

# Focus on Innovations: From First Ideas to Industrial Solutions

## CENTER OF EXCELLENCE IN NEW MATERIALS

Bayreuth . Fürth . Würzburg  
Germany

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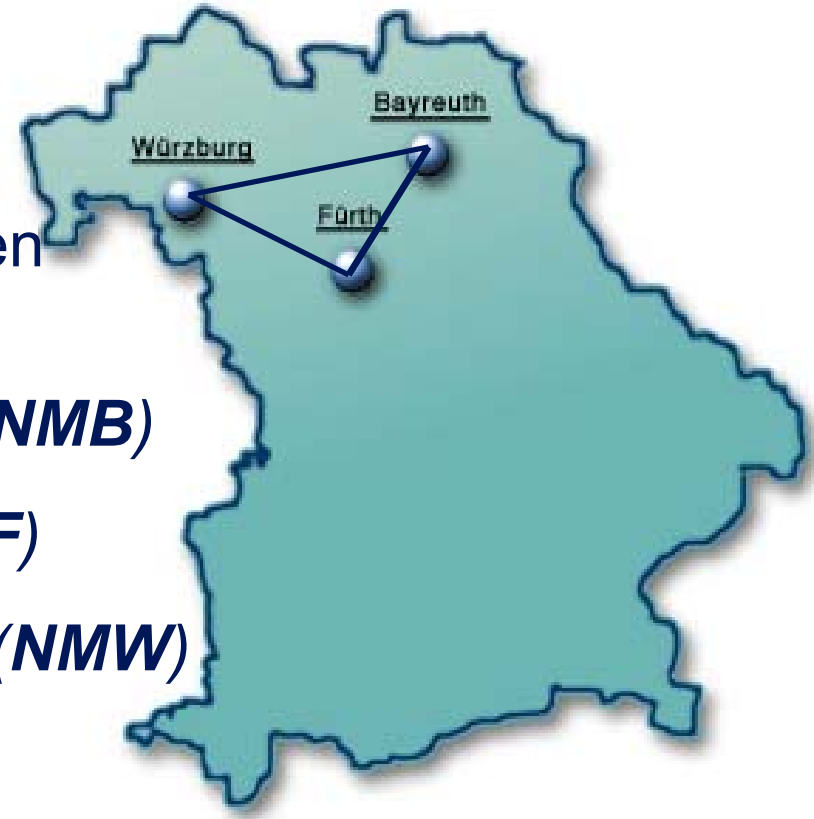


# Center of Excellence New Materials

[www.new-materials.de](http://www.new-materials.de)

A Network of four companies

- ➔ Kompetenzzentrum Neue Materialien Nordbayern GmbH (**KNM**)
- ➔ Neue Materialien Bayreuth GmbH (**NMB**)
- ➔ Neue Materialien Fürth GmbH (**NMF**)
- ➔ Neue Materialien Würzburg GmbH (**NMW**)



established mid 2000 in the frame of the  
High Tech Initiative Bavaria  
(support: 56 M €)



# Locations



New Materials  
Würzburg Ltd.

New Materials  
Fürth Ltd.

Center of Excellence in  
New Materials North  
Bavaria Ltd.

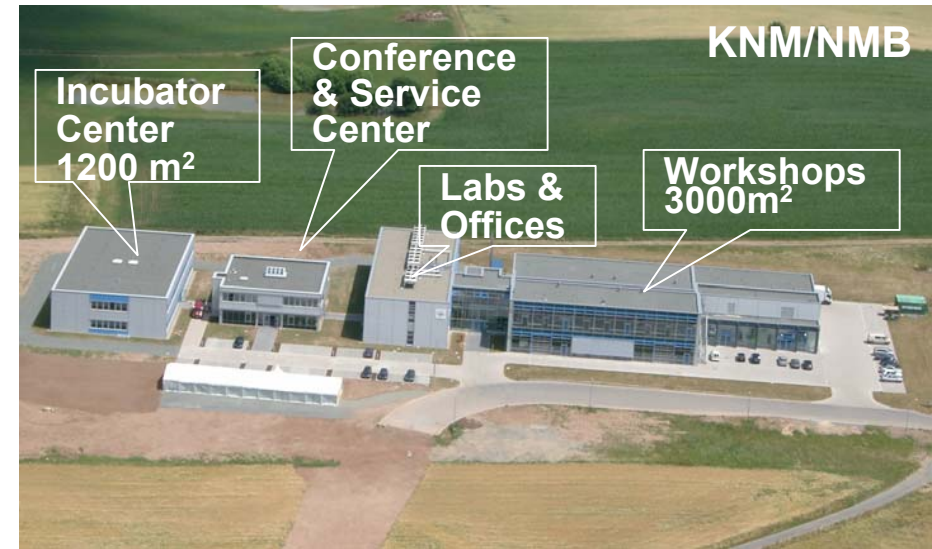
New Materials Bayreuth  
Ltd.

