

Science and Research in the 21st Century and its Success in Technology

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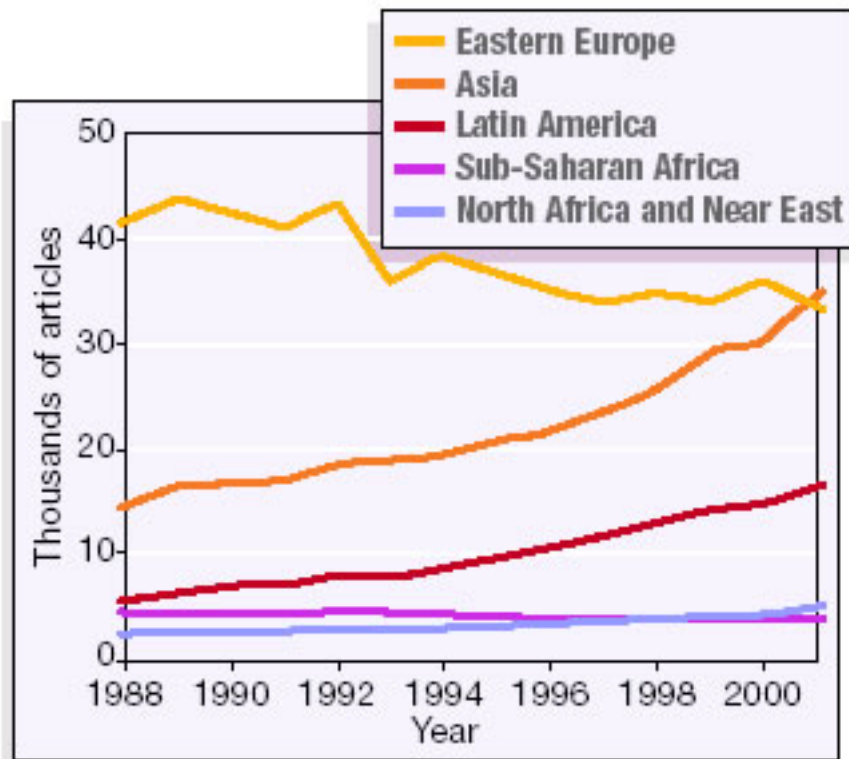


Europäische Wissenschaftstage in Steyr

Wien, 22.06.2006

1. New major players are appearing on the worldwide stage of research and technology.
2. More financial support alone is no guarantee for success in research politics.
3. Excellent career opportunities for young scientists will help to invert the brain drain.
4. Utilization of innovative research and knowledge transfer have multiple solutions.
5. New technologies yield the largest profits where the discoveries and innovations were made.

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News in brief: “Latin America records rapid rise in research publications.”
Nature **432**:8, 2004.

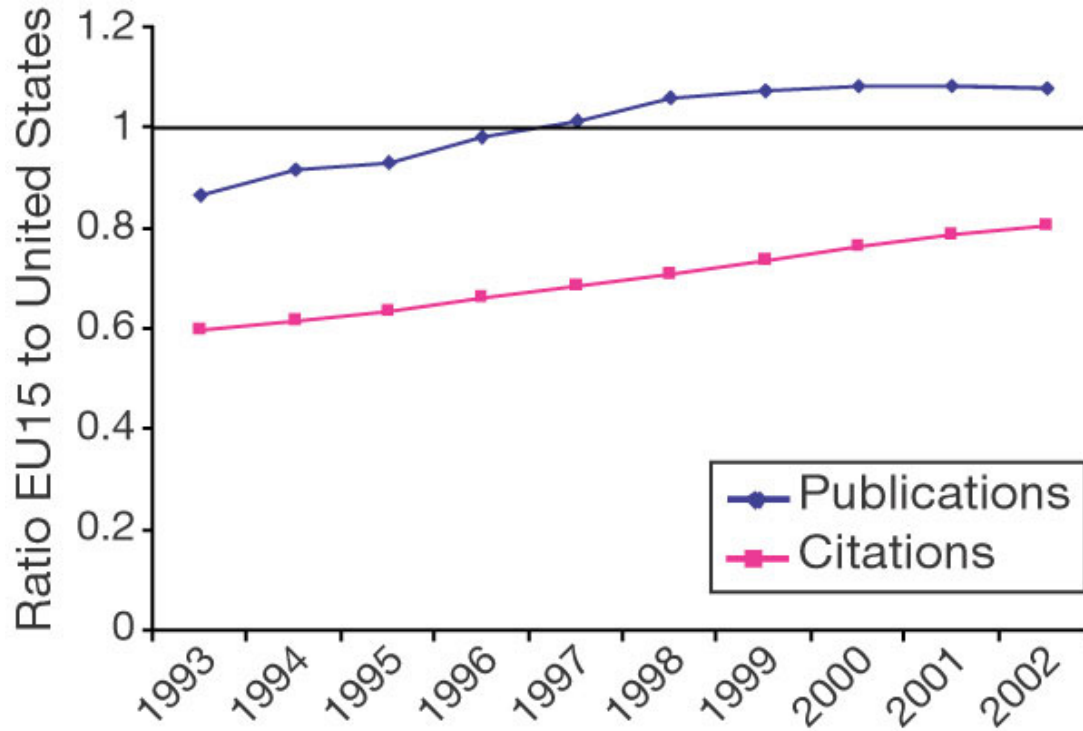
Alice in Wonderland:

