ACC **TERAHERTZ**

Based on excellent research and interdisciplinary collaboration, the ACC-THz assists in the effective and efficient transfer of innovative technology. Currently, we focus on the spectroscopic investigation of solvation and the development of innovative methods and spectroscopic processes with the chair of Physical Chemistry II, headed by Prof. Dr. Martina Havenith-Newen, and the development of compact and cheap laser diode-based THz-sources with the chair of Photonics and Terahertz- Technology, headed by Prof. Dr. Martin Hofmann.

Important applications of the present and near future are

- Nondestructive testing (Material Sciences)
- Analysis and measurement (Life Sciences)
- Safety-solutions for airports and pharmacy.

The ACC invites especially private enterprises to contact us for collaboration, questions, and suggestions.

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ACC **PLASMA TECHNOLOGY**

The ACC Plasma Technology focuses on the technological evaluation and transfer of the state-of-the-art plasma research at Ruhr-Universität Bochum into industrial applications. Some examples are the surface treatment of medical goods (e. g. decontamination, bio-compatible layers) or individually designed thin film coating solutions. It draws on the diverse expertise of the RD Plasmas with Complex Interactions, comprising institutes and workgroups from plasma technology, materials science, chemistry and biology. This unique combination of different research topics paired with available diagnostic resources, e. g. from thin film properties to surface chemistry, allows for a competent and interdisciplinary support of industry-relevant research projects. For the many different plasma application areas, the ACC Plasma Technology is positioned as the first contact point for industrial research requests.

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At the Ruhr University Bochum, scientists from different areas jointly work on their research topics in interdisciplinary Research Departments. The Research Departments are part of the Ruhr-University's „Research Campus" strategy.

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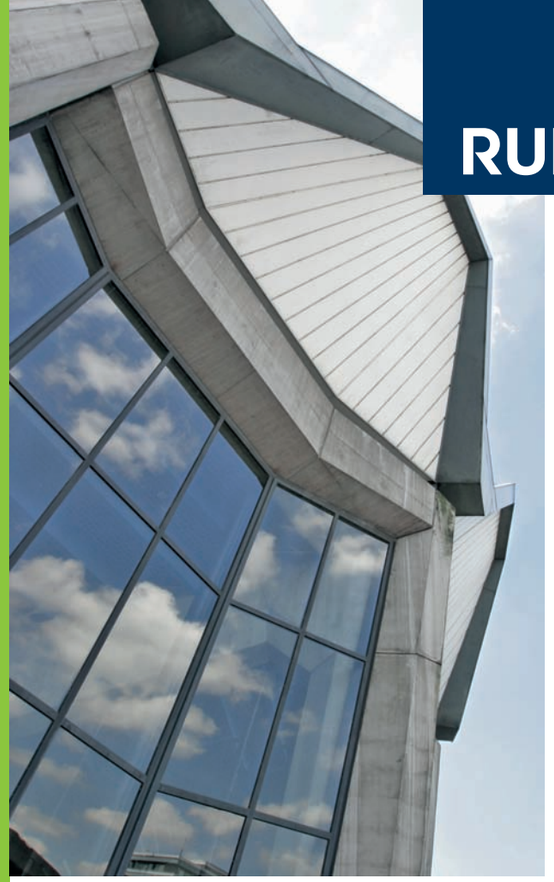

RUB

RUHR-UNIVERSITÄT BOCHUM

RESEARCH DEPARTMENTS
CUTTING-EDGE RESEARCH

PURSUING RESEARCH
ON THE RESEARCH CAMPUS

RESEARCH DEPARTMENTS: POOLING RESEARCH STRENGTH

True to its principle of "universitas" – the community of people learning from each other – the Ruhr-Universität Bochum (RUB) wants to implement three claims for academic education: the unity of research and teaching, the unity of teaching and learning, and the unit of science.

Cutting-edge research at RUB is organised along the lines of flexible, interdisciplinary Research Departments. Research Departments that maintain strong networks between each other and also on an international scale then lead to larger clusters for delving into comprehensive issues. The Research Departments are set up for a specific period of time and tied to strict criteria: these consist of participation in

- a collaborative research centre (SFB) or equivalent
- three other collaborative research projects.

Implementing Research Departments is a key element in the "RUB Research Campus" strategy. The Ministry of Innovation, Science, Research, and Technology of North Rhine-Westphalia supports the RUB in its striving for excellence with 20 million Euros.

The RUB has already founded Research Departments in the Life Sciences, Material Science, and Religious Studies. New Research Departments can be set up at any time in other excellent research areas.

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CERES

The CERES Research Department ("Center for Religious Studies") harnesses synergies from twenty humanities and social science disciplines at RUB to research religious formation and diffusion processes. It builds on several national and international joint research projects with an interdisciplinary focus. The research program "Relational Religion. Complex Resonances and Figurations in and beyond the Religious Field" pools and combines the results of these preceding studies into an overarching research paradigm. The basic starting point of this research is the working hypothesis that the relationality of religion comprises four different dimensions:

- knowledge, which offers orientation
- experience, which generates evidence
- actions, which unfold between planning, regulation and implementation
- materiality which co-determines psychological and social processes.

The research topic at the heart of the Research Department is the emergence of the religious field in its relationships to other areas of society such as economics, politics, law, medicine, science, education and art both from a historical and a comparative cultural perspective. By linking research and teaching, the Research Department also intends to specifically promote young academics and researchers.

