# Technology Transfer in Germany

## General overview and a deeper look at strategies and instruments of Helmholtz Association

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Trieste, 07/06/13

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# OUTLINE

- **Helmholtz Association in the German Research System**
- **Technology Transfer in Germany**
- **Helmholtz Technology Transfer: Organization, Track record and Instruments**
- **Innovation and Infrastructure - Success Stories**
- **Conclusion and Goals**

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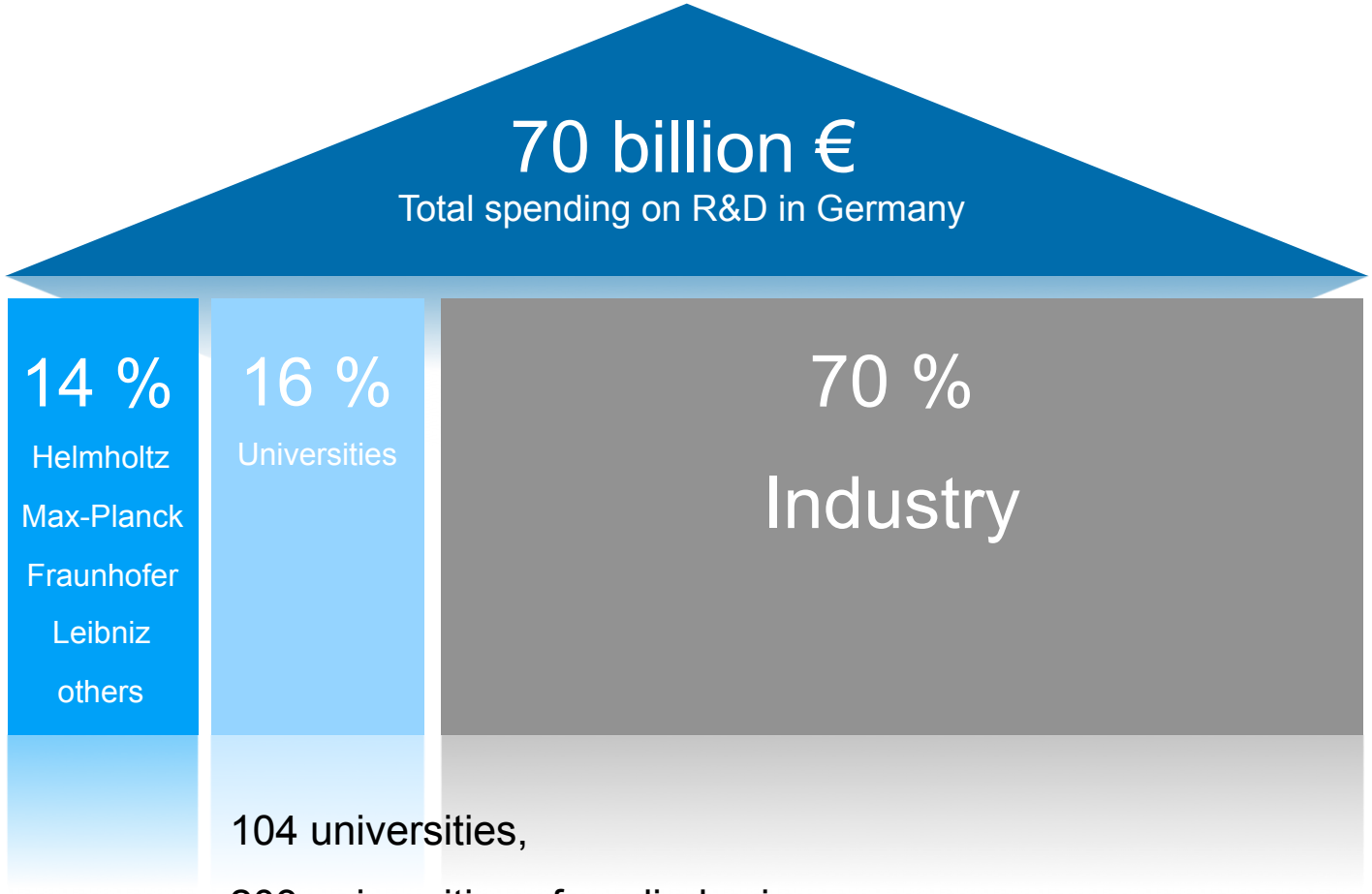
# HELMHOLTZ ASSOCIATION IN THE GERMAN RESEARCH SYSTEM




104 universities,

203 universities of applied sciences

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# HELMHOLTZ ASSOCIATION AND THE OTHER GERMAN RESEARCH ORGANISATIONS

| | Budget/ billion | Staff | Centres/ Institutes |
|---|---|---|---|
| **Helmholtz Association**<br>Use-inspired basic research with strategic programmes | **€ 3.76** | **33,619** | **18** |
| **Max Planck Society**<br>Pure basic research | **€ 1.89** | **17,019** | **80** |
| **Fraunhofer Society**<br>Industry-oriented research and development | **€ 1.8** | **20,000** | **60** |
| **Leibniz Association**<br>Long-term research topics | **€ 1.5** | **17,259** | **86** |

Currently available figures.