... The Red Queen to Alice: „Now, here, you see, it takes all the running you can do to keep in the same place. ...“

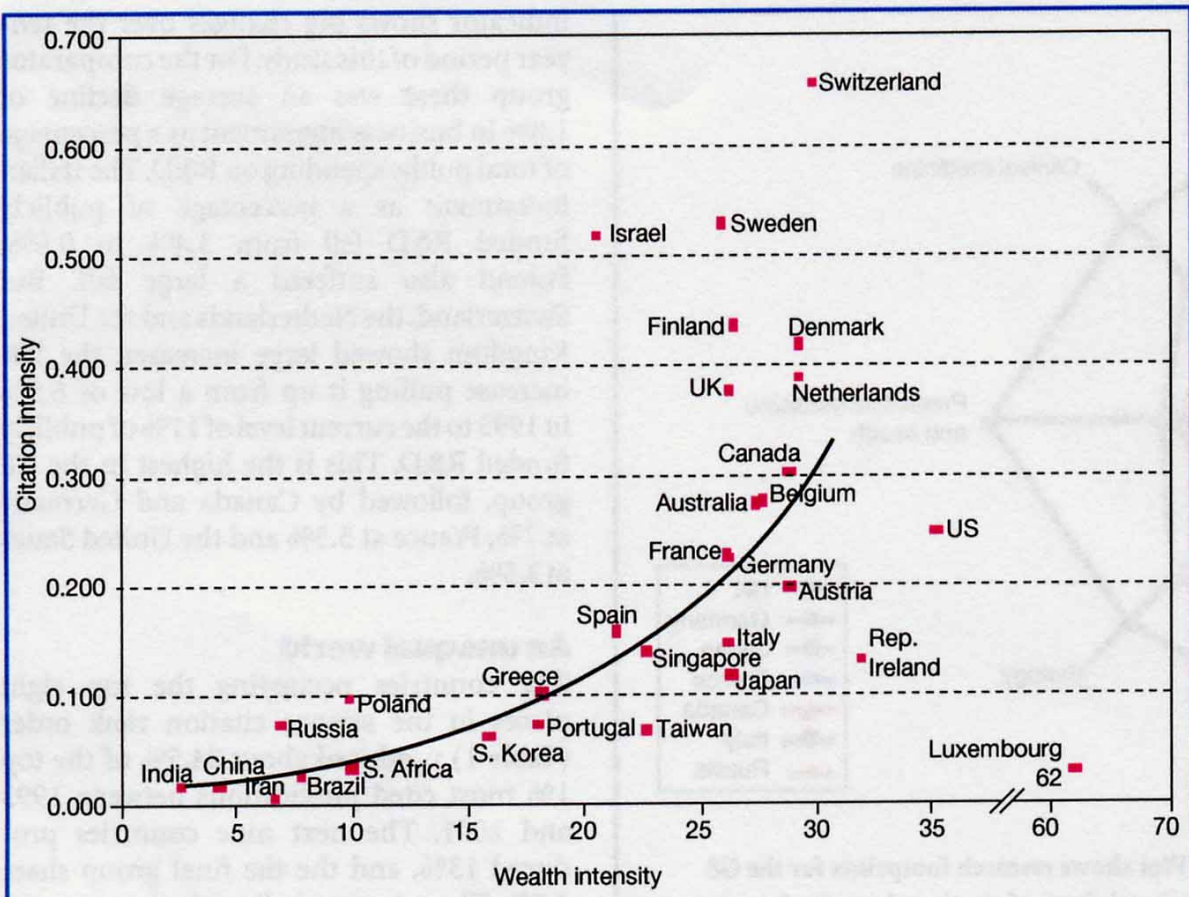
Van Valen, L. A New Evolutionary Law, *Evolutionary Theory* **1**:1-30, 1973.

Carrol, L. *Through the looking glass and what Alice found there*. Macmillan, London 1872.

