

# Report Research Alliance Cologne





# ResearchAlliance Cologne (RAC)

Prof. Dr. Dr. h.c. Thomas Krieg

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### Introduction

The University of Cologne (UoC) is embedded in a dense network of internationally renowned non-university research institutions and has established long-standing and excellent cooperation with these partner institutions. In 2011, the UoC launched the Research Alliance Cologne (RAC) that aims to synergize opportunities and share resources by joint strategic development planning. For this purpose, a cooperation agreement was concluded between the University of Cologne (UoC) and ten research partners (see Figure 1). The contract provides the framework for joint strategic development of research areas and collaborative research projects, recruitments, the promotion of doctoral students and early career researchers as well as cooperation in the field of research infrastructures. Additional bilateral contracts further sharpen or specify the cooperation. For example, the Forschungszentrum Jülich and the UoC signed an additional contract in 2018 that aims at further enhancing joint research and infrastructure development.

In 2016, the RAC-members defined focus areas with particularly high potential for enhanced cooperation and joint strategic development. A particular focus lay on the establishment of Clusters of Excellence: In 2018 the UoC was awarded funding for four Clusters of Excellence of which three are in cooperation with RAC-partners.

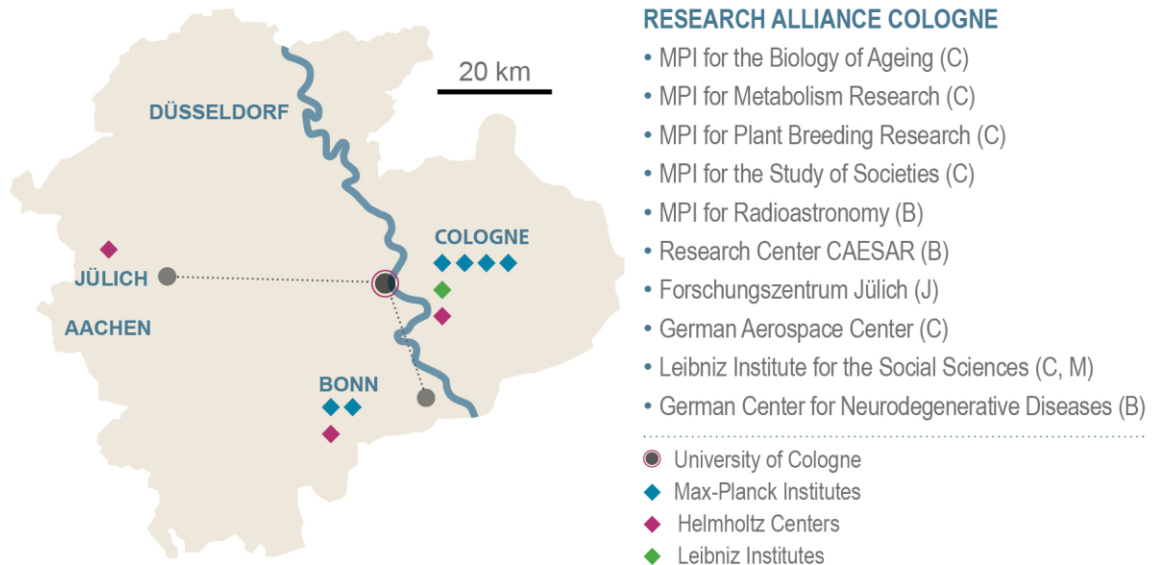
The following report gives an outline of the focus and cooperation areas in the Research Alliance Cologne.



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Figure. 1: Research Alliance Cologne



### 1. Research Cooperation

The RAC partner institutions have identified joint focus areas in research in which there is particular potential for cooperation. These are regularly updated and reviewed to include on-going developments. The following research areas are currently the focal points of cooperation between the UoC and its RAC partners:

- Aging research
- Astrophysics
- Geoscience
- Neuroscience
- Plant Science
- Social Sciences
- Quantum Materials

Working groups with representatives of the UoC and the RAC partner institutions accompany the strategic development of the existing cooperation in these areas. In



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2017/18, we concentrated our efforts on the application for "Excellence Clusters" within the Excellence Strategy. Five joint cluster proposals, in which the RAC was instrumentally involved were submitted, three of which were successful. The quality of the research collaborations initiated by the RAC is also underlined by six joint Collaborative Research Centers (CRC) in which RAC-partners are participating.

