkins	Chemistry	University of Leipzig
Gerhard Murer	Industry member	Anton Paar Group
Winfried Petry	Physics	Technical University of Munich
Stephan Sigrist	Bioscience	FU Berlin
Susan Stipp	ESES	Technical University of Denmark
Josef Teichmann	Mathematics	ETH Zurich

▲ The current members of the NAWI Graz Steering Committee and of the Scientific Advisory Board in alphabetical order

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