

# Education and Particle Physics Research in Poland



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**RECFA visit to Poland, May 11, 2012**

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# Outline

- Basic facts about Poland
- Education system
- Research funding
- High Energy Physics

# Poland



- Rzeczpospolita Polska – Republic of Poland
- Capital Warszawa - Warsaw
- Area 312 679 km<sup>2</sup> (5<sup>th</sup> in EU)
- Population 38.2 milion (6<sup>th</sup> in EU)
  - 47.9% men, 52.1% women (100/109)
  - Natural increase +0.9 (per 1000)  
(in 2010; Central Statistical Office 2012)
- GDP: 754 B\$, per capita 19 750 \$ 62% of EU average  
(PPP\$; OECD 2010)
- CERN member since July 1991, observer since 1963
  - contribution to CERN budget 2.90% (2012)
  - number of users+associates: 264, fellows: 31, staff members: 58  
about 35% increase in the last three years

# Education

- Public education system is evolving

- 1999

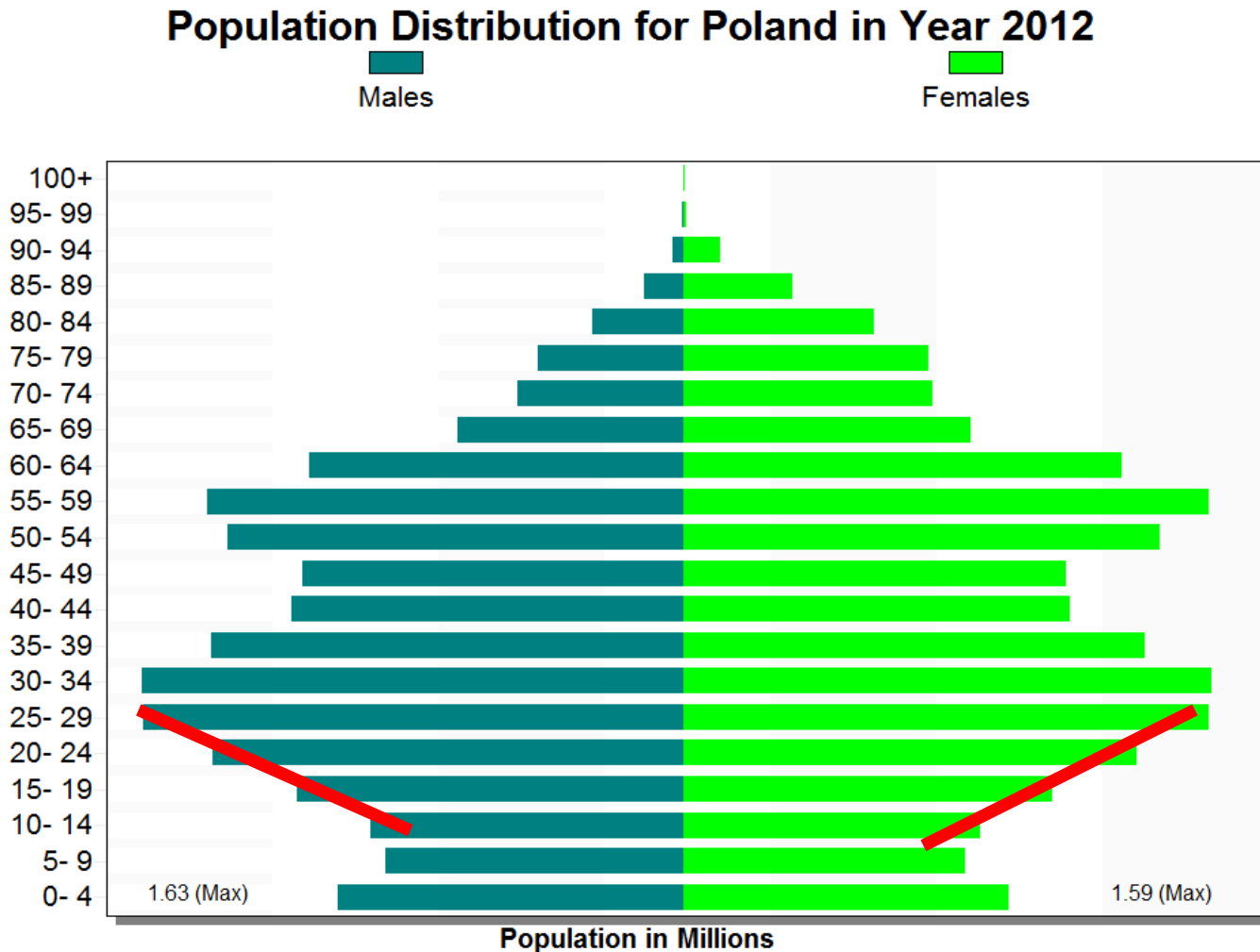
Structure of the Polish Education System

Before the reform of 1999					After the reform of 1999					
age				grade	age				grade	
6	Zero class (primary schools or kindergartens)			0	6	Zero class (primary schools or kindergartens)			0	
7	Comprehensive primary schools			I	7	Comprehensive primary schools			I	
8				II	8				II	
9				III	9				III	
10				IV	10				IV	
11				V	11				V	
12				VI	12				VI	
13				VII	<b>Final test</b>					
14				VIII	13	Comprehensive lower secondary schools ( <i>gimnazjum</i> ) ISCED 2A			I	
<b>Entrance exam</b>				14	II					
15	General secondary schools ( <i>liceum</i> )	Secondary vocational schools ( <i>technikum</i> )	Basic vocational schools	I	15				III	
16				II	<b>Final exam</b>					
17				III	16	General secondary schools ISCED 3A	Profiled general secondary schools ISCED 3B	Secondary vocational schools ISCED 3B	Basic vocational schools ISCED 3C	I
18				IV	17					II
19	Matura			V	18	Matura	Matura		III	
<b>Matura</b>					19	Matura	Matura		IV	
					<b>Matura</b>					

- Public education system is evolving
  - 1999 – changing to 3 level public school system
    - „ Poland strongly improved the quality of its secondary education and the performance of its students. In the 2009 PISA tests, Poland ranked among the top 15 OECD countries.” (PISA report 2012)  
PISA - The OECD Programme for International Student Assessment
  - 2009 – new teaching program for secondary schools
    - Allow pupils to decide (earlier) what they want to learn
      - Should help preparing them better to high school education
      - In practice, access to some teaching paths can be limited
      - We have to wait another 3-4 years to see results...