### **Aging Research**

A particular powerful cooperation exists in the focus area Aging Research. The Cluster of Excellence "Cellular Stress Responses in Age-Associated Diseases (CECAD)" is a joint activity of the University of Cologne, the University Hospital of Cologne, the two Max Planck Institutes (MPI) for Metabolic Research and for the Biology of Ageing as well as the German Center for Neurodegenerative Diseases. CECAD has been funded in the Excellence Initiative since 2007 and successfully obtained funding for a third period in 2017. The establishment of CECAD led to a dynamic infrastructure development of the UoC in cooperation with the University Hospital Cologne and the participating MPIs which are located directly on the Cologne campus. In 2014, the CECAD-research center was opened which houses state-of-the-art core facilities and laboratories. An application for a research building (Forschungsbau, Art. 91b) in metabolomics was successful in 2018.

Close cooperation also exists in the area of promoting early career researchers, for example through the joint Cologne Graduate School of Ageing Research, the joint awarding of postdoctoral grants and joint retreats for junior researchers organized by the UoC and the MPI's.

### **Astrophysics**

In the field of astrophysics there are numerous and long-standing cooperations with the Max Planck Institute for Radio Astronomy, the Forschungszentrum Jülich and the German Aerospace Center. A close and long-standing exchange of knowledge and experience between these institutions and the Argelander Institute for Astronomy of the University of Bonn has been the basis for the establishment of three subsequent



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CRCs, currently CRC 956 Conditions and Impact of Star Formation (UoC, University of Bonn, MPI Radio Astronomy). Medium-term development prospects include the establishment of a regional/national competence center for astrophysics together with the Forschungszentrum Jülich, the Max Planck Institute for Radio Astronomy and the German Aerospace Center.

### **Geosciences**

The geosciences of the RWTH Aachen University, the University of Bonn, the University of Cologne and the RAC-partner Forschungszentrum Jülich have created a strategic cooperation platform in form of the ABC/J Geo Alliance, which was founded in 2009 to bundle expertise of these four partners in geoscientific research and teaching. The Geo Alliance ABC/J is committed to the continuous development of the geosciences in the ABC/J region by creating attractive framework conditions for excellent research and the education of students. In 2016, the Geo Alliance successfully established the CRC Earth - Evolution at the dry Limit. A joint proposal for funding as a Cluster of Excellence was submitted in 2017, however, was not successful.

### **Neuroscience**

In the research area “neuroscience” close cooperation exists between the UoC, the University Hospital Cologne and the Forschungszentrum Jülich, e.g. five joint professorships. The Memory Clinic Cologne-Jülich uses infrastructure and resources of the University Hospital Cologne and the Forschungszentrum Jülich to provide comprehensive early diagnosis in case of dementia syndromes. In particular, state-of-the-art imaging procedures are used. Furthermore, UoC-researchers in the field have access to computing facilities at the Forschungszentrum Jülich. This cooperation led to the submission of an application for a Collaborative Research center and the launch of a regional network on neuroscience together with other universities in the region.

### **Plant Science**

In the field of plant sciences, the UoC cooperates closely with the MPI for Plant Breeding Research and the Forschungszentrum Jülich. At the core of this



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cooperation is Cluster of Excellence on Plant Science (CEPLAS) which was acquired jointly with the HHU Düsseldorf. It has been funded since 2012 and was again selected for funding in 2018. In the context of CEPLAS, five university working groups are located at the MPI. In addition, the MPI provides 30 hectares of open land for CEPLAS experiments. Moreover, CEPLAS-researchers have access to state-of-the-art phenotyping technologies at the Forschungszentrum Jülich. Together with the MPI for Plant Breeding Research, the UoC successfully applied for funding for an Alexander-von-Humboldt-professorship in 2016: The structural biologist Jijie Chai will establish the innovative method of cryo-electron microscopy at the UoC which makes it possible to see and analyze the structures and receptors of certain proteins and has far only been used in few research sites. With Chai's research and the use of these new technologies the UoC and MPI plan to bring their research in botany and biochemistry even closer together.