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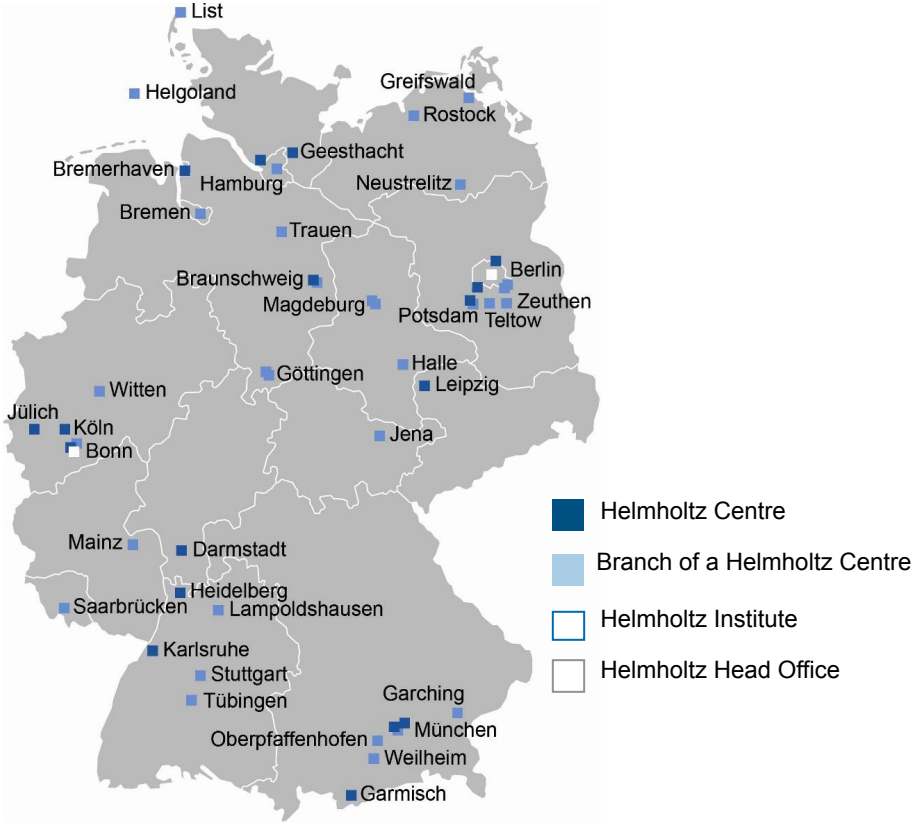
## Facts and Figures*

- 18 Research Centres, legally independent entities
- 33,619 Staff
  - 11,369 scientists & engineers
  - 6,234 PhD students
  - 1,623 vocational trainees
- Budget 2013: €3.76 billion
  - €2.37 bn: Institutional funding (90% federal, 10% local)
  - €1.23 bn: Third-party funding**
  - €0.17 bn: Special Financing




* including GEOMAR
**including contracts of project management agencies about €121 m

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## Research Centres

- Alfred Wegener Institute for Polar and Marine Research
- Deutsches Elektronen-Synchrotron DESY
- German Cancer Research Center
- German Centre for Neurodegenerative Diseases
- German Aerospace Center
- Forschungszentrum Jülich
- Karlsruhe Institute of Technology
- GSI Helmholtz Centre for Heavy Ion Research
- Helmholtz-Zentrum Berlin für Materialien und Energie
- Helmholtz-Zentrum Dresden-Rossendorf
- Helmholtz Centre for Environmental Research - UFZ
- Helmholtz Centre for Infection Research
- GEOMAR Helmholtz Centre for Ocean Research Kiel
- Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research
- Helmholtz Zentrum München – German Research Center for Environmental Health
- Helmholtz Centre Potsdam GFZ, German Research Centre for Geosciences
- Max Delbrueck Center for Molecular Medicine (MDC) Berlin-Buch
- Max Planck Institute for Plasma Physics (associated)

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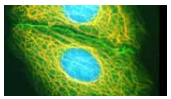
# HELMHOLTZ ASSOCIATION
## Mission and Research Fields

- Seeking solutions for major societal challenges with cutting-edge research
- Think big, act big: Developing and operating complex infrastructure and large-scale facilities for the national and international scientific community
- Creating wealth for society and industry through transfer of knowledge and innovation


Energy


Earth & Environment


Health


Aeronautics, Space and Transport


Key Technologies


Structure of Matter

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## USP as Chance for Innovation - Examples

- big research infrastructures
  - Research vessels and aeroplanes for marine and polar research
  - Beamlines and detectors for particle physics
  - Systemic phenotyping, archiving and distribution of mouse models for health research
- use inspired basic research
  - Energy research (e.g. geothermal, solar)
  - New materials (e.g. magnesium technology)
  - Earth and Environment (e.g. Climate Information Centers, Big Data modelling by supercomputing)

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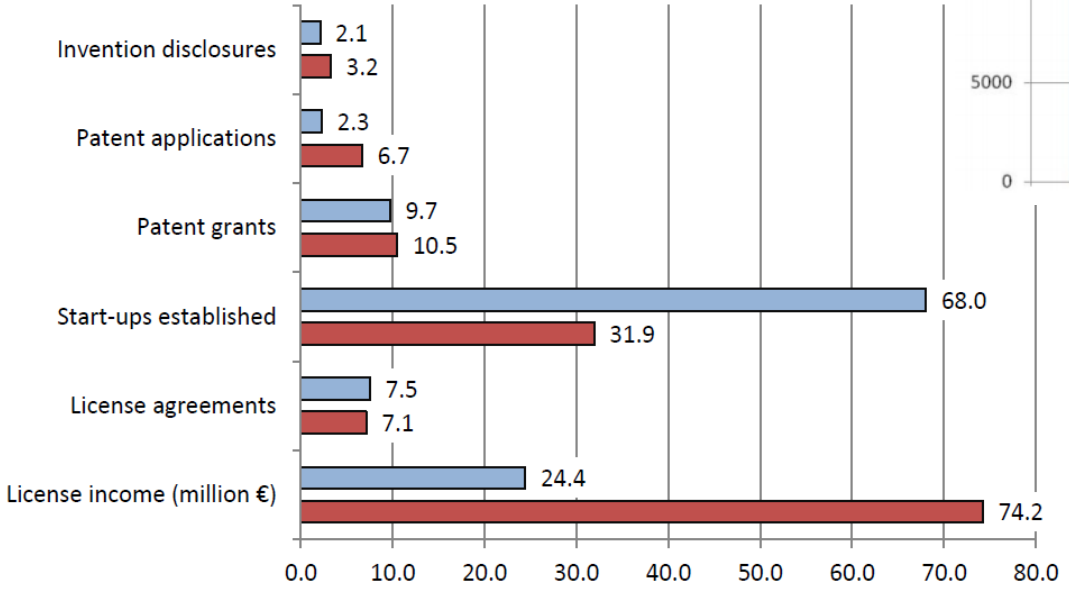
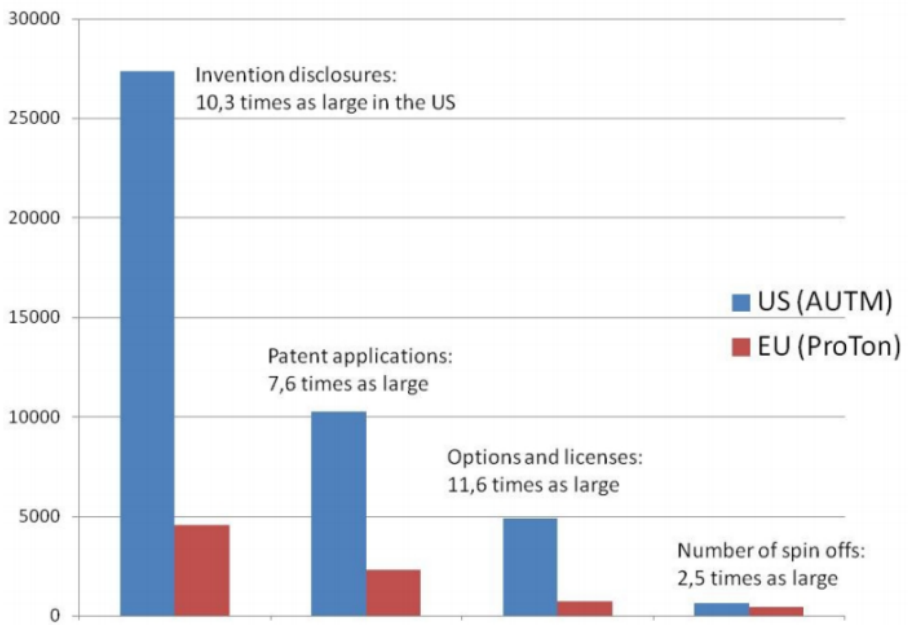
POLARSTERN