# Education

- Demographic decline in number of students

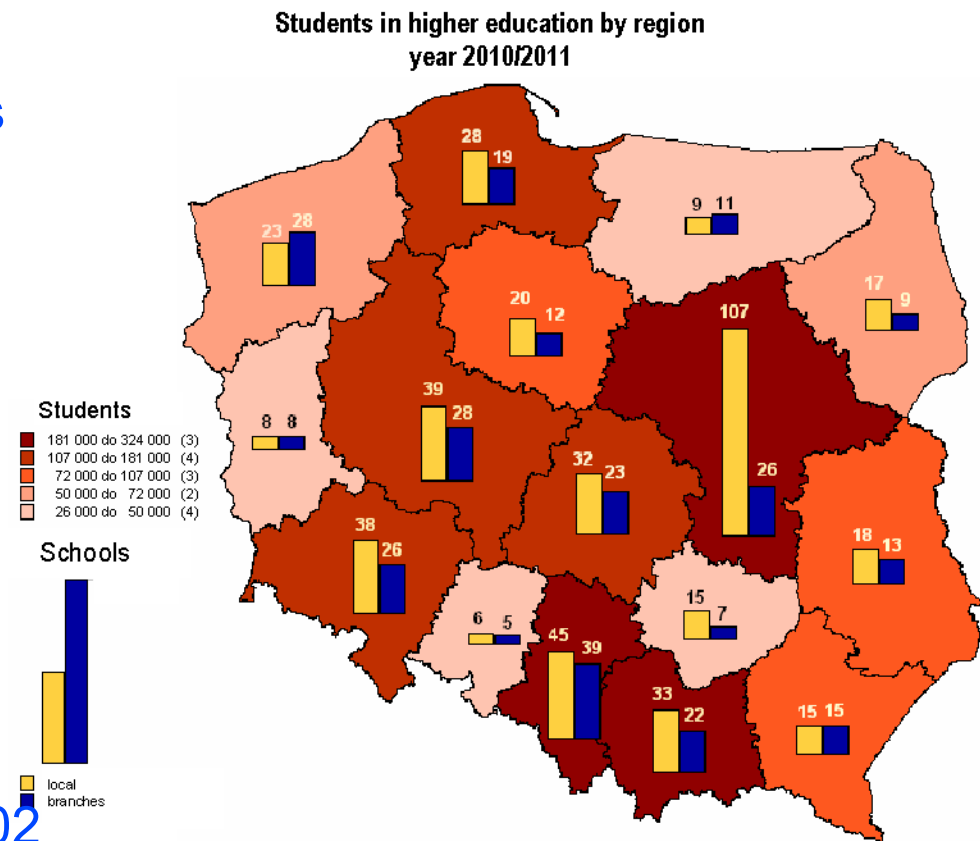


# Higher Education

- 460 higher education institutions
  - 132 public and 328 non-public
  - 19 universities, 23 technical universities
- 1 841 thous. students

Based on:  
Higher Education Institutions  
and their Finances in 2010  
Central Statistical Office 2011

- decrease by over 6% in 5 years
- 68.5% in public
  - 67.5% full-time
- 58.8% women
- Tertiary education level
  - 35% (aged 30-34)
  - 16.8% (aged >13)
    - 14.6% men, 18.8% women
    - large increase from 9.9% in 2002



# Higher Education

## Graduates of higher education institutions

- 479 thousands (one academic year: 2009/2010)
  - 65.4% females
  - 310 thousands from public schools
- First level - Bachelor: 212 thous. (44%)
  - Engineer: 42 thous. (9%)
- Second level (Master): 124 thous. (26%)
- Uniform (Master): 101 thous. (21%)
- Third level (completed PhDs): 5 023 (1‰)



# Physics Education

- Total students in Poland: 1 841 thous.
  - Universities: 526 thous. + Technical univ.: 319 thous.
    - Engineering 132100 (20.4% female)
    - Computing: 74000 (10.5% female)
    - Physical sciences: 27 400 (62.1% female)  
Includes: Physics, Astronomy, Chemistry, Geophysics, Biophysics, Medical physics etc.
    - **Physics: 4400**      **2.4‰ of students**
- PhD students: 37 500 total (females 52.6%)  
Universities and higher education institutions + Research Institutes,  
Scientific units of the Polish Academy of Sciences – PAS (+medical education centers)  
27 100 full-time; more than 50% in 3 centers: Warsaw, Cracow, Wroclaw
  - **PhD students in physics: 1225 (37.6%)**      **3.3% of PhD students**  
Completed:  
25% in up to 2 years, **60% in 3-4 years**, 13% in 5-6 years, 2% in 7-8 years  
**(from formal opening of PhD course !)**