### **Social Sciences**

Researchers in the Humanities, Social Sciences and Economics at the UoC cooperate with the RAC partners MPI for the Study of Societies and the Leibniz Institute for Social Sciences GESIS as well as the MPI for Research on Collective Goods in Bonn<sup>1</sup>. The Global South Studies Center of the UoC has submitted an application for a Cluster of Excellence together with the MPI for the Study of Societies. In addition, scientists from the MPI are involved in the CRC Future Rural Africa which receives funding since 2018.

### **Quantum Materials**

The Universities of Aachen, Bonn and Cologne established the Cluster of Excellence Matter and Light for Quantum Computing together with the RAC partner Forschungszentrum Jülich. The cluster was selected for funding in 2018. In order to strengthen the application process, the UoC and the Forschungszentrum Jülich jointly recruited Tomaso Calarco, an expert for the application of quantum optimal control methods to quantum computation and to many-body quantum systems.

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<sup>1</sup> The MPI for Research on Collective Goods in Bonn is not a member of the RAC, but close cooperation exist in economics, e.g. the director Matthias Sutter also has an affiliation with the University of Cologne. In 2018, the UoC, the University of Bonn, the MPI and the briq Institute in Bonn established the Cluster of Excellence ECONtribute: Markets & Public Policy.



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Researchers of ML4Q have full access to the Helmholtz Nano Facility at the Forschungszentrum Jülich. Furthermore, the RWTH Aachen University, the UoC and the Forschungszentrum Jülich have jointly invested in the purchase of 4m€ electron beam plotter.

### **Collaborative Research Centers / Transregio:**

Based on the cooperation with its RAC partners the UoC has currently six joint Collaborative Research Centers , in which MPI's and the Research center Jülich are involved:

#### **CRC 829 Molecular Mechanisms regulating Skin Homeostasis**

- 2009-2020
- Participating RAC-members: MPI for Biology of Ageing, MPI for Metabolism Research

#### **CRC 956 Conditions and Impact of Star Formation – Instrumentation and Laboratory Research**

- 2011-2022 (second funding period)
- Participating RAC member: MPI for Radioastronomy

#### **CRC 1211 Earth – Evolution at the dry limit**

- Since 2016
- Participating RAC-member: Forschungszentrum Jülich

#### **CRC 1218 Mitochondrial regulation of cellular function**

- Since 2016
- Participating RAC-members: MPI for Biology of Ageing, MPI for Metabolism Research

#### **CRC 1238 Control and Dynamics of Quantum Materials**

- Since 2016





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- Participating RAC member: Forschungszentrum Jülich

### CRC 1310 Predictability in Evolution

- Since 2018
- Participating RAC member: MPI for Biology of Ageing

## 2. Early Career Support

Promoting early talent is one of the key aspects of cooperation in the RAC. To this end, the UoC and its RAC partners have established currently nine graduate schools and programs (see Table 1). These graduate schools are part of the UoC network of graduate schools in which the Albertus Magnus Center forms the central hub. Early career researchers of the RAC partners have access to central general skills courses of the Albertus Magnus Center. Furthermore, RAC-researchers can become members of the UoC's Junior Faculty Club which provides an interdisciplinary networking platform for researchers on their way to professorship. Moreover, the UoC's Tenure Track Order sets the framework for joint tenure track procedures, e.g. by offering excellent early career researchers of RAC partners' tenure track at the UoC. Junior researchers from RAC partners are furthermore involved in teaching at the UoC and can thus gain teaching experience.

**Table 1: Graduate Programs with RAC partners**

Name	Program	RAC partners	Further partners
Astronomy and Astrophysics	International Max Planck School	University of Cologne , MPI for Radio Astronomy	University of Bonn



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CEPLAS Graduate School	Graduate School of Cluster of Excellence CEPLAS	University of Cologne, MPI for Plant Breeding Research, Forschungszentrum Jülich	HHU Düsseldorf
Cologne Graduate School of Ageing Research	International Max Planck Research School and Graduate School of Cluster of Excellence CECAD	MPI for Biology of Ageing, MPI for Metabolism Research, Center of Advanced European Studies and Research (caesar)	
The Social and Political Constitution of the Economy (SPCE)	International Max Planck Research School	MPI for the Study of Societies	Columbia University, Northwestern University, Sciences Po Paris, European University Institute
Understanding Complex Plant Traits using Computational and Evolutionary Approaches	International Max Planck Research School	MPI for Plant Breeding Research,	HHU Düsseldorf
BioSoft: International Helmholtz Research School of Biophysics and	Helmholtz Graduate School	Forschungszentrum Jülich, Center of Advanced European Studies and Research (caesar)	HHU Düsseldorf