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King, D.A. The scientific impact of nations. What different countries get for their research spending. *Nature* **430**:311-316, 2004.



GDP = gross domestic product
 wealth intensity = GDP/person
 citation intensity = #citations/GDP

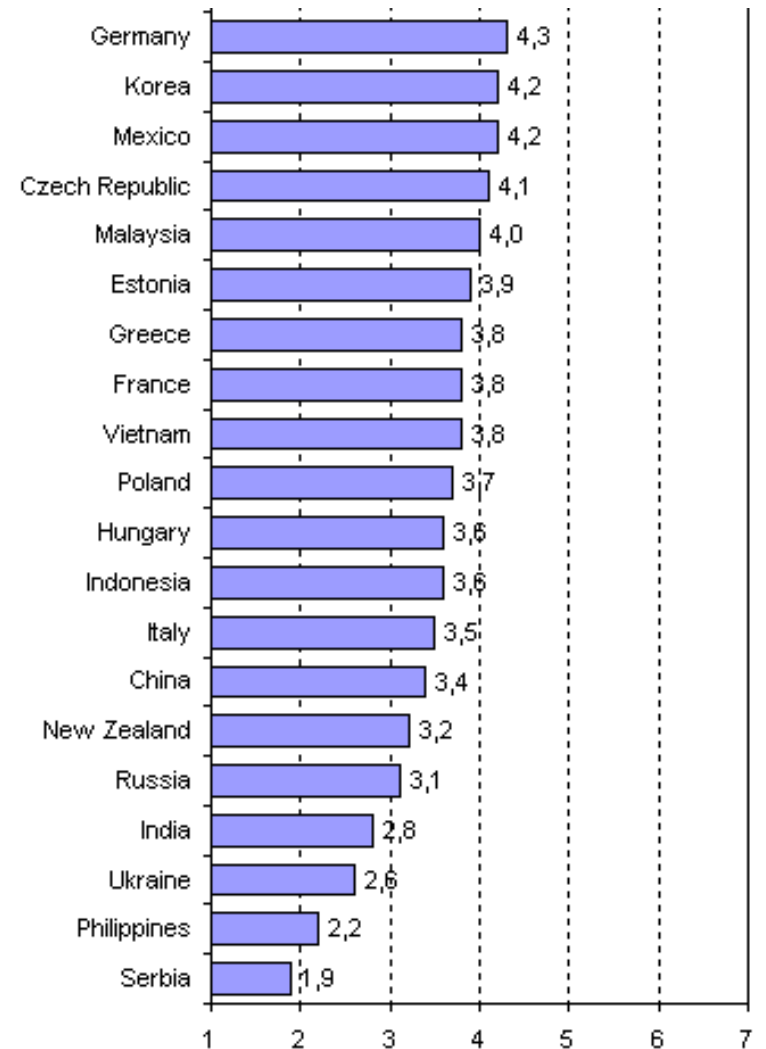
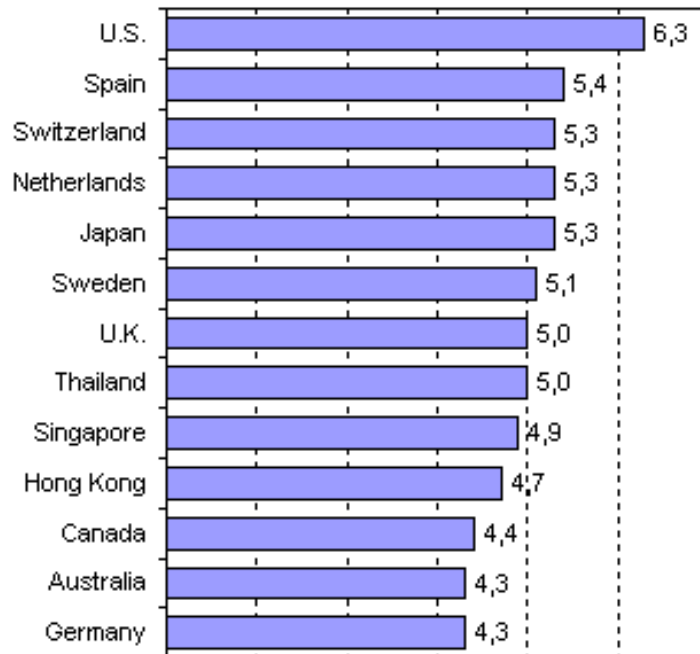
Figure 2 Comparing economic and scientific wealth. National science citation intensity, measured as the ratio of the citations to all papers to the national GDP, shown as a function of the national wealth intensity, or GDP per person, for the 31 nations in the comparator group. GDP and wealth intensity are given in thousands of US dollars at 1995 purchasing-power parity. Sources: Thomson ISI, OECD and the World Bank.