# Funding of Higher Education

- Total expenditure on higher education: 1.4% GDP

## Revenues of higher education institutions:

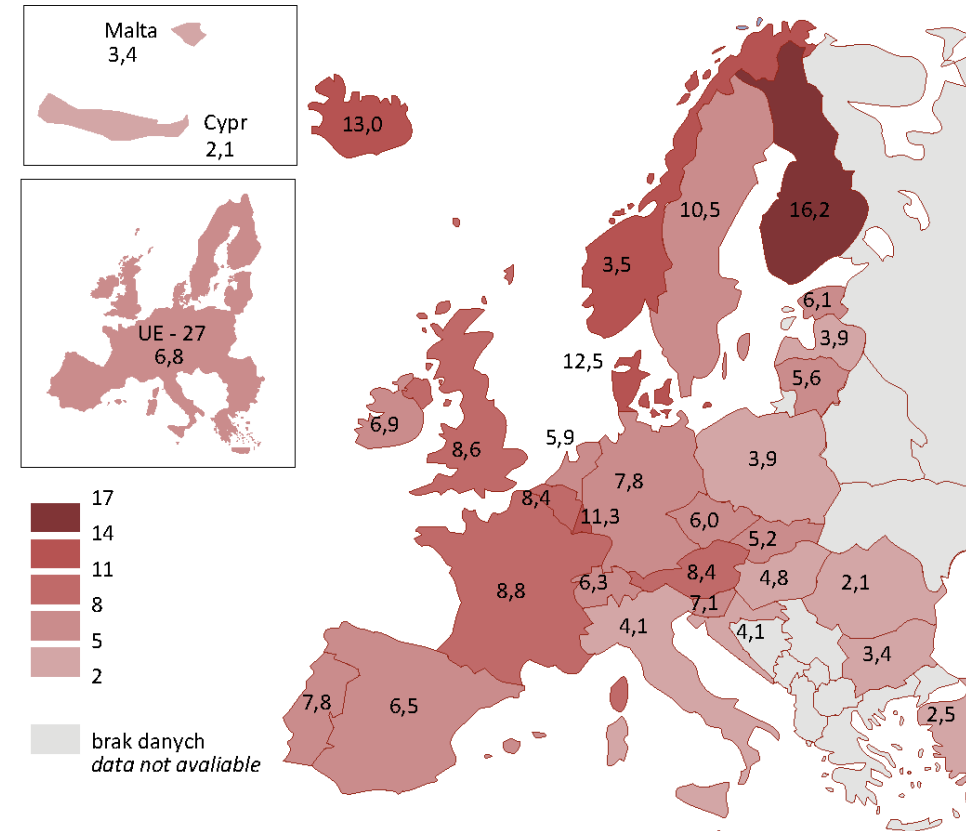
- 80% for teaching activities. *Average in case of public university:*
  - 68.7% subsidies from budget and other public fund,
  - 19.7% teaching fees
  - 11.6% other
- 14% for research activities
  - 50.6% funds for financing statutory activity
  - 17.5% realization of research projects
  - 16.5% financing international cooperatives
    - 7.1% sales of experimental research and development results
    - 3.0% realization of development projects
    - 0.3% realization of appropriated projects
    - 0.7% funds from Minister's projects and programmes

# Research in Poland

- Total of about 120 thous. involved in R&D
- 4.7 FTE in R&D per 1000 economically active
  - 3.9 researchers  
(EU average: 6.8)
  - 38% women

Science and technology in Poland in 2009  
Central Statistical Office 2011

*Researchers<sup>a</sup> per 1000 total employed in selected countries in 2008*

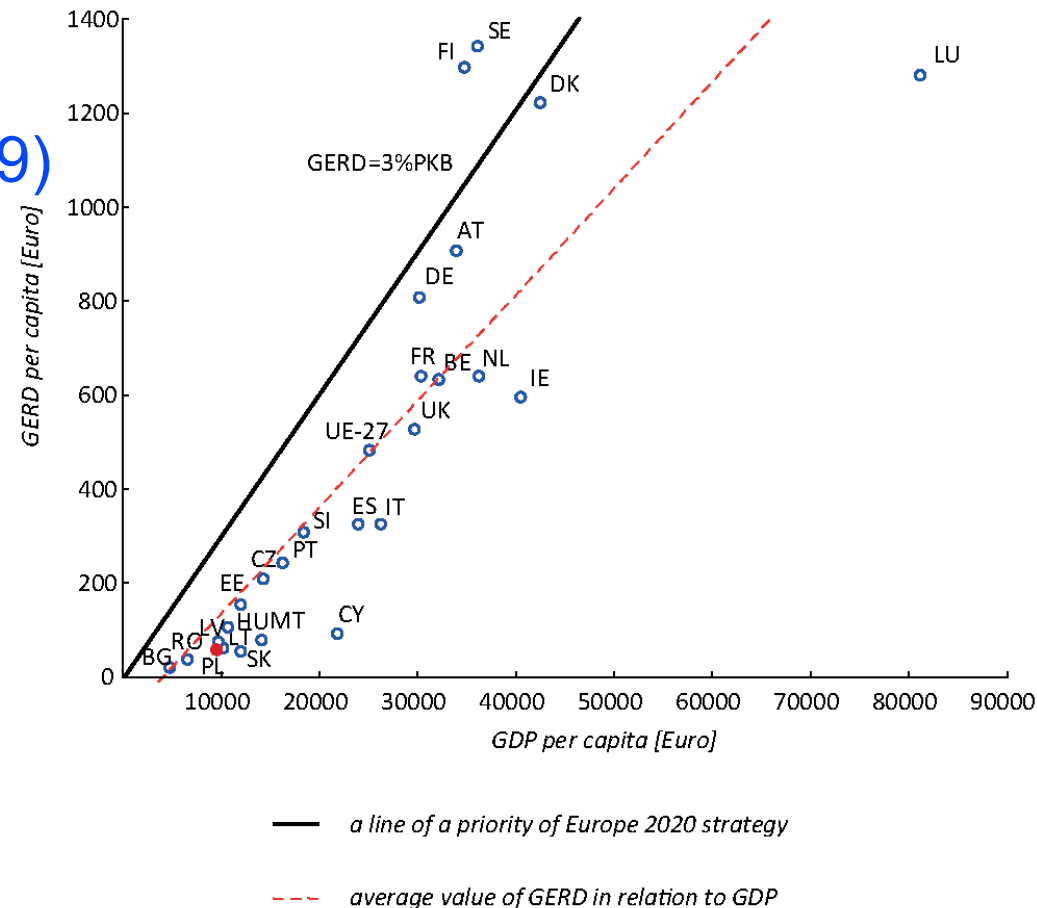
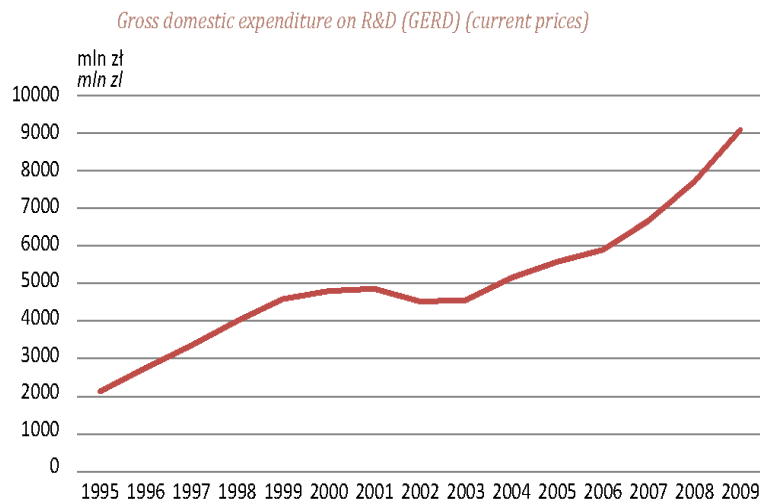