Munich

100 Km

## A Group of four Companies:

- ➔ Kompetenzzentrum Neue Materialien Nordbayern GmbH (KNM)
- ➔ Neue Materialien Bayreuth GmbH (NMB)
- ➔ Neue Materialien Fürth GmbH (NMF)
- ➔ Neue Materialien Würzburg GmbH (NMW)



## NMF: 2.300 m<sup>2</sup> Workshops, Labs & Office

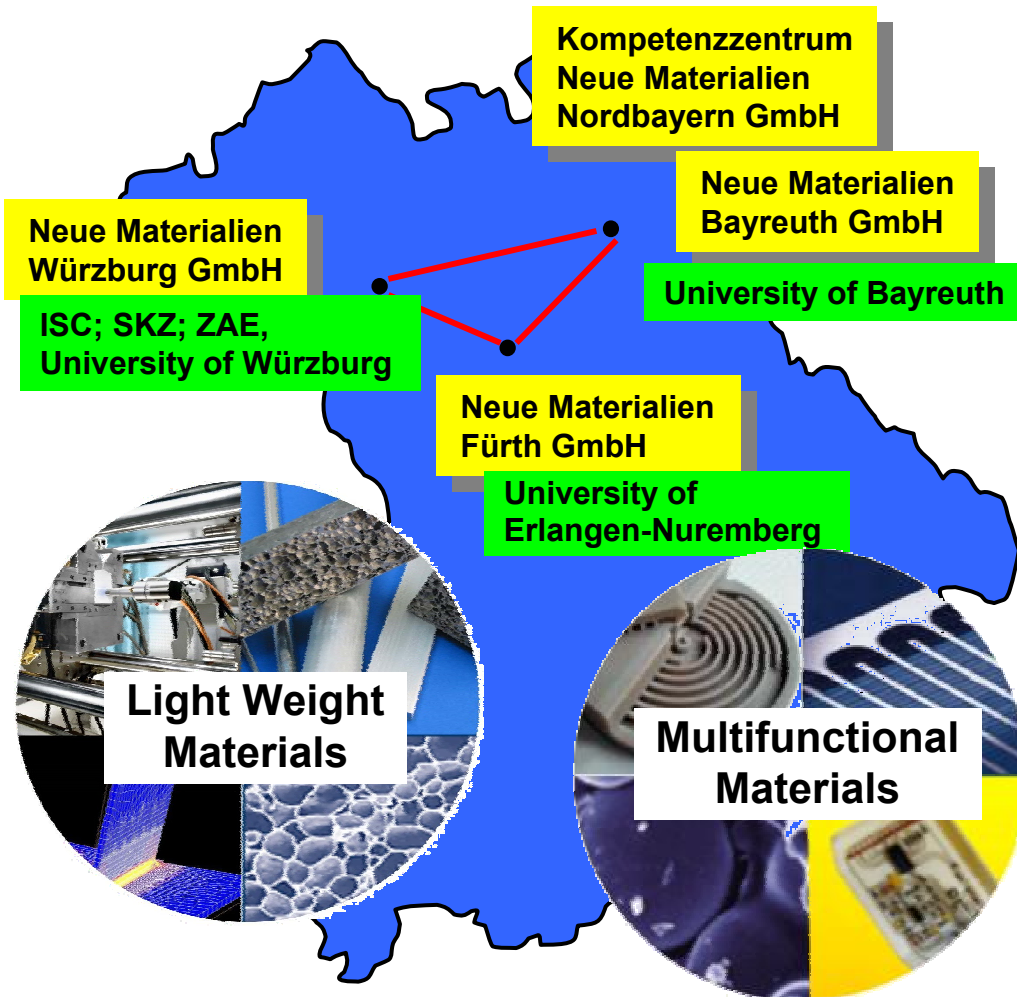


## NMW: 1400 m<sup>2</sup> Workshops, Labs & Office



# Bayreuth - Fürth - Würzburg

## The Materials Innovation Triangle in Germany



### The Know-How

- Materials performance
- Materials processing
- Technology of metals
- Polymer technology
- Surface coatings, corrosion resistance
- Fiber technology
- Nanotechnology
- Materials synthesis
- Production technology
- Experimental and technical physics
- Energy technology
- Chemical technology