GALILEO S/C MGSE
S/C STAND
(SCS)

# TECHNOLOGY TRANSFER IN GERMANY
## Benchmarking – EU and US

Compared to US the performance of EU (and Germany) is weaker, but in relation to research expenditures* European PRO are more efficient concerning the number of start-ups and license agreements




Source: Respondent Report of the Knowledge Transfer Study, 2011

* Performance by research expenditures of EU and US million Euros to produce 1 output, 2011

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# TECHNOLOGY TRANSFER IN GERMANY
## Characteristics of German Innovation System

- compared to EU 27, US and Japan there is a highest share of third party funds coming from the industry in Germany (14 % universities, 11 % PRO)
- traditionally strong interaction between Academia and Economy
- moreover effect from the unique contract research model and success of Fraunhofer
- high and growing R&D Expenditures from Industry AND the State to reach the 3%-Goal of Lisbon Agenda (2011: 2,88 % thanks to 1,94 % by Industry and 0,98 % public research expenditure)
- High-Tech Start-ups: small number and weak dynamics in Germany, especially since 2001

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# TECHNOLOGY TRANSFER IN GERMANY
## Initiatives and public funding

High-Tech Strategy: national approach which integrates numerous research and innovation activities and involves all government departments

- Federal Ministry of Economics and Technology (BMWi):
  - SIGNO for valuation and exploitation of intellectual property, funding of patent marketing agencies for universities (PVA)
  - KMU-Innovativ for supporting of Start-ups / SME
- Federal Ministry of Education and Research (BMBF)
  - EXIST: two instruments for fostering spin-offs
  - Go-Bio: Start-ups in Biotech
  - Proof-of -Concept-Funding (VIP): appr. 60 projects 2010-2012
  - Pilot projects for Innovation in PRO

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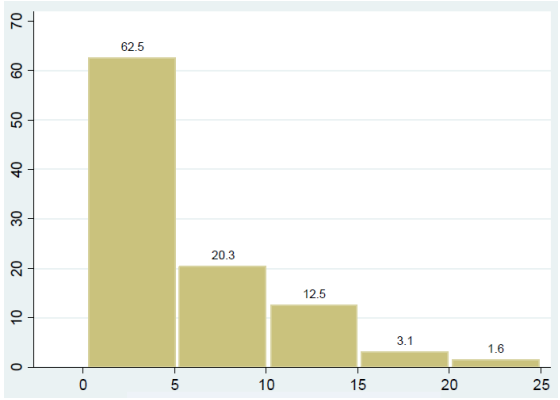
# TECHNOLOGY TRANSFER IN GERMANY

## Agencies and Facilities




- TTO of Universities and PRO,

  including commercial arms

  (e.g. TU Dresden, HU Berlin, MPI)
- independent public and private Transfer agencies
- Technology Parks ans Incubators
- Public funded patent marketing agencies (PVA)
- Facilities of industrial collaborative research / external Industrial research facilities
- Cluster Management, Chambers of commerce
- Ascenion GmbH for valuation and exploitation of intellectual property in Life Sciences (4 Helmholtz Research Centres)