## Research centres:

- Public universities (~200)
- Public R&D units (~120)
- Scientific facilities of Polish Academy of Sciences PAS (~80)
- **Industrial R&D units (~700)**

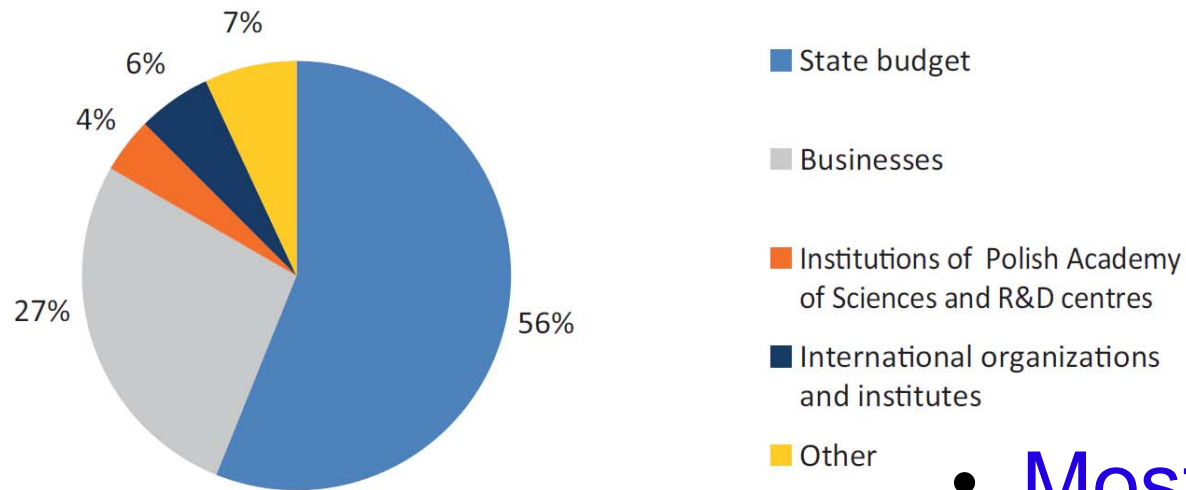
# Research funding

- Expenditures on R&D: 0.68% GDP
  - 56% from state budget
  - yearly increase of 4.7% (in EUR, average 2005-2009)
  - but still one of the lowest expenditures in EU

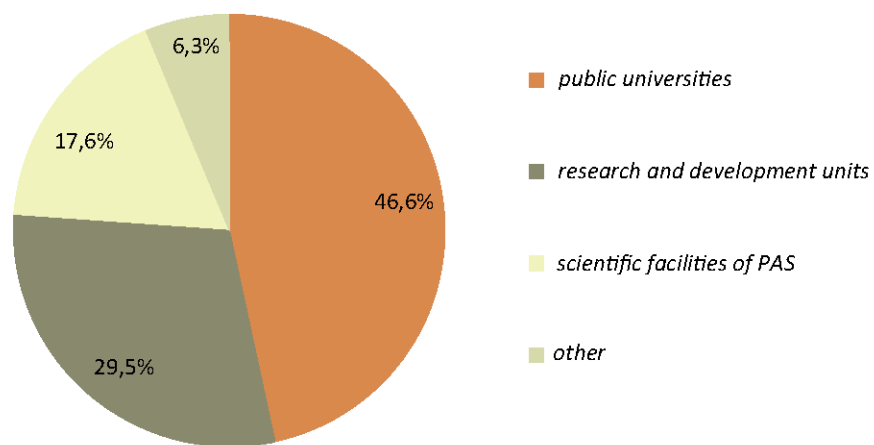


# Research funding

## Sources of funding R&D



*The structure of direct government grants for research and experimental development activities in government sector by NA in 2009*



