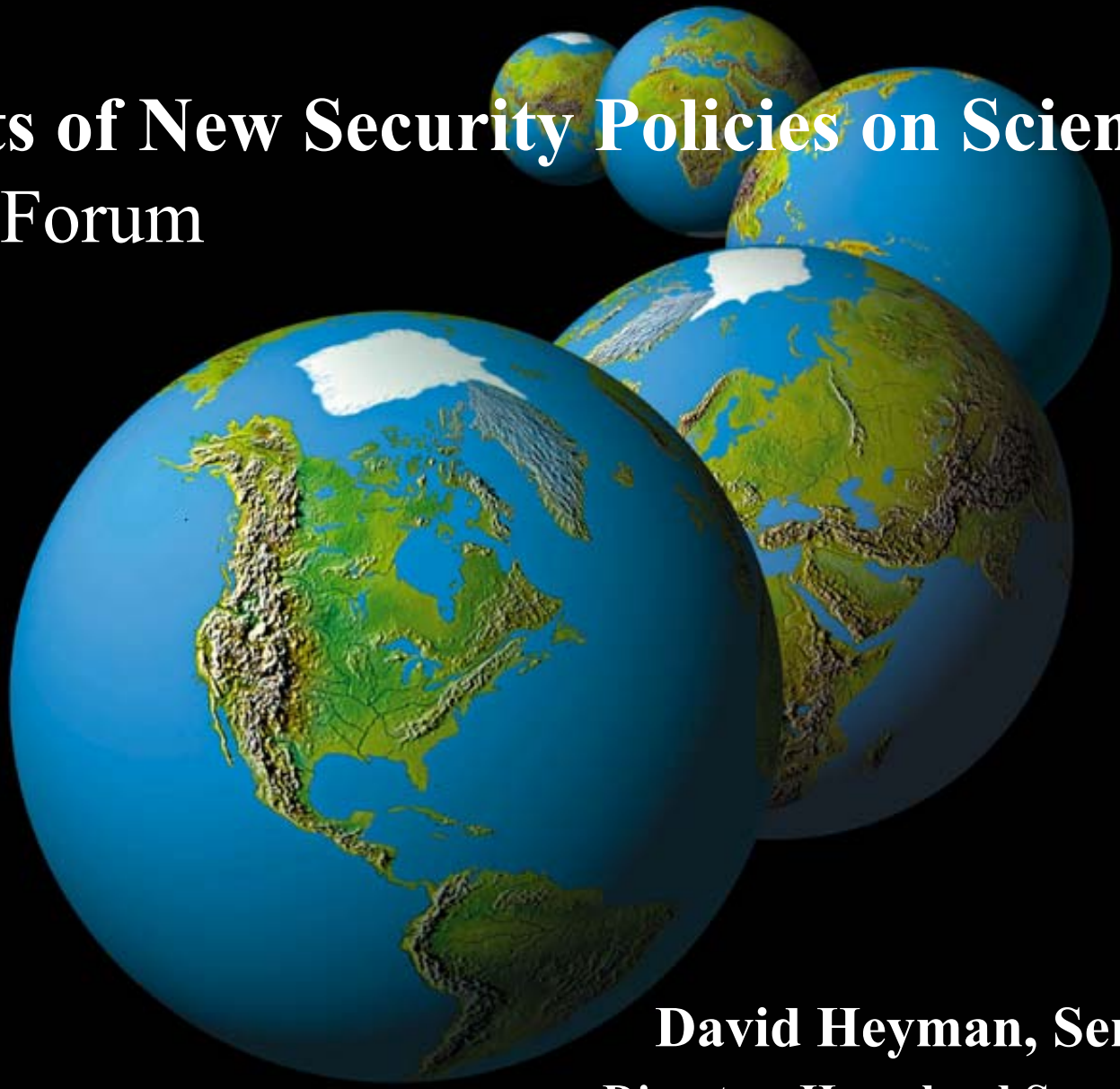
Impacts of New Security Policies on Science

AAAS Forum



David Heyman, Senior Fellow

Director, Homeland Security Program

Center for Strategic and International Studies (CSIS)