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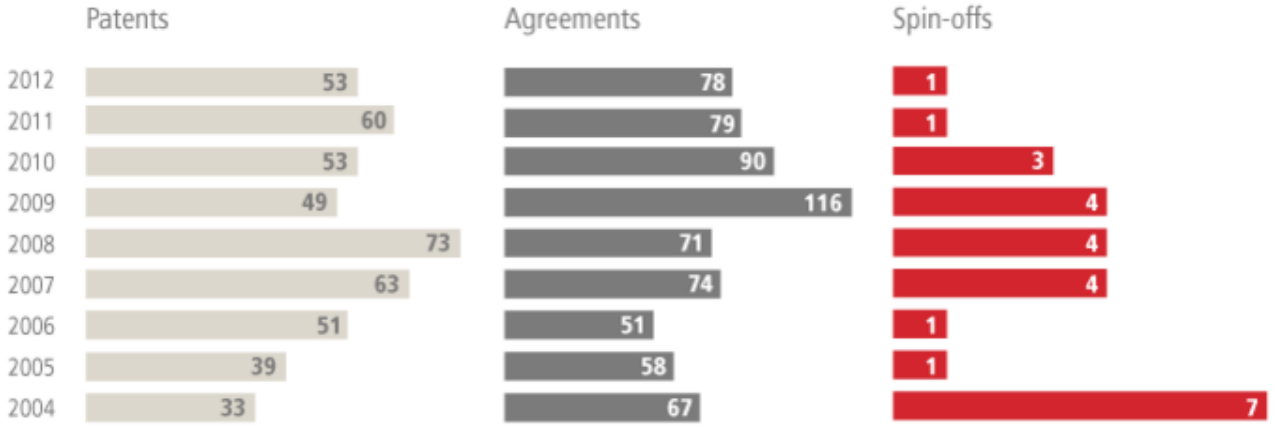
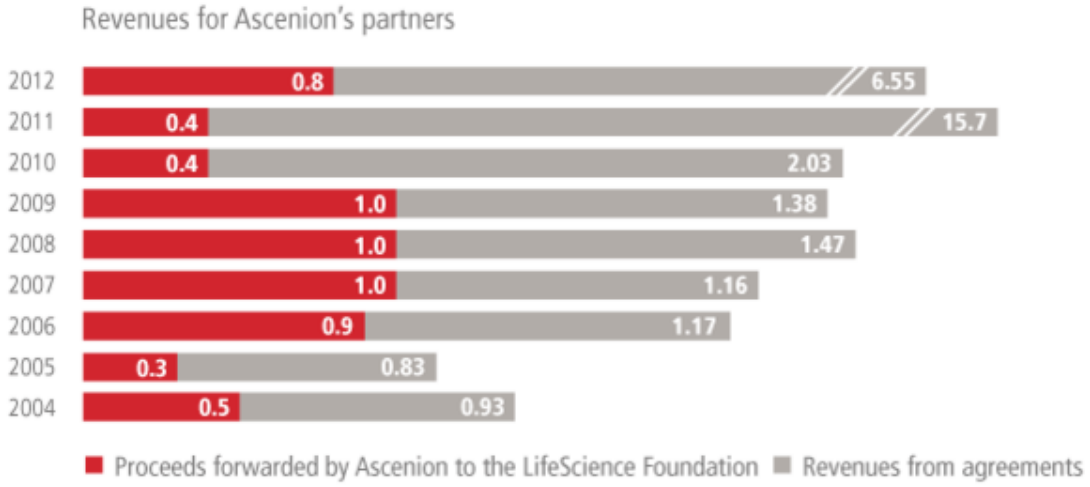
# TECHNOLOGY TRANSFER IN GERMANY
## KPI of leading TTOs: Ascenion GmbH

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# TECHNOLOGY TRANSFER IN GERMANY
## KPI of leading TTOs: Fraunhofer Venture

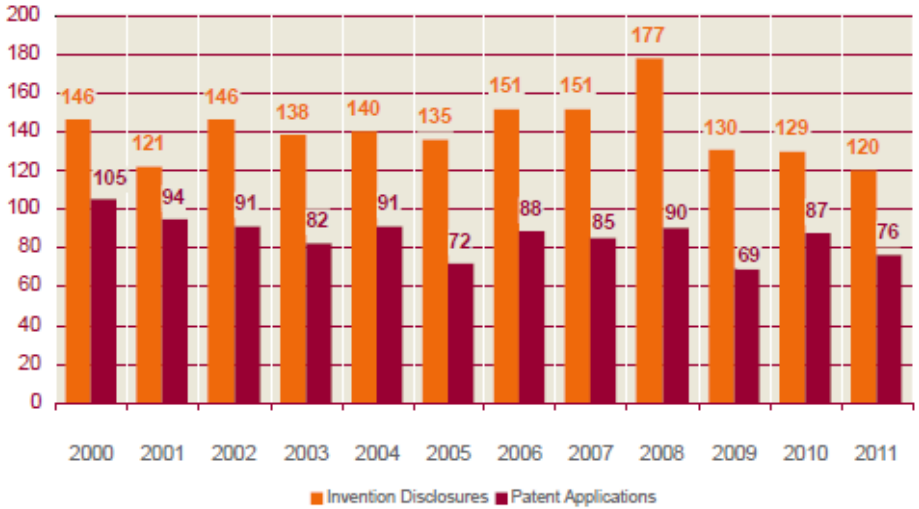
Fraunhofer VENTURE

- founded in 2001 as a department within the headquarters
- team of 18 People
- in over 150 foundations involved
- currently 80 technology shareholdings
- internal Fund with 1.5 Mio. Euro p.a. to support spin-off-projects
- external VC-Fund with a close link to Fraunhofer
- approx. **40 new spin-off-projects p.a.**
- approx. **15 foundations p.a.**
- approx. **10 new shareholdings p.a**.
- **> 50% of spin-offs are financed by VCs, Business Angels and banks**
- **low insolvency rate (lower 10%)**