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Soft Matter			
Helmholtz Interdisciplinary Doctoral Training in Energy and Climate Research (HITEC)	Helmholtz Graduate School		Universities Aachen, Bochum, Düsseldorf, Wupperatal
Helmholtz School for Data Science in Life, Earth and Energy (HDS-LEE)	Helmholtz Graduate School (Helmholtz Information & Data Science Schools)	Forschungszentrum Jülich, German Aerospace Center	RWTH Aachen, University, MPI Iron Research

### 3. Research Infrastructure

An important part of the cooperation within the RAC based on the cooperation contract is the joint planning of the acquisition and use of cost-intensive research infrastructures, including research buildings and central infrastructure platforms, which are open to researchers of the UoC and the RAC partners.

Examples of joint planning for the acquisition and use of research infrastructures include:

- CECAD Core Facilities (lipidomics, proteomics, imaging, in-vivo):  
MPI Biology of Ageing, MPI for Metabolism Research, UoC
- Development of the method platform of the Geo Alliance ABC/J:  
Universities Aachen, Bonn, Cologne and Forschungszentrum Jülich)
- Joint purchase of a 4m€ electron beam writer  
Universities Aachen, Cologne, Forschungszentrum Jülich
- Access to the Helmholtz Nano Facilities at the Forschungszentrum Jülich
- Access to open spaces of the Max Planck Institute for Plant Breeding Research



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- Access to the Max Planck Genome Center Cologne of the MPI for Plant Breeding Research
- Establishment of the cryo electron microscopy facility (MPI for Plant Breeding Research, UoC)

### 4. Recruitments

The cooperation within the RAC also enables joint appointments and recruitments of leading researchers (see table 2), e.g. the Alexander-von-Humboldt professor Jijie Chai together with the MPI for Plant Breeding Research or the recruitment of Tomaso Calarco together with the Forschungszentrum Jülich which is specifically strengthening the new Cluster of Excellence ML4Q. There are currently a total of 15 joint professorships (see table 2). In addition, the directors of the MPIs in Cologne are co-opted by the UoC.

**Table 2: Joint Professorships**

Professorship	Name	RAC partner
Nanostructured cellular materials (Jülicher Modell)	Dr. Barbara Milow	German Aerospace center
Physics of Granular Matter (Jülicher Modell)	Dr. Matthias Sperl	German Aerospace center
Empirical Social Research Scientific Director of the GESIS Department Data Archive for Social Sciences (Jülicher Modell)	PhD Alexia Katsanidou	GESIS
Theoretical Physics (Jülicher Modell)	Prof. Dr. Calarco	Forschungszentrum Jülich
Computational Neuroscience - Modelling Neural Network	PD Dr. Silvia Daun	Forschungszentrum Jülich



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Function (Heisenbergprofessur/afterwards Jülicher Modell)		
Neuroscience	Prof. Dr. Gereon Fink	Forschungszentrum Jülich
Theoretical Matter and Biophysics (Jülicher Modell)	Prof. Dr. Gerhard Gompper	Forschungszentrum Jülich
Experimental Physics (Jülicher Modell)	Prof'in Dr. Astrid Kiendler-Scharr	Forschungszentrum Jülich
Nuclear Physics (Jülicher Modell)	Prof. Dr. Hans Ströher	Forschungszentrum Jülich
Cognitive Neuropsychology (Jülicher Modell)	Jun.-Prof. Dr. Simone Vossel	Forschungszentrum Jülich
Meteorology (Jülicher Modell)	Prof. Dr. Andreas Wahner	Forschungszentrum Jülich
Physical Chemistry (Jülicher Modell)	PD Dr. Simone Wiegand	Forschungszentrum Jülich
Physics of complex supply networks (Jülicher Modell)	Dr. Dirk Witthaut	Forschungszentrum Jülich
Director of the MPI for Metabolism Research	Prof. Dr. Jens Brüning	MPI for Metabolism Research
AvH-professor for Structural Biology	Prof. Dr. Jijie Chai	MPI for Plant Breeding Research



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