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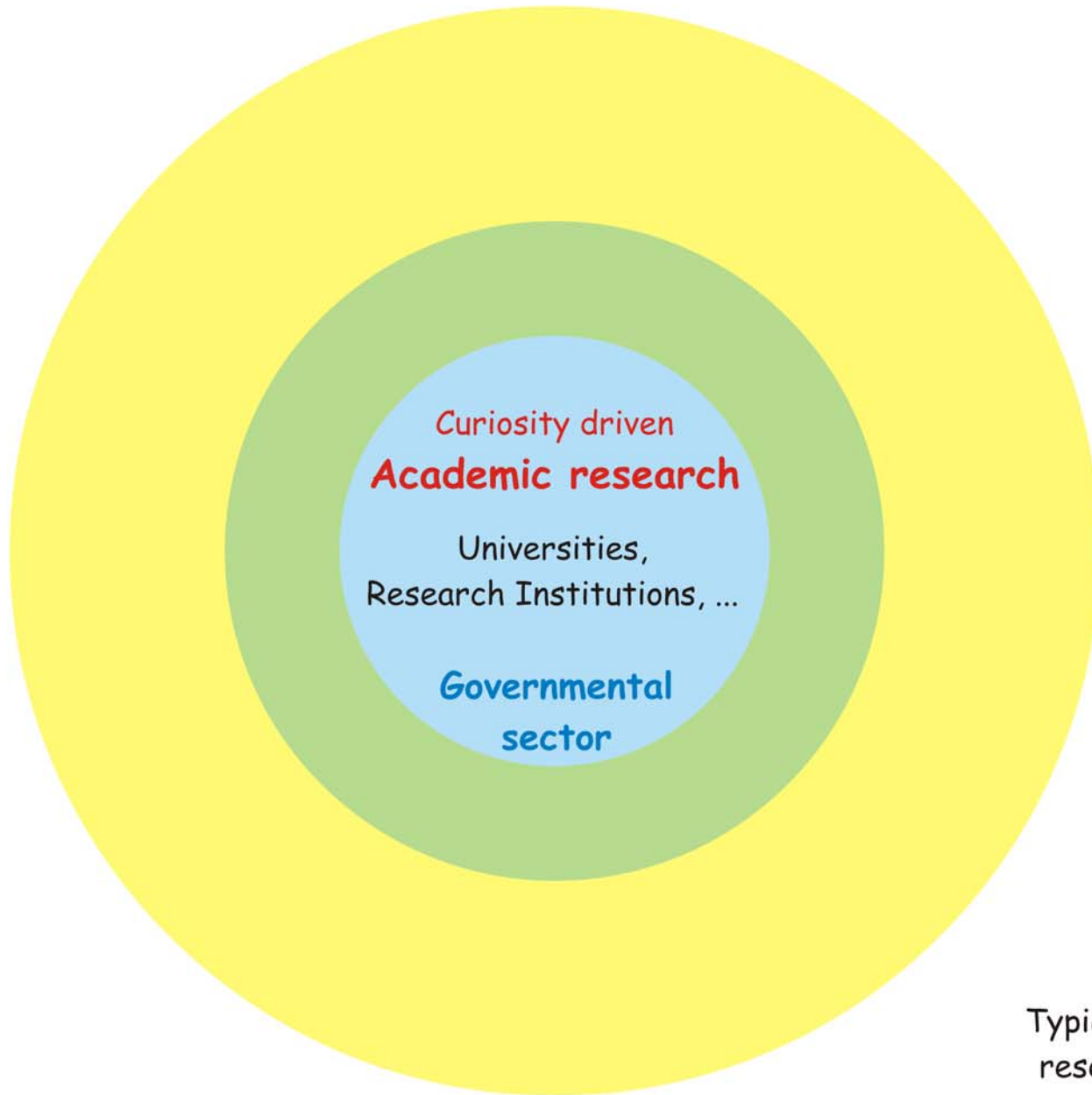
Brain drain

■ The country's talented people (1 = normally leave to pursue opportunities in other countries, 7 = almost always remain in the country)