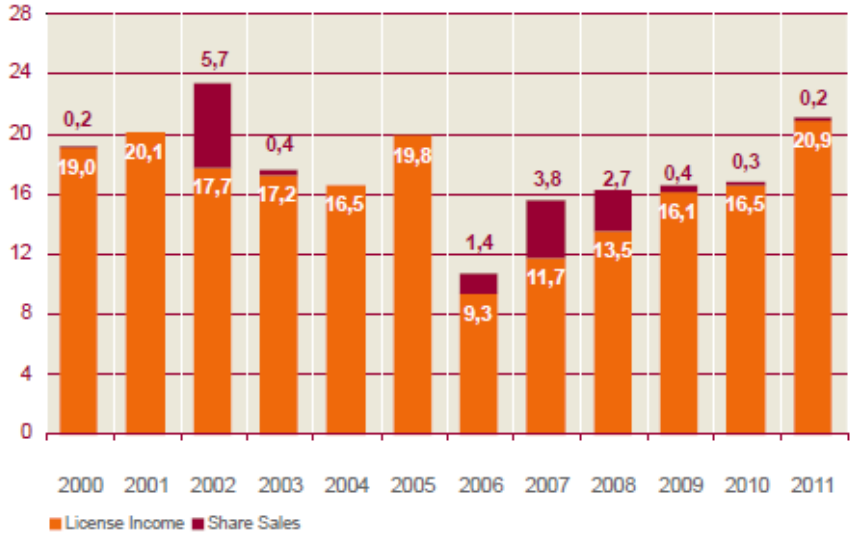
# TECHNOLOGY TRANSFER IN GERMANY

## KPI of leading TTOs: Max Planck Innovation GmbH

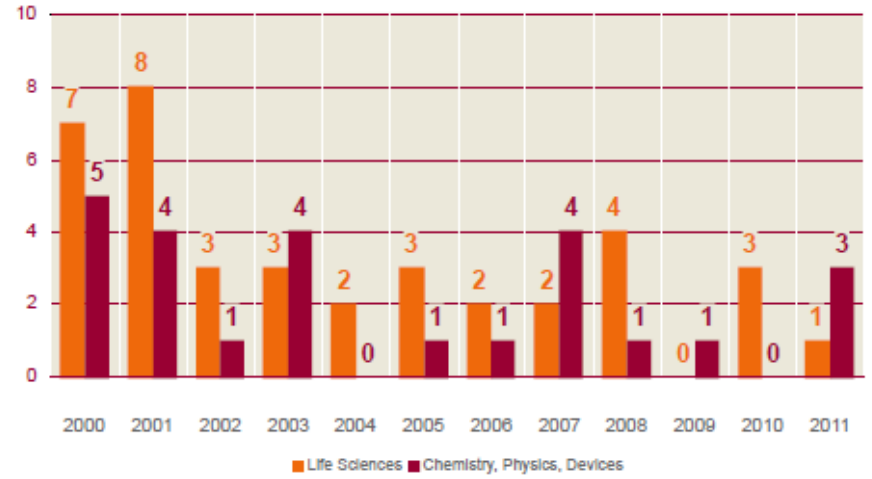
Invention Disclosures / Patent Applications



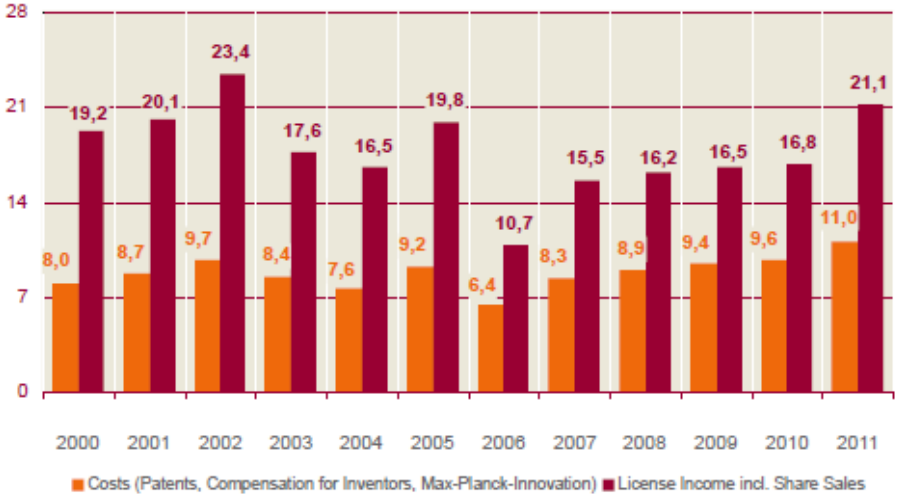

License Income (Mio EUR)




Spin-Offs




Cost-Benefit Analysis (Mio EUR) **> € 150 Mio. net profit since 1990**



# HELMHOLTZ TECHNOLOGY TRANSFER
## Organisation in the 18 Helmholtz Research Centres

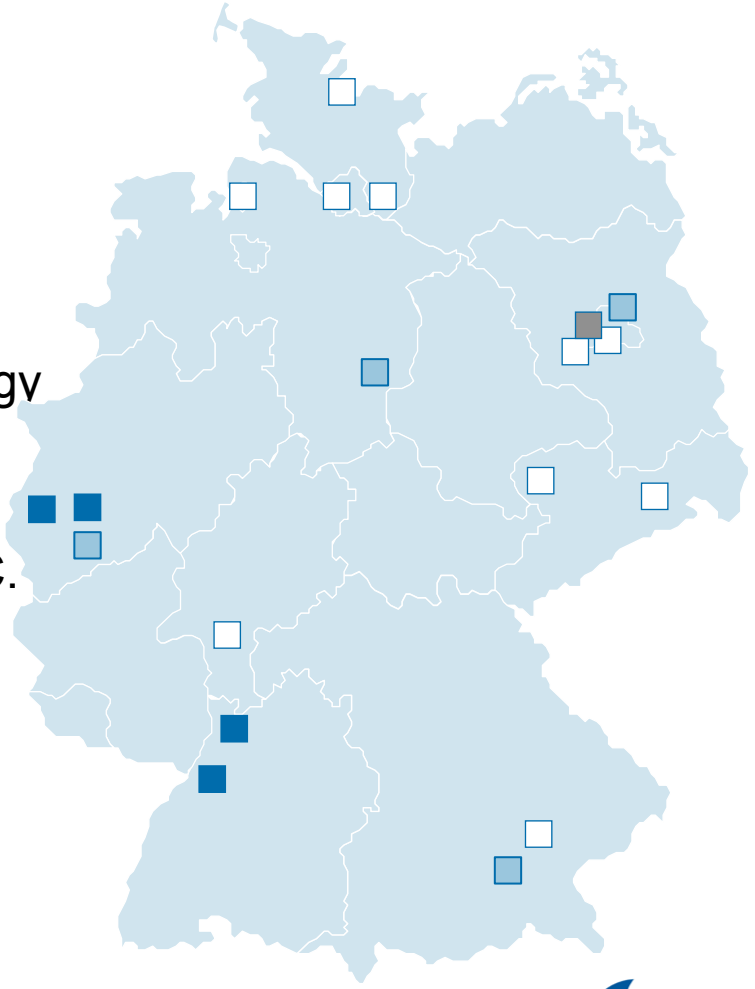
- Head Office Berlin: Support and co-ordination of Tech Transfer activities

- Large Helmholtz Centres with own professional Tech Transfer units
  - KIT – Karlsruhe Institute of Technology
  - FZJ – Research Centre Jülich
  - DLR – German Aerospace Center
  - DKFZ – German Cancer Research C.