- Most of public funds go to public entities
  - Private funding of basic research in public units still very limited
  - As is governmental funding of R&D in private sector

# Research funding

## New scheme for financing research in Poland

- **National Science Centre**
  - Financing of basic research. Governed by representatives of the scientific community. Special emphasis placed on supporting young scientists.
- **National Centre for Research and Development**
  - Financing applied research and development projects as well as supporting research commercialisation and transfer of scientific results to economy.
- **Minister of Science and Higher Education**
  - financing „statutory activities” supporting own research programmes of higher education institutions and research units
  - financing international cooperation (including support of FP projects)
  - special programmes supporting international mobility of researchers, encouraging Polish scientists to participate in ERC competitions, supporting outstanding young scientists...

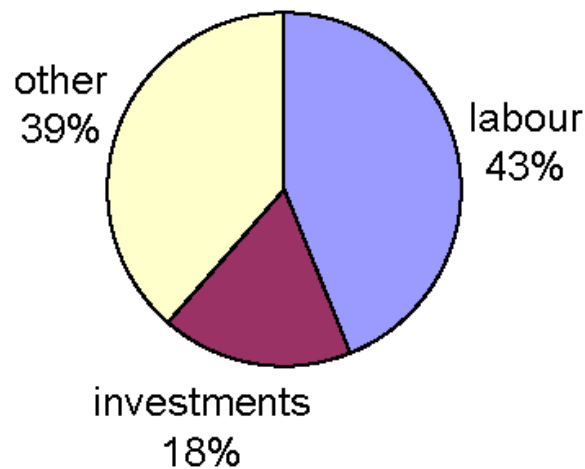
# Research funding

- **Polish Agency for Enterprise Development**
    - support for innovation research in closer cooperation with industry
  - **Foundation for Polish Science**
    - support to individual researchers, research teams, financing of investment projects. Prestigious grants, scholarships and prizes.
  - **Significant funds received within European Framework Programmes**
    - FP5 (1998-2002): 1,323 Polish teams, 152 M€
    - FP6 (2002-2006): 1,876 teams, 217 M€
    - FP7 (2006-2011): 1,146 teams, 211 M€
- and other international programmes...

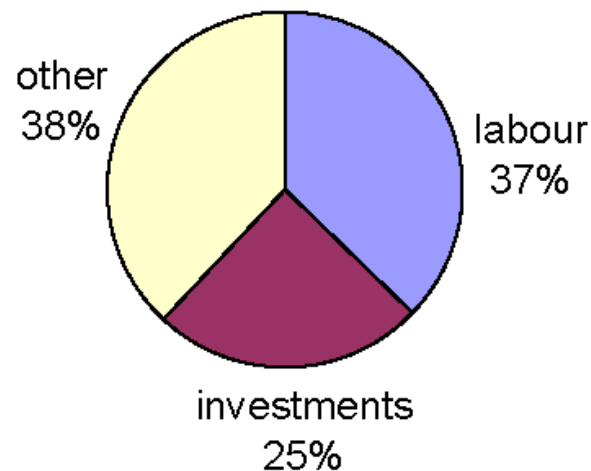
# Research funding

- Expenditures on R&D by main type of costs
  - Similar profile in different sectors