### The Materials

- Structural & functional materials
- Composites
- Ceramics, glass-ceramics, glass
- Metals
- Polymers



### Topics:

- ✓ **High strength steels**  
(hydroforming)
- ✓ **Fiber reinforced polymers**
- ✓ **Polymer foam** ( $\mu$ Cell, EPP)
- ✓ **Technical ceramic**
- ✓ **Ultra hard materials**
- ✓ **Numeric simulation**  
(laser welding)



### Topics:

- ✓ **Al- foam**  
(Conform Technology™)
- ✓ **Mg -Thixoforming**
- ✓ **Fiber reinforced polymers**
- ✓ **Polymer foam** ( $\mu$ Cell)
- ✓ **Polymer compounds**
- ✓ **Coatings (PVD)**
- ✓ **Numeric simulation**  
(squeeze casting)



### Topics:

- (functional materials)
- ✓ **Piezo electric fibers**  
(actuator/sensor-systems)
- ✓ **Electro-rheological fluids**
- ✓ **Magneto-rheological fluids**
- ✓ **Functional filler**  
(for polymers)

# Our Mission

- **Innovations with New Materials**
- **Rapid transfer to practice**
- **Industrial solutions ready for use**
- **Service for industry**

## R & D

- close to the customer
- close to the market

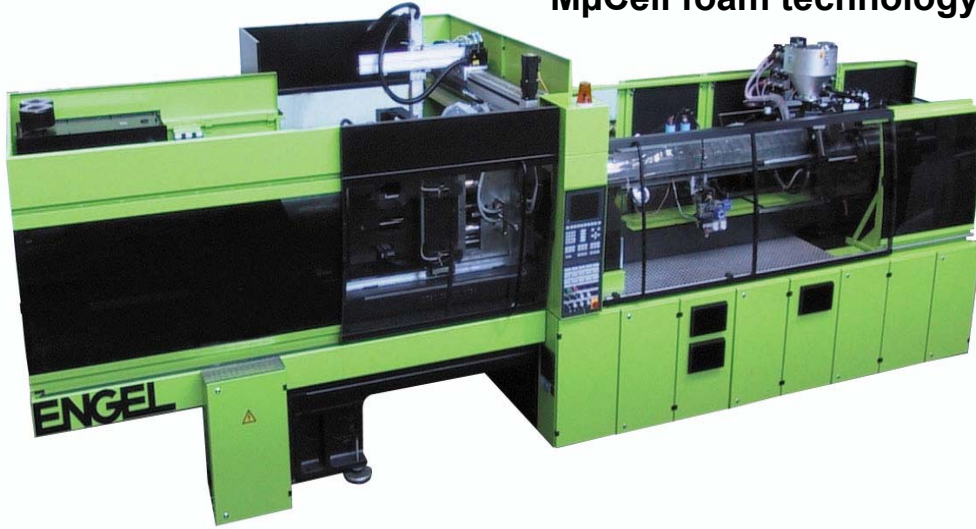
- **The Center of Excellence for New Materials in North Bavaria is the bridge between research institutes and companies for an effective and efficient know how transfer from science to practice**

# Strategy

- Industrial focus
- Synergy through interdisciplinary
- Efficient through co-operation with academia & industry
- Effective with the entire innovation chain and industrial-like equipment
- National and international partnership