- 4 Life Science Centres cooperating with a private partner (Ascenion)

- Other centres with small Tech Transfer units

Staff: > 100 Experts



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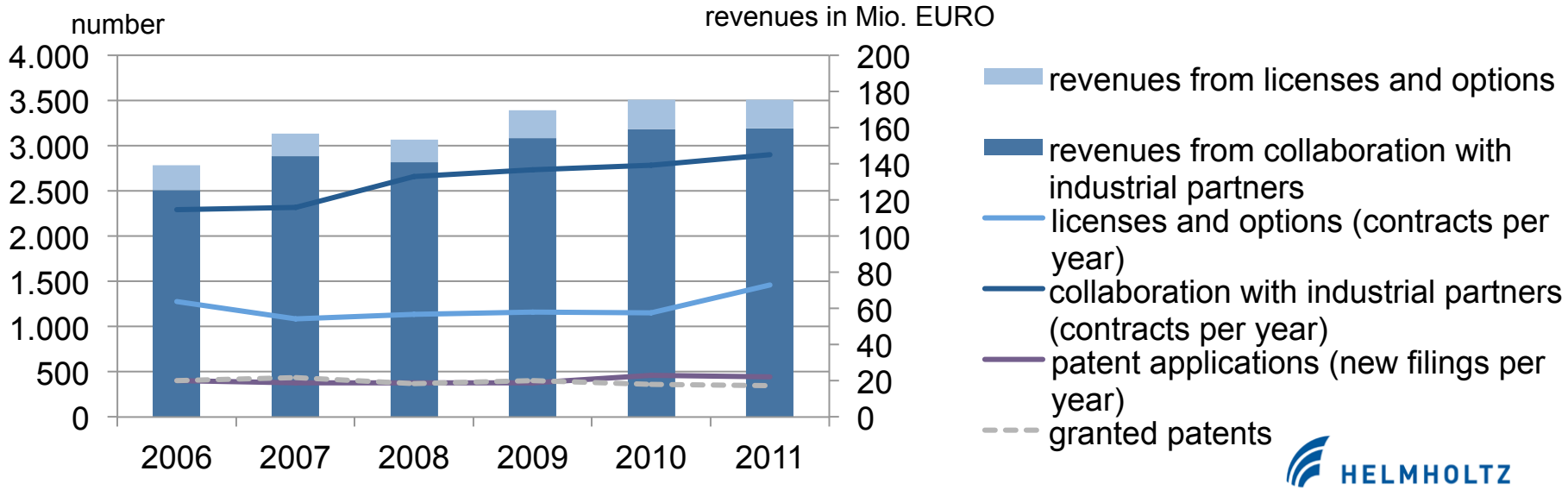
# HELMHOLTZ TECHNOLOGY TRANSFER
## Track Record

- 2,000 collaborative projects with industry with revenues of € 155 mio (2012)
- 1,400 licencing agreements with revenues of € 22 mio (2012)
- 400 new patents are filed every year
- 80 spin-offs between 2005 and 2012

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# HELMHOLTZ TECHNOLOGY TRANSFER
## Supporting Instruments and Activities

- Network / working group of technology transfer experts from the research centres since 30 years called TTGR
- Workshops and thematic interactions with Industry (e.g. in 2012: Zeiss Open Innovation Workshop, Siemens Energy Workshop, Roche Helmholtz Research Day)
- Up-Coming Open Innovation Workshops between relevant Helmholtz-Centres and Bosch, IBM and Bayer
- Innovations Days 2012 in Munich and 2013 in Berlin as Partnering event, showcase and commercialisation platform for spin-offs and technologies (together with MPG, FhG and WGL) – one focus this year will be the access and added value of Infrastructure
- 2 Funding Programs from the head office:

  Helmholtz Enterprise and Helmholtz Validation Fund

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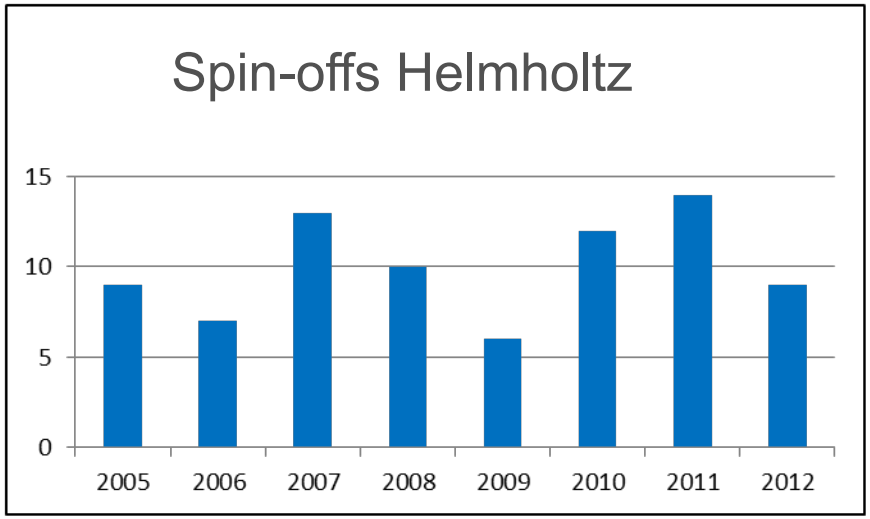
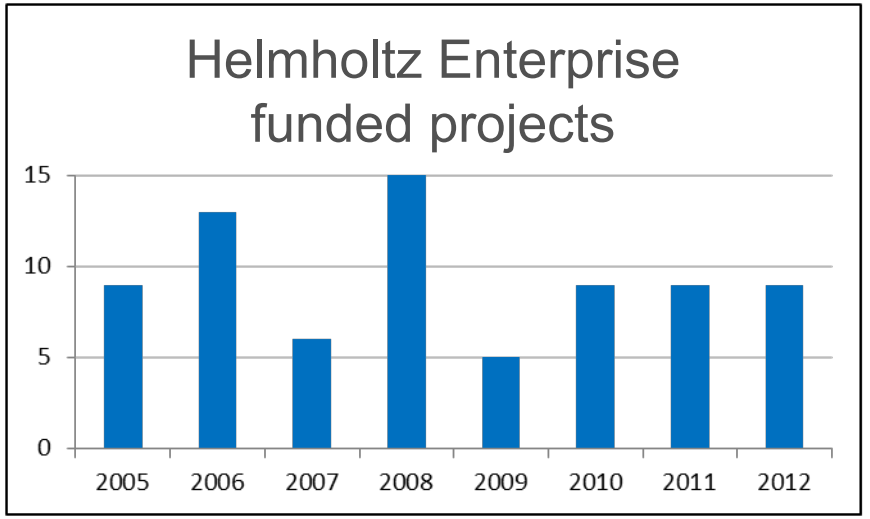
# HELMHOLTZ TECHNOLOGY TRANSFER
## Helmholtz Enterprise