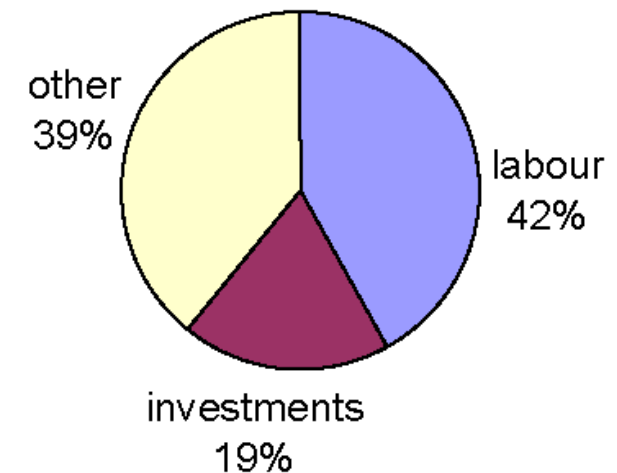
Public research units



Universities



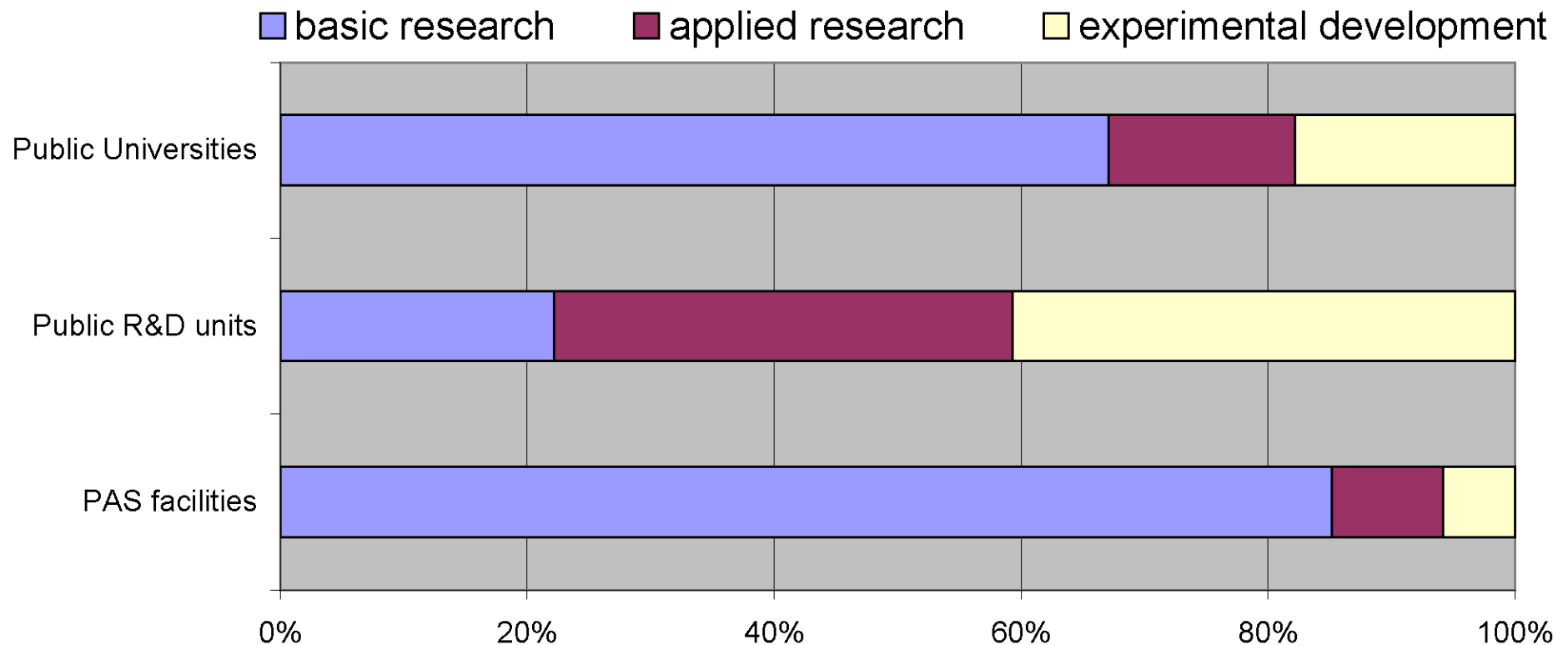
Business enterprise





# Research funding

- Expenditures on R&D by type of research
  - Basic research mainly at Universities and in PAS units



# HEP in Poland

## Main research centers

### ◦ Warsaw

- National Centre for Nuclear Research (NCBJ)
- University of Warsaw (UW)
- Warsaw University of Technology (PW)
- Centre for Theoretical Physics PAS (CFT)
- Copernicus Astronomical Centre PAS (CAMK)
- Space Research Centre PAS (CBK)

### ◦ Cracow

- Institute of Nuclear Physics PAS (IFJ)
- University of Science and Technology (AGH)
- Jagiellonian University (UJ)
- Cracow University of Technology (PK)
- Academic Computer Centre (ACK)

### ◦ Wrocław

- Wrocław University of Technology (PWr)
- University of Wrocław (UWr)
- Wrocław University of Environmental and Life Sciences (UPW)



# HEP in Poland

## Main research centers

- Katowice
  - University of Silesia
- Łódź
  - University of Łódź (UŁ)
  - Łódź University of Technology (PŁ)
  - National Centre for Nuclear Research (NCBJ)
- Kielce
  - Jan Kochanowski University of Humanities and Sciences (UJK)



# HEP in Poland

## Main research centers

- Katowice
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  - National Centre for Nuclear Research (NCBJ)
- Kielce
  - Jan Kochanowski University of Humanities and Sciences (UJK)
- Toruń
  - Nicolaus Copernicus University (UMK)
  - Copernicus Astronomical Centre (CAMK)
- M. Curie-Skłodowska University in Lublin (UMCS)
- University of Szczecin (USz)
- University of Zielona Góra (UZG)
- University of Warmia and Mazury in Olsztyn (UWM)
- University of Białystok (UB)
- University of Natural Sciences and Humanities in Siedlce (UPH)



# HEP in Poland

Human resources (FTE) Based on the ECFA 2009 survey

- Experimental HEP
  - 109 physicists
  - 37 PhD students
  - 43 engineers and support
- Astroparticle physics
  - 21 physicists
  - 7 PhD students
  - 7 engineers and support
- Theory
  - 102 physicists
  - 57 PhD students

Total: 232 physicists,  
101 students and 50 engineers

Most research positions  
(with PhD) are permanent.