Polymer injection moulding +  
MuCell foam technology



Hydro forming



Injection moulding compounder



Particle foam equipment

# Industrial Equipment

## Fürth (Examples)





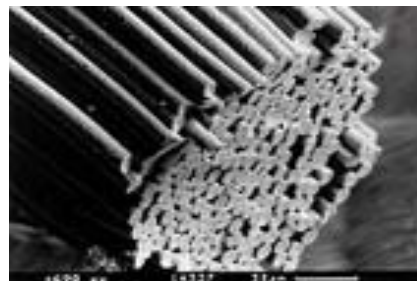
- Compounding equipment from apr. 100 g/h to 5 kg/h
- Film extrusion
- Vacuum-lamination-press
- HP Capillary rheometer
- Film-Coating



# PZT Fiber Technology

*the use of piezo electric properties of lead-zirconium-titanium compounds*

## Process steps:



## Networking & Service Center

### ➤ Innovation Forum

- Information turntable for scientists and engineers from industry and institutes,
- Symposia about latest materials development



### ➤ Know How Training & Transfer

- education & training from theory to practice, lectures, workshops seminars, short courses



### ➤ Technology Marketing

- know how, licenses, patent rights,
- assistance in obtaining public funding



### ➤ Project development & management

# Center of Excellence for New Materials: The Know-How-Company

## Your R&D – Partner for Materials Innovations

**Time to market for  
application of new materials in systems  
is a critical factor for commercial success**





# **International Materials Forum 2005 - Frontiers in Materials Science and Technology**

## **Opening**

**Professor Dr. Dr. h. c. Helmut Ruppert**  
*President of the University of Bayreuth*

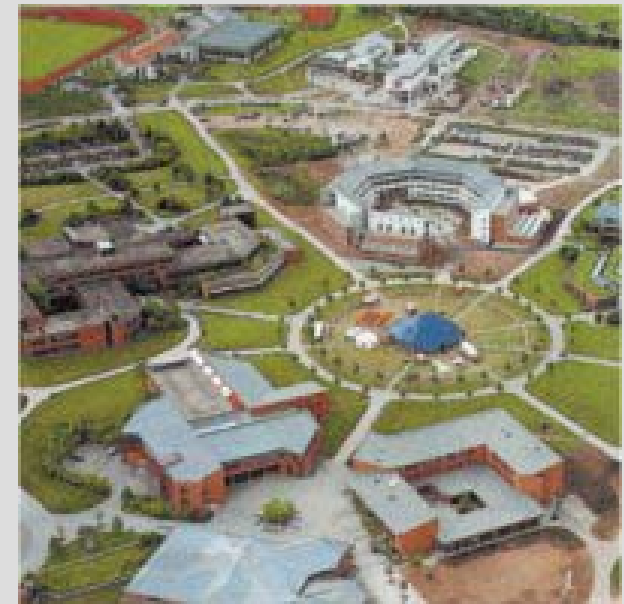
1<sup>st</sup> August 2005



# The University of Bayreuth

... a modern Campus-University

... with high international academic standard



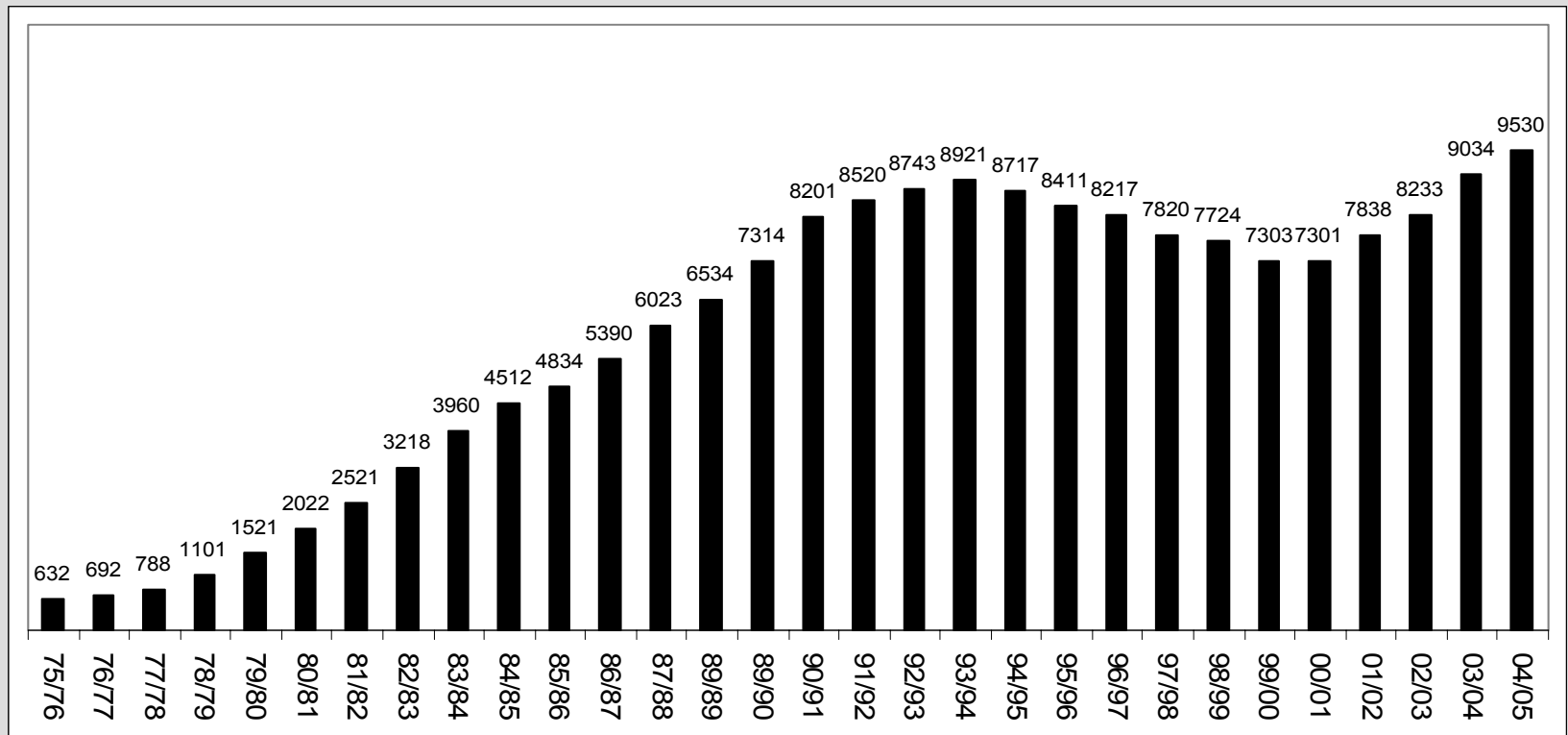
## The Faculties

- Mathematics and Physics
- Biology, Chemistry and Earth Sciences
- Law and Economics
- Linguistics and Literatures
- Cultural Studies
- Applied Sciences