- since 2005 more than 75 spin-off-projects have been supported with 260,000 € each
- new definitions and funding of Interim Management allowing “Spin-offs” with researchers as CSO and experienced external Managers as CEO

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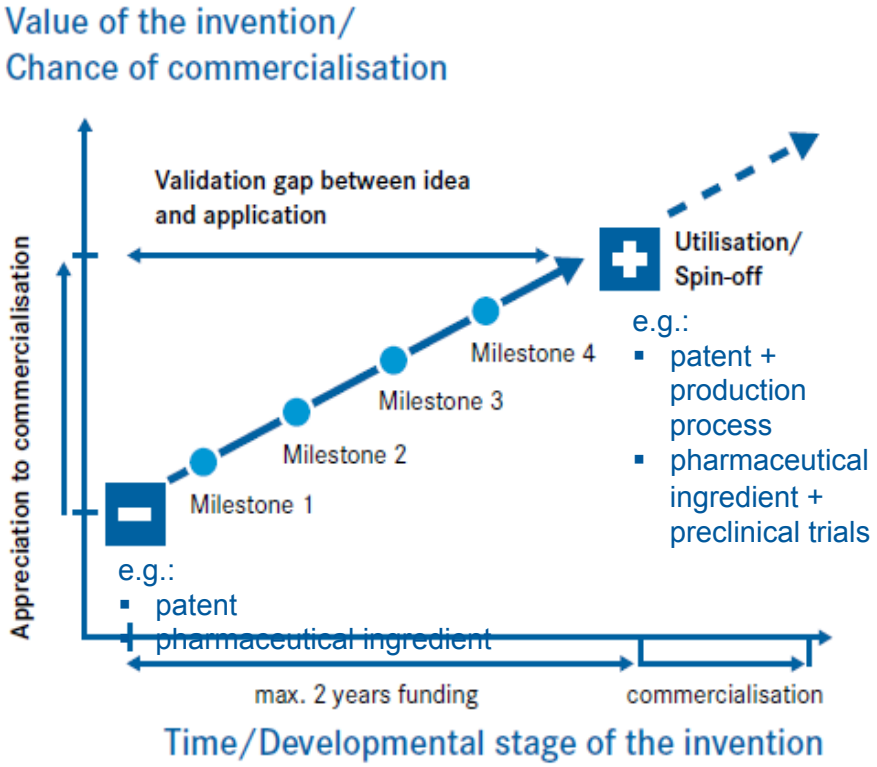
# HELMHOLTZ TECHNOLOGY TRANSFER
## Helmholtz Validation Fund

- "proof-of-concept-fund" as new internal programme to bridge the "valley of death"
- Funding budget 2011-2015 of 20 m € by Helmholtz, with matching over 40 m € (return on invests, but no real revolving fund)
- Projects have to show proof of concept / market potential to increase value and chance of commercialisation

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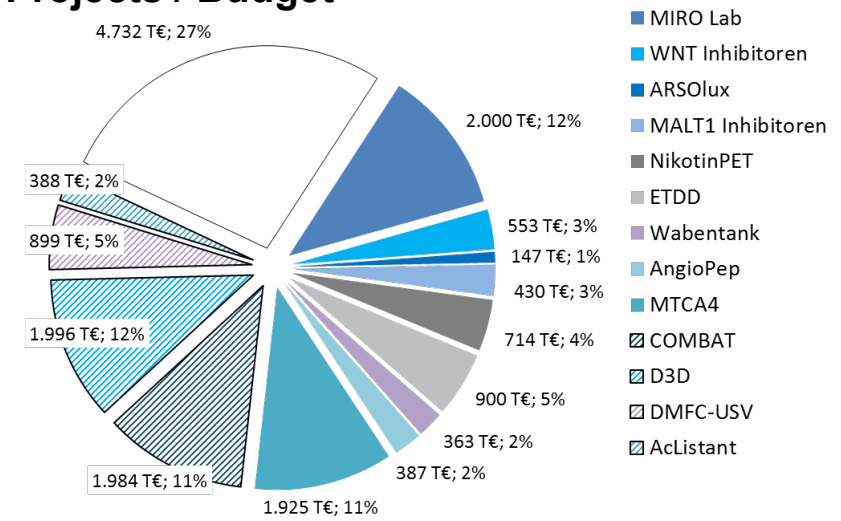
# HELMHOLTZ TECHNOLOGY TRANSFER