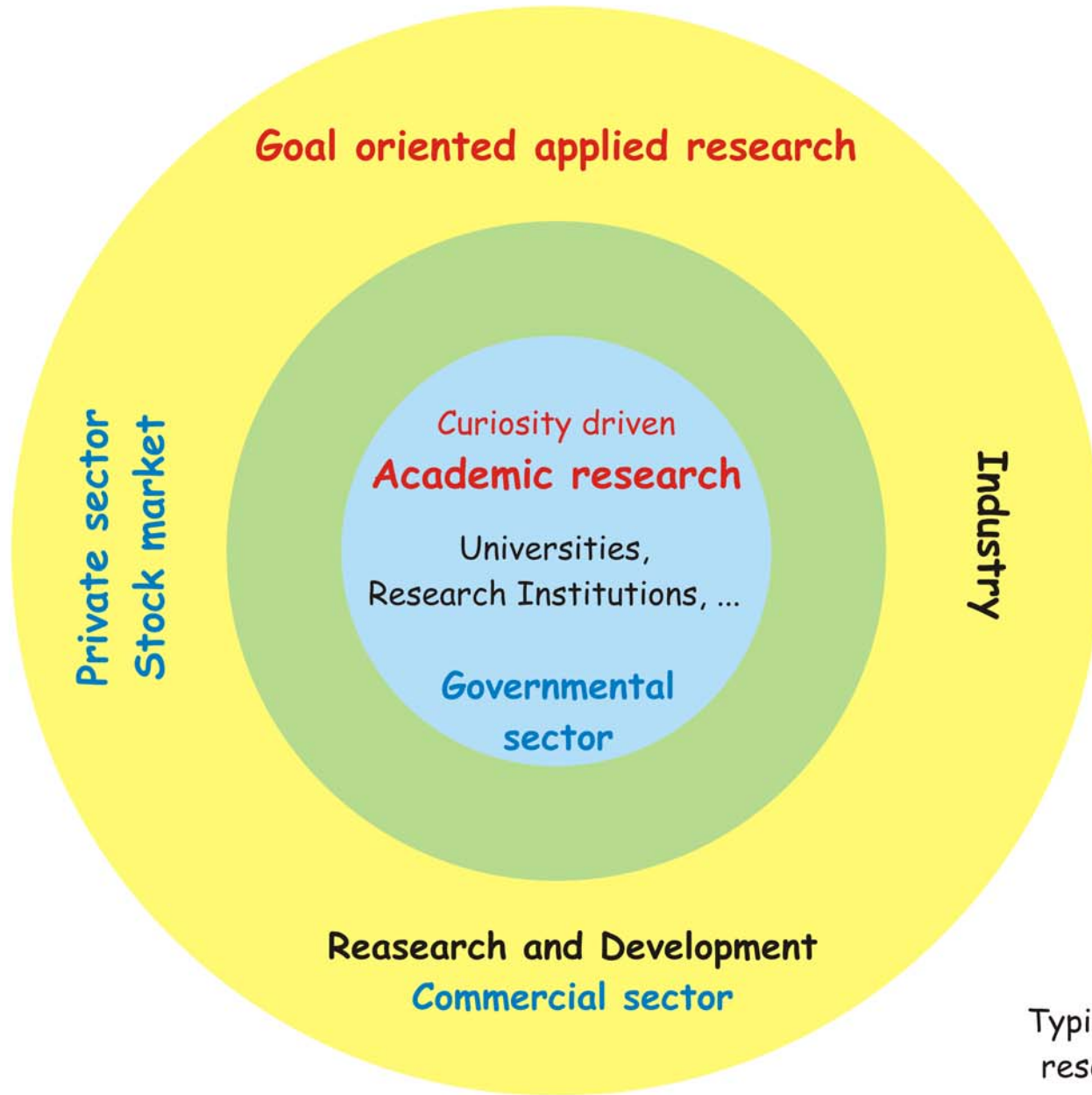


Comparison of 'brain drain' worldwide

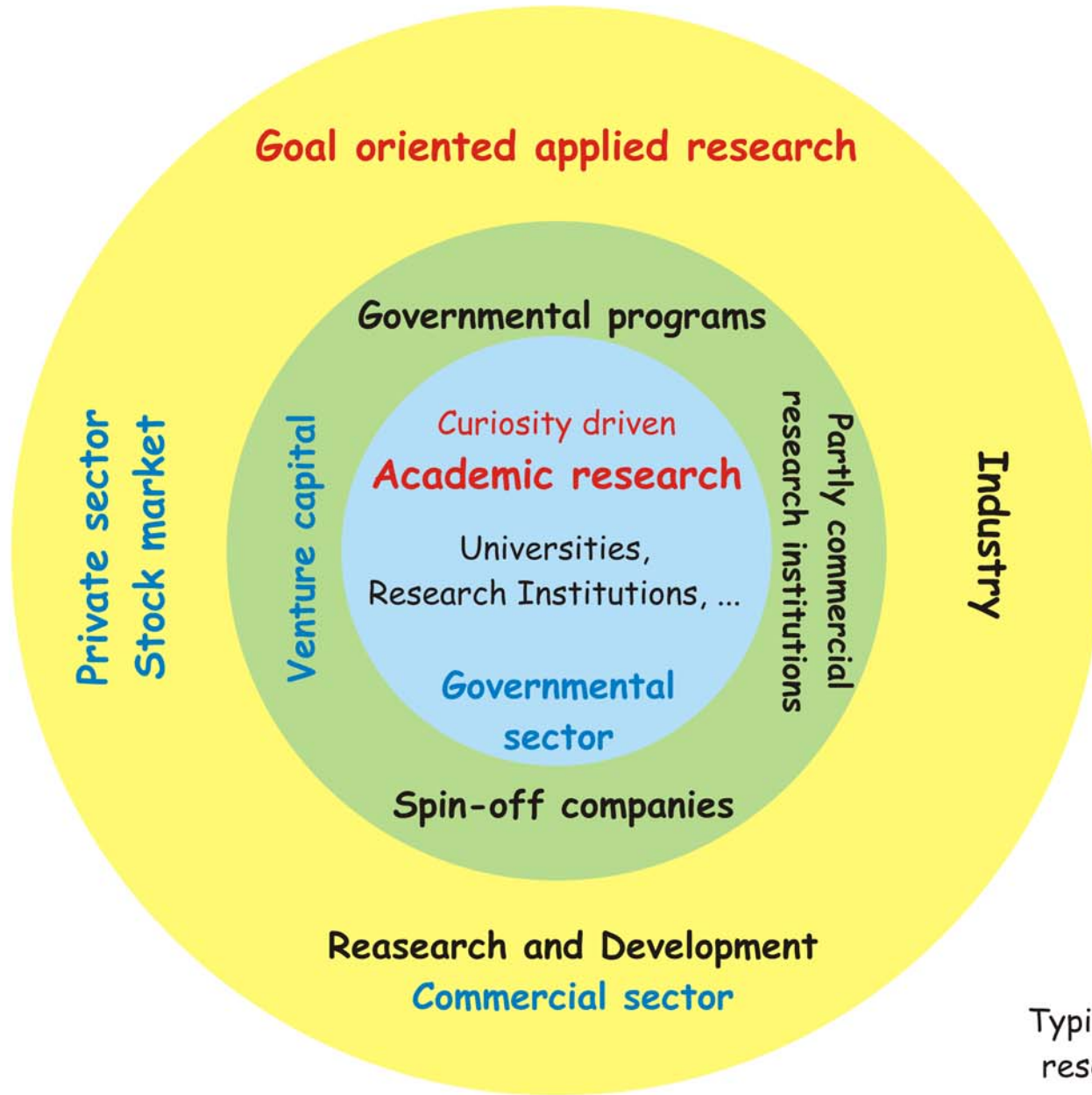
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Typical concept of governmental
research planning in the 1990s



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There is no recipe for success in planning discovery and innovation but there are rules for failure with high probability:

1. **Rigid planning of research:** Five year plans with pre-assigned application goals for basic research (DDR).
2. **No research plan at all:** 'Coordination-free science' commonly leads to sub-critical research entities, which cannot compete on a worldwide scale.
3. **Barriers between disciplines:** Modern innovation makes use of knowledge from all disciplines from humanities and social sciences to physics and mathematics. Universities are not yet preparing for research across disciplines.
4. **Contact-hostile grouping of researchers:** In curiosity driven research scientists need personal contacts almost every day.

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1885 - Separation of 'didym' into *neodym* and *praseodym*.

1885 - Gas burner mantle for incandescent lighting.

1890 - First industrial process using powder metallurgy.

1898 - Electric bulb with osmium filament.

1903 - Pyrophoric alloys (cerium-iron) used as flints.

1907 - Foundation of the 'Treibacher Chemische Werke GmbH' in Treibach-Althofen for the production of ferrocerium-lighter flints under the trade name 'Original Auermetall'.