April 2004

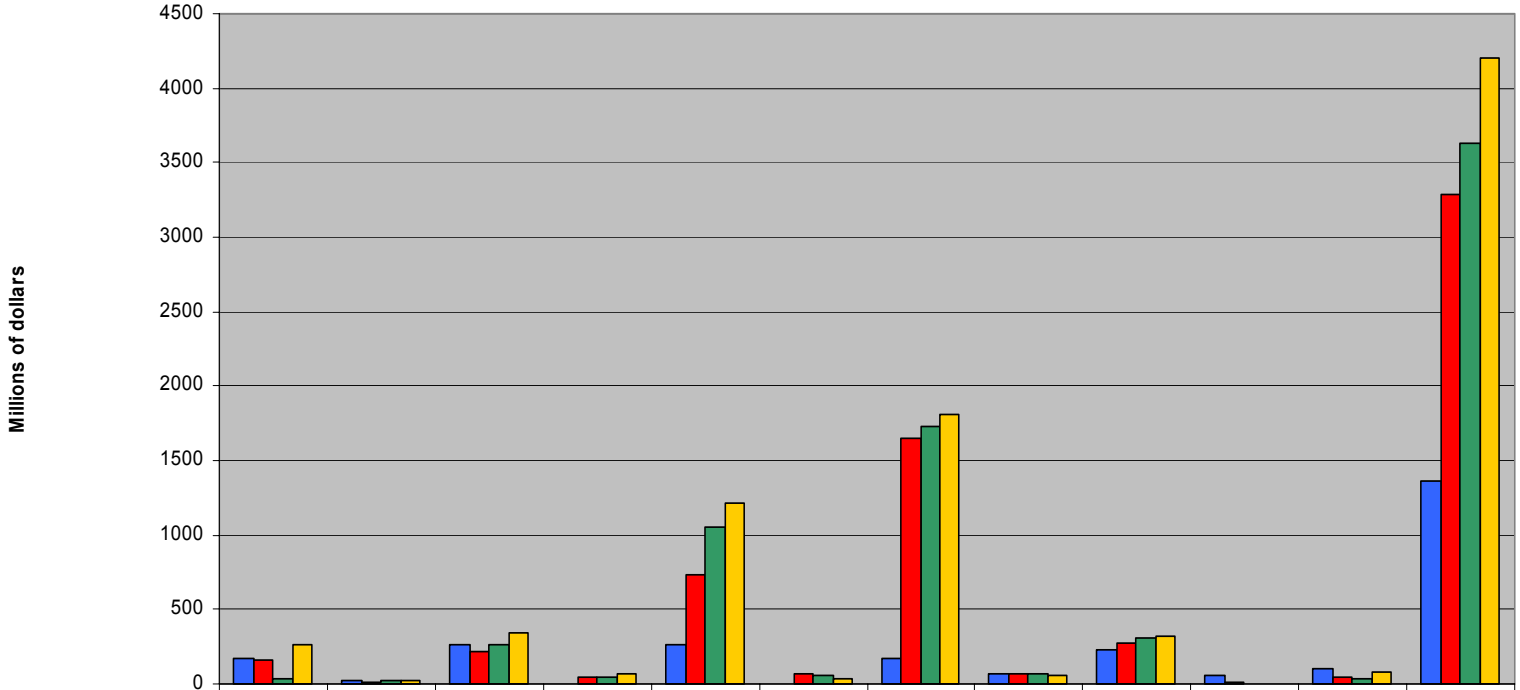
Al Qaeda Fatwas Against America

- **Annihilation of the US:** "*The people of Islam should join forces and support each other to get rid of the main 'Kufr who is controlling the countries of the Islamic world.*" -Bin Laden
- **Covert Action:** "*Due to the imbalance of power between our armed forces and the enemy of forces, a suitable means of fighting must be adopted i.e. using fast moving light forces that work under complete secrecy.*" -Bin Laden
- **Mass Casualties:** "*The ruling to kill the Americans and their allies -- civilians and military--is an individual duty for every Muslim who can do it in, in any country in which it is possible to do it…*" -Bin Laden
- **US Economy:** "*…(destroy) the enemies of Allah….by means of destroying exploding, the structure of their civilized pillars such as the touristic infrastructure which they are proud of and their high world buildings.*" -Sheik Omar Abdel Rahman,

CSIS

Post 9-11 Trends: Frontiers of War

Post 9-11 Trends: Science Resources



	USDA	DOC	DOD	DOE	DHS	EPA	HHS	NASA	NSF	DOT	Other	Total
FY 2002 Actual	175	19	259	0	266	4	177	73	229	55	104	1361
FY 2003 Actual	155	16	212	48	737	70	1653	73	271	7	47	3289
FY 2004 Estimate	39	24	267	47	1053	60	1725	65	308	3	34	3625
FY2005 Request	262	24	340	68	1216	31	1804	55	317	2	80	4199

Source: AAAS Report XXIX, Research and Development FY2005, w/ OMB data

Global Trends in Science: Resources

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The US share of total world R&D is decreasing…