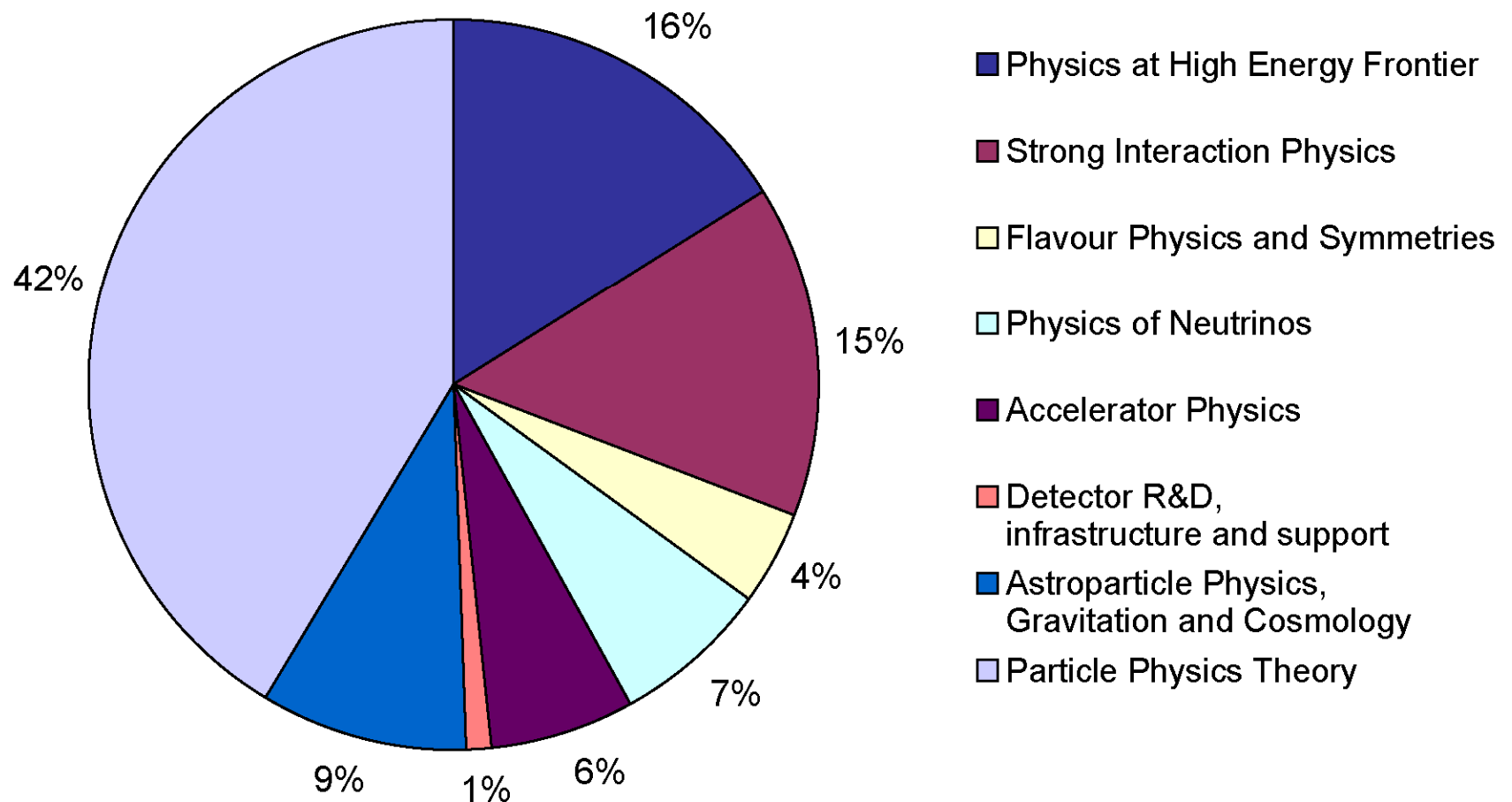
Very limited number of fixed-term  
positions in research projects.