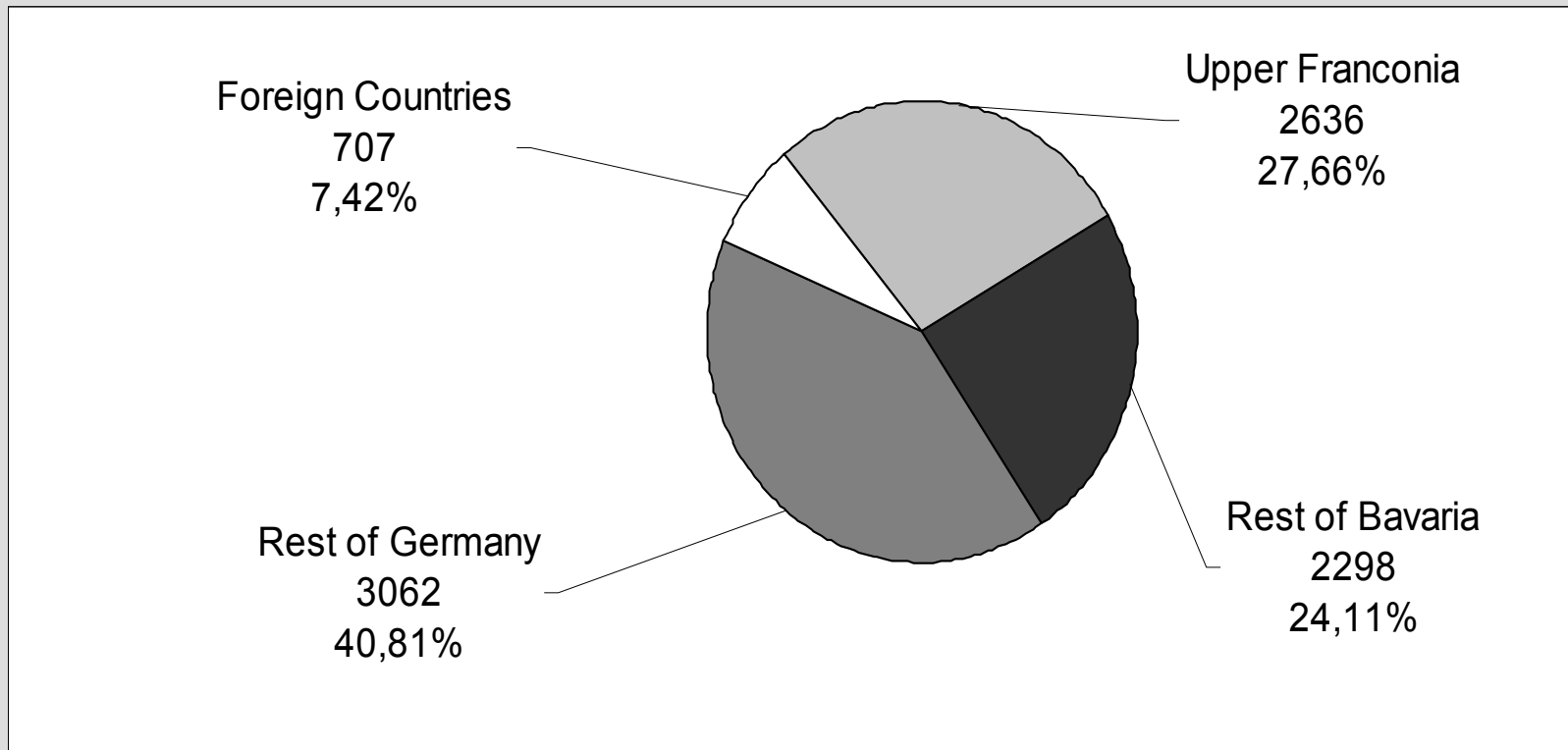


## Number of students at the University of Bayreuth (Winter term 1975/76 - Winter term 2004/05)





## Origin of the students (location at which students qualified for university entrance) - Winter term 2004/2005





## Research Priorities of the University of Bayreuth

1. High temperature and high pressure research (Geosciences)
2. Macromolecules and colloids (Physics / Chemistry / Material Sciences)
3. Ecology and the environmental sciences
4. New materials
5. Molecular biosciences
6. Nonlinear dynamics (Mathematics / Physics / Applied Sciences)
7. African studies
8. Comparative cultural studies and intercultural processes
9. Dynamics and order – development of law and economy



## The Research Priority “New Materials”



Materials Research at the University of Bayreuth focuses on both creating innovative materials for use in the fields of computer science, medicine, energy, transport and production engineering, and improving or adapting the properties of existing materials for new applications.

Research into ceramics, metals and polymers, and increasingly tailor-made composites, is currently being undertaken.



## The Research Priority “New Materials”

Materials Research is established

- in the Faculty of Applied Sciences,
- in the Institute for Materials Research and
- in interdisciplinary co-operations with Chemistry, Physics, Mathematics and the Biological Sciences departments.



The Institute for Materials Research works together with several faculties and the Bavarian Geoinstitute within the university, and, beyond the university, has strong links with research institutes and companies in Bavaria and most parts of Germany. The Institute is involved in international projects with research institutes in many European countries, in the USA and in Asia and places particular stress on the importance of its joint European projects.



## Central Research Institutes at the University of Bayreuth

*In addition to the faculties, Central Research Institutes have been created to promote interdisciplinary research; these institutions and the Research Centres reflect the research priorities of the University of Bayreuth.*

- Bavarian Research Institute of Experimental Geochemistry and Geophysics - Bavarian Geoinstitute
- Bayreuth Institute for Macromolecular Research - BIMF
- Bayreuth Centre for Ecology and Environmental Research - BayCEER
- Bayreuth Centre for colloids and interfaces - BZKG
- Bayreuth Centre for molecular Biosciences- BZMB
- Institute for Materials Research
- Research Institute of Music Theater - FIMT
- Institute of African Studies / IWALEWA-House - Africa Centre
- Bayreuth Institute for European Law and Culture
- Centre for the Promotion of Mathematical-Scientific Instruction - Z-MNU
- Centre for School Research and Teaching Instruction - ZSL
- Ecological-Botanic Garden