INTERFACIAL SYSTEMS CHEMISTRY

The Research Department IFSC is an interdisciplinary approach of chemical and neighbouring disciplines. Researchers collaborate in the open spirit of a Research Department to get a fundamental understanding of the structural and dynamic complexity of hierarchically structured assemblies and chemical systems at the molecular level. Several of the most important, but also least understood processes occur at interfaces. By using a combination of synthesis, spectrosocpy and simulation, it is our vision to achieve a general understanding of the evolution of chemical complexity. Projects in the Research Department lead up to the development of smart drug carriers, adaptive biosensors, and novel materials for energy conservation. Main topics of interest are:

- Solvation phenomena
- The in-depth understanding of mechanisms in heterogeneous catalysis
- Immobilisation of inorganic, organic and biological functional macromolecules on surfaces
- Complex biomolecular interactions

For enabling scientists to develop and perform their research within these topics, the Research Department IFSC offers different options:

- IFSC Laboratory
- IFSC Practical Courses
- Workshops and Conferences
- Support for projects and young scientists

MATERIALS RESEARCH DEPARTMENT (INTEGRITY OF SMALL-SCALE SYSTEMS/ HIGH-TEMPERATURE MATERIALS)

Cutting-edge research in material science is carried out within the Research Department Integrity of Small-Scale Systems / High-Temperature Materials (IS³/HTM) where scientists from mechanical engineering, electrical engineering, chemistry, physics, mathematics and geosciences work together. Combining the expertise of the different research groups based at the Ruhr-Universität Bochum, including the Interdisciplinary Centre for Advanced Materials Simulations (ICAMS) and the Central Unit for Ionbeams and Radionuclides (RUBION) with the expertise of surrounding research institutes, e.g. MPI-Eisenforschung Düsseldorf, MPI-Kohlenforschung Mülheim, Deutsche Zentrum für Luft- und Raumfahrt (DLR Köln) enables new perspectives in cooperative research. Additionally, already existing co-operations with industrial partners are planned to be extend.

The Research Department IS³/HTM focuses on top-level interdisciplinary research projects. First-rate results are achieved through collaboration within the following topics:

- Integrity of small-scale systems
- Small-scale systems in harsh environments (high-temperatures and mechanical loads, corrosive environment)
- High-temperature materials

Research will consider fundamental aspects of integrity issues for small-scale specimens investigated within in model systems using new experimental techniques. Additionally, applied research is conducted focused on improving lift-time, effectiveness and fatigue properties of high-temperature materials and nano-scale machinery. A special emphasis is placed on thin film materials.

NEUROSCIENCE

The aim of the Research Department (RD) of Neuroscience is the development and reinforcement of a unique and interdisciplinary scientific landscape within the Ruhr-University and its immediate environment, that pivots upon the established strengths of the RUB as an outstanding centre for systems neuroscience research.

The strength of the RD is its highly interdisciplinary orientation, which integrates the expertise and research tradition of five faculties (Biology and Biotechnology, Chemistry and Biochemistry, Medicine, Psychology and Philosophy), together with three institutions: the Institute of Neuroinformatics, the Institute of Cognitive Neuroscience and the International Graduate School of Neuroscience (IGSN) as well as the University Clinics involved in this specialist field.

With the integration of methodical approaches in molecular, cellular, systems, cognitive, clinical and computational brain science, a multidisciplinary strategy will be established for the investigation of brain functions within this RD, with particular focus on:

- Sensory systems
- Learning and Memory
- Brain Pathology
- Applied Neuroscience

Another important mission of the RD is the support of young scientists and postdocs, in achieving an independence at an early stage of their scientific career.

PLASMAS WITH COMPLEX INTERACTIONS

The RD "Plasmas with Complex Interactions" explores currently unknown scientific areas and carries plasma techniques and methods well beyond their traditional limit. We explore the interfaces to solid state physics, materials science, chemistry, biology, and astronomy:

LOW TEMPERATURE PLASMAS & MICROPLASMAS

This section deals with the development and characterization of low temperature plasma discharges operating at low pressures, at atmospheric pressure or above.

HIGH ENERGY PLASMA & ASTROPHYSICS

Plasma-astrophysics is re-emerging in the overlapping fields of plasma research and astrophysics. It has attracted a broad interest recently after the observation of gamma ray bursts and cosmic radiation with energies up to Exa-electron volts.

WEAKLY MAGNETISED TECHNOLOGICAL PLASMAS

One key technical plasma application is the modification of surfaces by dry etching, thin film deposition, and/or surface functionalization. One goal of this research is to enable the independent control of electron density and ion energy.

MODELLING, THEORY & COMPUTATIONAL PLASMA PHYSICS

Typical interactions in most plasma systems involve length scales varying over orders of magnitude from kinetic to macroscopic fluid scales. Modelling of these interactions requires multiscale modelling of small-scale processes.

PROTEIN RESEARCH DEPARTMENT

The Protein Research Department (PRD) bundles cutting-edge research for a better understanding of cellular protein networks. The main research areas are: "Sensory Biology" (A), "Platform Technologies in Protein Research" (B) and "Translation into Application "(C).

Topics ranging from protein structure and mechanism, macromolecular assemblies, and functions of membrane-protein complexes up to cellular behaviour are studied from a molecular perspective using state of the art methods in structural biology, biophysics, biochemistry, and cell biology. Its targets are to bridge the gap between molecular and systemic approaches, achieve molecular understanding of the respective cellular processes, and gain insight into the relationship between genetically programmed and dynamically regulated networks.

The PRD focuses on studies on sensory transduction originating at G-Protein Coupled receptors (GPCRs) and pathways involving GTP-binding proteins of the Ras superfamily. Since defects in the addressed interactions account for a variety of serious diseases including cancer, the acquired understanding at the atomic level should eventually result in the development of innovative biotechnology applications with long-term benefits for public health, e.g. the identification of biomarkers.