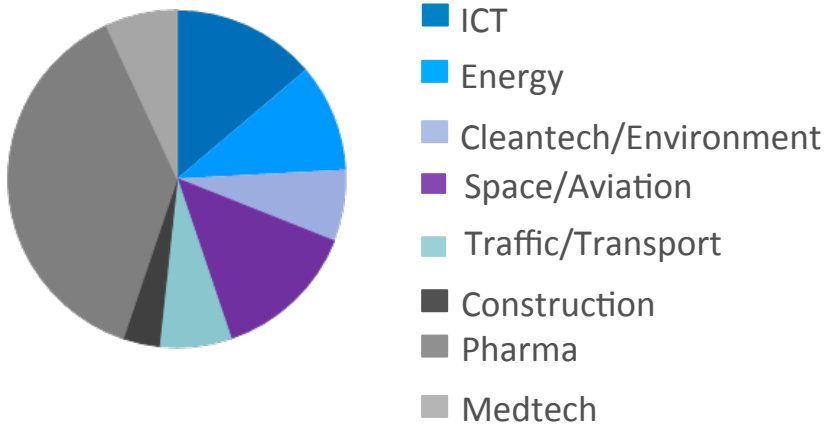
## Helmholtz Validation Fund

- Financial support (up to 4 m € within 2 years including 50 % matching)
- Management support by coaches and professional fund management
- Decision for granting is made by an experienced investment board
- 12 on-going projects, selected from 30 proposals
- Next round: September 2013

**Projects / Budget**




**Proposals / Branches of Industry**

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# HELMHOLTZ TECHNOLOGY TRANSFER
## Further activities and effects in the Centres

- Various strategic collaborations and common Labs, e.g. IBM-DESY, HMGU-Roche, DKFZ-Siemens, KIT-BASF
- Commercial arms to improve offering of unique Infrastructure, e.g. HZDR Innovation GmbH for Ion beam source for customers from Automotive
- Incubator on campus, e.g. KIT
- Helmholtz Centres as nuclei of cluster development, e.g. HZB and Photovoltaic Enterprises in Berlin

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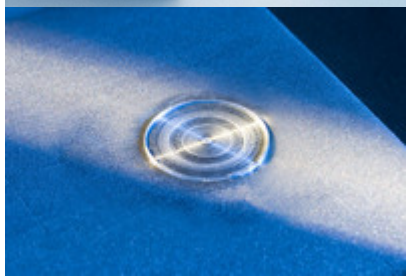
# HELMHOLTZ TECHNOLOGY TRANSFER
## New Products and Processes





- Examples from Life Sciences:
- Gardasil (HPV; Vaccine)
- Removab (maligmant ascites; antibody)
- Akita (aerosol therapy system)
- IXEMPRA (tubulin-binder; small molecule)
- Examples from Physical Sciences:
- oil heating systems work using the “blue burner” technology from rockets
- innovative production process for low emission cement “celitement”
- new bonding technique – spot friction welding

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# INNOVATION AND INFRASTRUCTURE
## Examples for Helmholtz Large-Scale Facilities

- unique infrastructure enables disruptive innovations, e.g. in pharma, biotech, material research, clean tech

| |
|---|
| Free-Electron-Laser (FEL) in Hamburg – FLASH |
| Synchrotron Radiation Source – PETRA III |
| Long-Term Population Study – National Cohort |
| Jülich Supercomputing Centre – JSC |
| Modular Earth Science Infrastructure – MESI |
| Accelerators and Experimental Facilities at GSI |
| FAIR Green IT Cube – Cube |
| Research Reactor in Berlin – BER II |
| Synchrotron Radiation Source – BESSY II |
| Radiation Source – ELBE |
| High Magnetic Field Laboratory in Dresden – HLD |
| Ion Beam Centre – ISZ |
| German Engineering Materials Science Centre – GEMS |
| Synchrotron Radiation Source – ANKA |

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# INNOVATION AND INFRASTRUCTURE
## Success Stories

- Societal innovation from technical solutions of large research infrastructures, e.g. the famous example of CERN and the invention of the www in 1989

In the Helmholtz Association:

- Commercialisation of Research Results, e.g. Ion Beam Therapy developed by GSI or Proton Therapy developed by HZB for cancer treatment
- Research solutions as new common standards also for industrial partners, e.g. new electronic standard developed by DESY-researchers, proof-of-concept phase funded by Helmholtz Validation Fund

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# INNOVATION AND INFRASTRUCTURE
## Success Stories

- Access for industry / SME (e.g. chemical firms rent beam times at DESY for improvement of catalysts)
- Innovative process  technologies as a result of setting-up Research Infrastructure (e.g. Welding Technologies for the stellarator Wendelstein 7-X (IPP) or detector technologies for GSI)
- Supporting spin-offs by allowing the use of infrastructure (e.g. Labs, MRT facilities or Supercomputing Centers) for usual market prices

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# INNOVATION AND INFRASTRUCTURE
## Success Stories

- Nobelprice für Physics 2007 for Prof. Dr. Peter Grünberg from FZ Jülich (with A. Fert)

- Discovery of the Giant magnetoresistance (GMR) effect in 1988

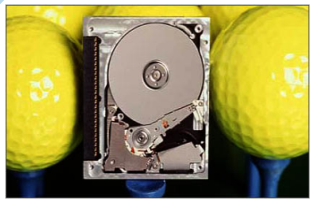

**Basic Research**

**Applied Research**

**Industry Development**

**Mass market product**

- Ten years later: Beginn of Mass Production (innovative magnetic field sensors, which are used to read data in hard disk drives)



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# CONCLUSION AND GOALS

- TechTransfer in EU and Germany is on the way, but improvement still necessary
- enormous potential for applied / contract research and strategic collaboration at large scale facilities
- Unique Research Infrastructure is a basis for disruptive Innovation
- Trends of Open Innovation and new possibilities of Big Data Management should be used
- Goals in the field of Innovation and large Infrastructure:
  - Enable innovation by better communication of advantages and easier access to beamlines etc. for industry and SMEs
  - Create appropriate incentives for collaboration and transfer
  - But: important to maintain the balance between basic research and commercial use

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# HELMHOLTZ TECHNOLOGY TRANSFER

## Contact

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