## DFG Collaborative Research Centres

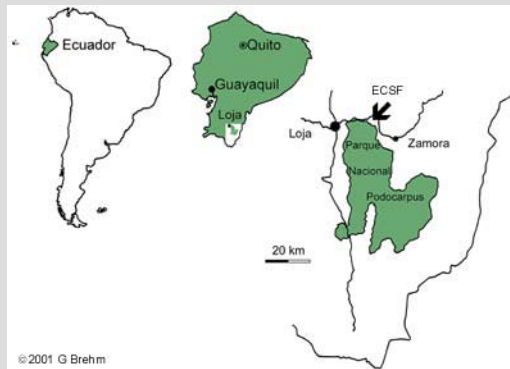
DFG Collaborative Research Centres (SFB) *are long-term (but limited) university research projects in which scientists co-operate across disciplines.*

SFB 137	Principles and Strategies of Matter Turnover in Ecological Systems	1981 - 1992
SFB 213	Topospecific Chemistry and Toposelective Spectroscopy of Macromolecular Systems	1984 - 1995
SFB 214	Identity in Africa - Processes of its Creation and Transformation	1984 - 1997
SFB 279	Interplay between Order and Transport in Solids	1995 – 1998
SFB 466	Lymphoproliferation and Virale Immune Efficiency (in Cooperation with the University of Erlangen-Nürnberg)	Since 1996
SFB 481	Complex Macromolecular and Hybrid Systems in Internal and External Fields	Since 1998
SFB/FK 560	Local Action in Africa in the Context of Global Influences	Since 2000



## DFG Research Units

*DFG Research Units are medium-term projects involving several scientists who normally work at the same location. These groups often help to define new areas of research.*



Aging Processes in Plants	Since 1995
Differential Equations in Hydrodynamics	1991-1997
Transport Phenomena in Supra Conductors and Supra Fields (in Cooperation with the University of Regensburg)	Since 1998
Functionality in a Tropical Montane Forest: Diversity, Dynamic Processes and Utilization Potentials under Ecosystem Perspectives	Since 2001
Dynamics of soil processes under extreme meteorological boundary conditions	Since 2005
Non-linear Dynamics of complex continuous systems	Since 2005





## Research Training Groups

*Research training groups are temporary university institutions to support young graduates in research.*



(1) Probengefäß, (2) Heizblock, (3) Filterhalter,  
(4) Miniaturpumpe, (5) Steuergerät



Plant-Herbivore Systems (DFG)	1987-1993
Materials and Phenomena at Very Low Temperatures (DFG)	1990-1997
Complex Manifolds (DFG)	1990-1999
Intercultural Relations in Africa (DFG)	1990-1999
Biosynthesis of the Proteins and Regulation of their Activity (DFG)	1991-2000
Nonlinear Spectroscopy and Dynamics	1991-2000
Rural Regional Development in the Maghreb (GTZ)	1993-2004, since 1999 in Bayreuth
Ecological Significance of Natural Compounds and other Signals in Insects - from Structure to Function (DFG)	since 2001
Non-equilibrium Phenomena and Phase Transitions in Complex Systems (EGK)	since 2001
Cultural Encounters: Interdisziplinäre Studien in Language, Literature and Media (International Ph.D. Program, DFG and DAAD)	since 2004
Intellectual Property and the Public Domain (DFG)	since 2005

## Elite Network of Bavaria

### Granted proposals of the first slice:

Macromolecular Science (Elite Graduate Program)

Lead Structures of Cell Function (International Doctorate Program)

Structure, Reactivity and Properties of Oxide Materials (International Doctorate Program)

Nano-Bio-Technologie (International Doctorate Program - coordinating institution: LMU Munich)