**New survey under way,  
numbers still to be verified.**

# HEP in Poland

Human resources (FTE) Based on the ECFA 2009 survey

- Fields of interest of Polish community

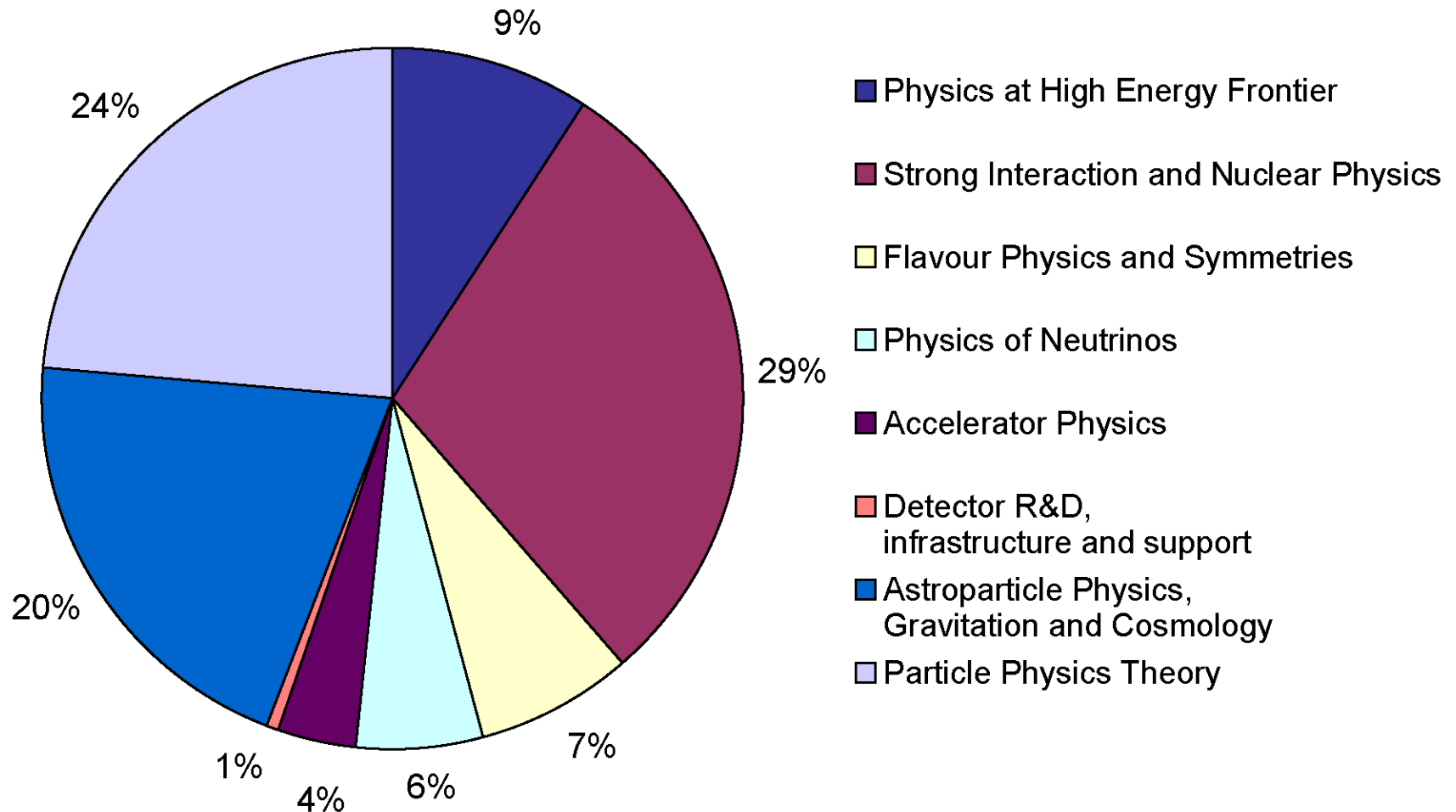


Physicists + PhD students + engineers

# HEP in Poland

Based on the new survey of HEP and APP activities

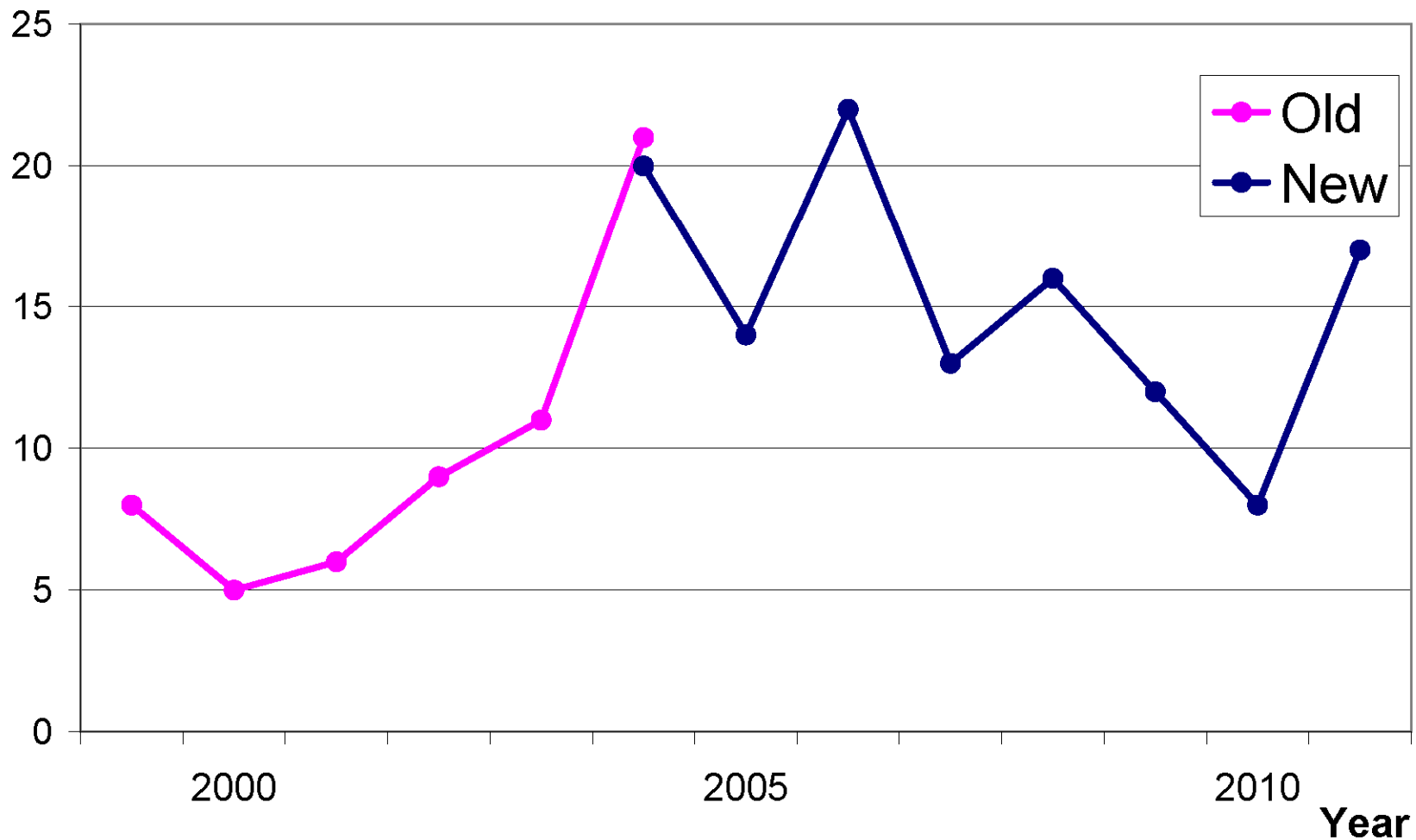
- Fields of interest of Polish community



Larger coverage, including overlap with astrophysics and nuclear physics

# HEP in Poland

- Completed PhD theses in HEP





# HEP in Poland

- Diversity of research activities
  - Polish model of academic career and university tradition assumes high independence of senior researchers
  - Research funding for large, long-term projects difficult to obtain, easier to get money for small projects without large investments
  - Evaluation system of research institutions based on number of publications encourages diversity
- No formal coordination of HEP activities on national level
  - Only advisory bodies at different level
  - Work on the update of the HEP strategy in Poland

# HEP in Poland

- Recent development:  
meeting on CERN related subjects with the  
Minister of Science and Higher Education
  - We asked for establishing regular working contacts
  - Important subjects to elaborate include:
    - Better support for general activities related to CERN
    - Engagement of the Ministry in strategy process
    - New mechanisms for supporting participation in large-scale international projects