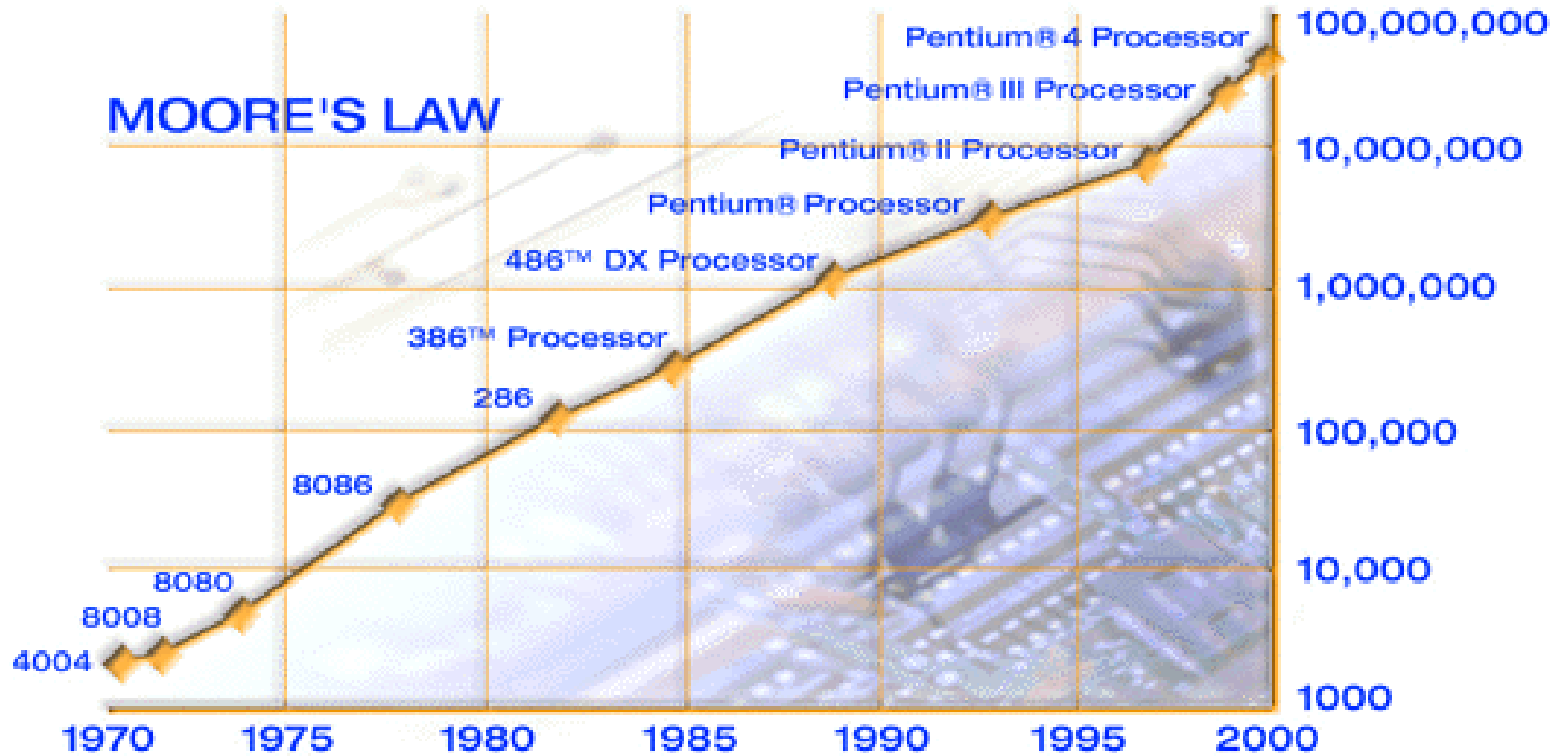


2006 - About one hundred years later the 'Treibacher Chemische Werke' are still flourishing and represent the major industry and employer in the whole region.