### Granted proposals of the second slice:

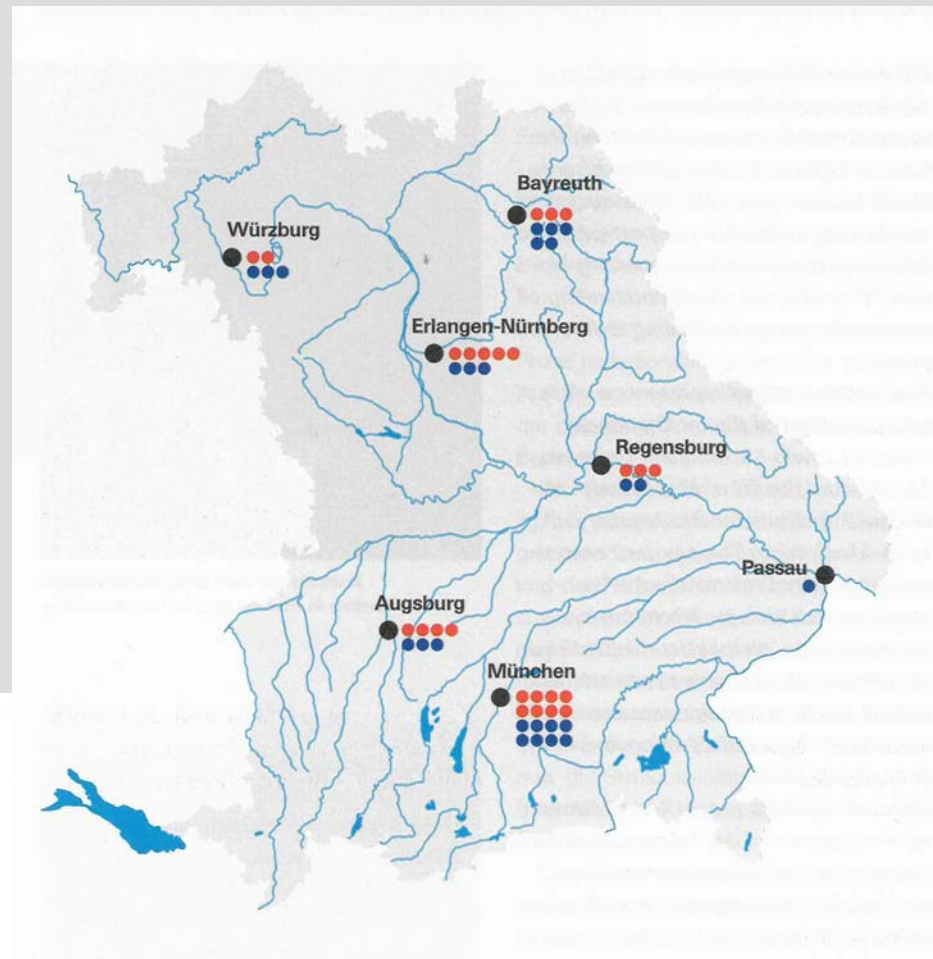
Advanced Materials and Processes (Elite Graduate Program, coordinating institution: University of Erlangen-Nürnberg)

Incentives - Bavarian Graduate Program in Economics (International Doctorate Program, coordinating institution: University of Erlangen-Nürnberg)

Identification, Optimization and Control with Applications in Modern Technologies (International Doctorate Program, coordinating institution: University of Erlangen-Nürnberg)

NanoCat: Nanodesign of High Performance Catalysts (International Doctorate Program, coordinating institution: Technical University of Munich)

## Places of Study in the Elite Network of Bavaria



- Elitestudiengänge  
*Elite Graduate Programs*
- Internationale Doktorandenkollegs  
*International Doctorate Programs*



## Humboldt-Ranking 2003 weighted against the number of C3- and C4-Professorships

Rank	Host Universities 1998-2002	Guest scholars per 100 Professors
1	University of Konstanz	34,25
2	University of Heidelberg	34,05
3	University of Stuttgart	33,33
4	Technical University of Munich	33,01
5	University of Ulm	31,80
<b>6</b>	<b>University of Bayreuth</b>	<b>31,72</b>
7	Technical University of Darmstadt	29,58
8	University of Tübingen	28,37
9	University of Göttingen	27,81
10	University of Bonn	26,71
11	University of Karlsruhe	26,60
12	Free University of Berlin	26,29
13	University of Kaiserslautern	24,67
14	University of Freiburg	24,18
15	Technical University of Berlin	23,40
16	University of Erlangen-Nürnberg	22,75
17	Technical University of Aachen	21,93
18	Humboldt-University of Berlin	21,45
19	University of Würzburg	21,14
20	University of Bochum	20,62