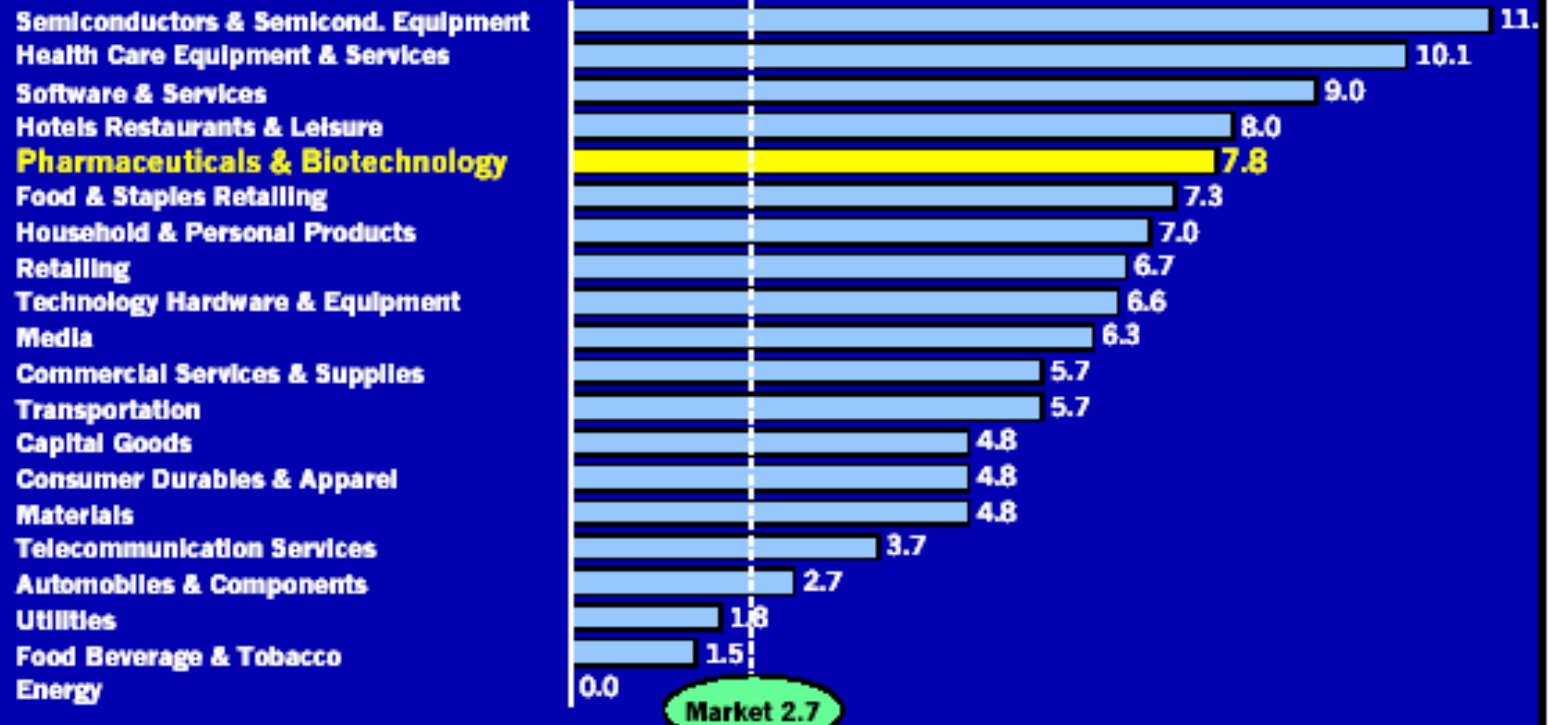
Source: Auer von Welsbach-Museum, Treibach-Althofen, Kaernten, Austria.

transistors



Pharmaceuticals Continues to Expand as One of the Fastest Growing Industries

Global sector and market growth 2004-2006E (CAGR)
in %

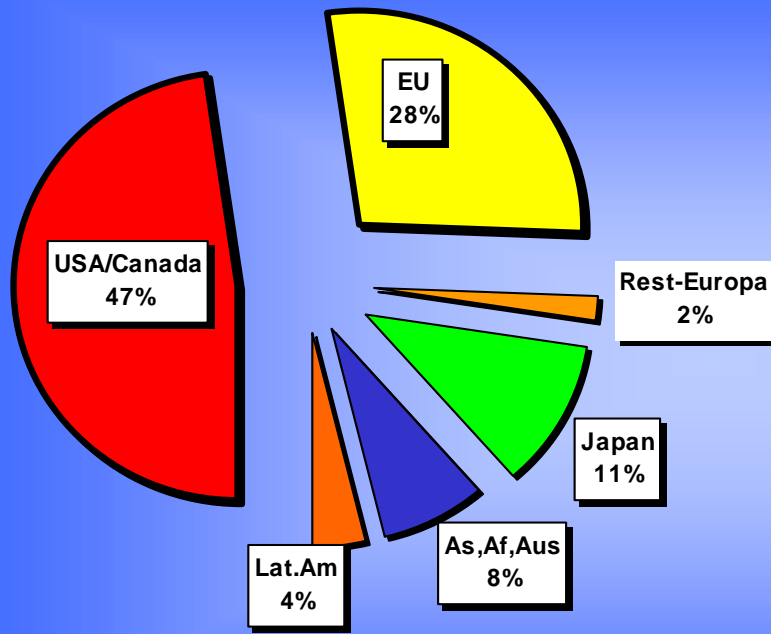


Source: IBES, MSCI, Morgan Stanley Research

10 January 14, 2005 – Flims, Bank Bellevue Conference T. Ebeling

 **NOVARTIS**

Pharma sales



2005 Total: 565 Bio \$

	2002	2003	2004
	[%]		
N-Am	50,9	49	47,8
EU		25	27,8
Eur.	25,4	3	1,8
Japan	11,7	11	11,1
As..	7,9	8	7,7
L-Am	4,1	4,0	3,8
Total			
Bio \$	423,5	466,3	518,0

DNA sequencing



Genome research



Proteom research



Functional genomics



Molecular medicine