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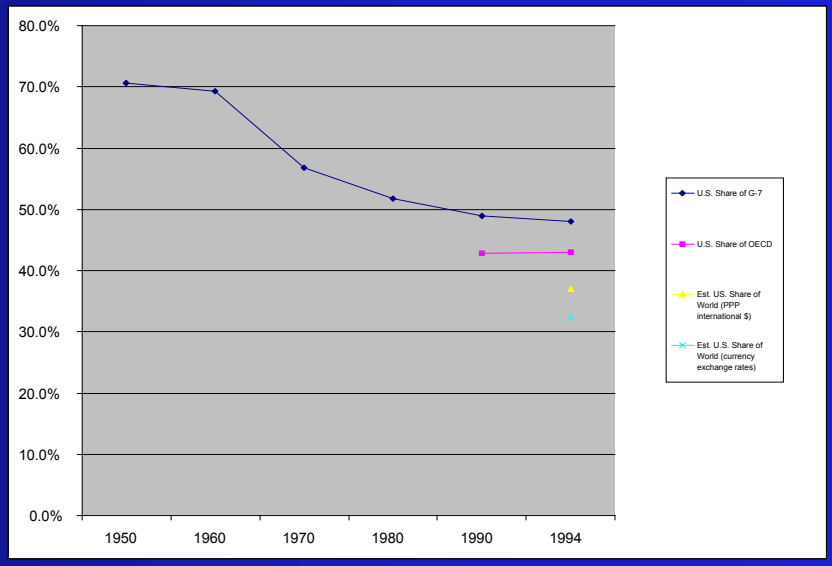
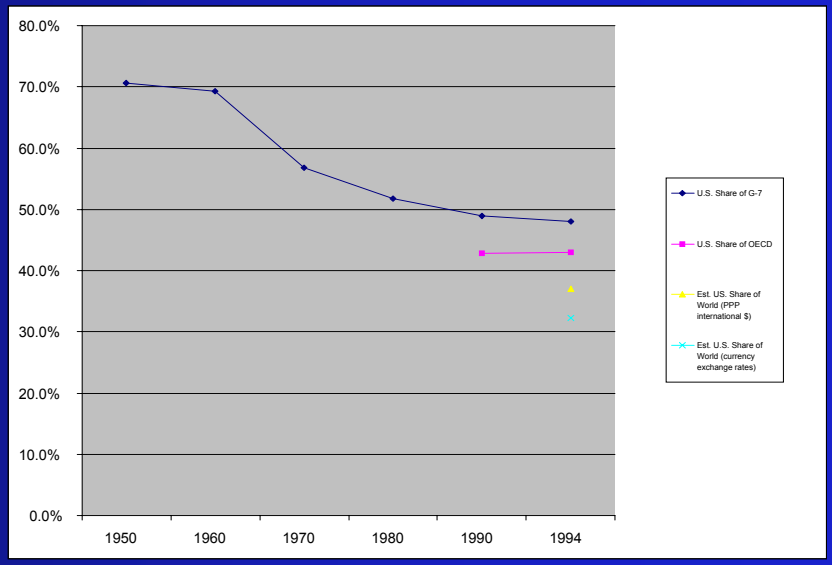
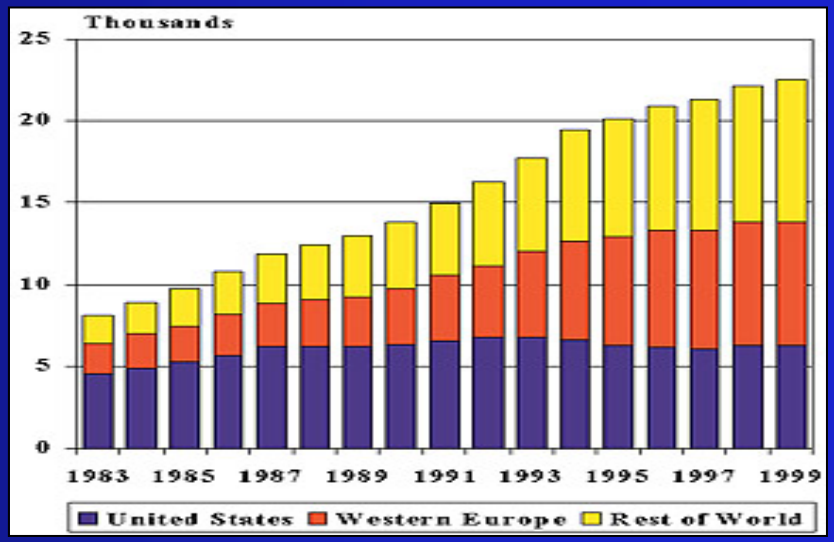


Global Trends in Science: Resources

The US share of total world R&D is decreasing…

- more research capabilities are available outside the US.
- an increasing percentage of peer-reviewed articles submitted to APS from the world than from the US.





Global Trends in Science: Interactions

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EXAMPLES:

➔ **space exploration, high energy physics, human genome program…**

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EXAMPLES:

- ➔ **space exploration, high energy physics, human genome program…**
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- ➔ **weapons disposal, NATO integration, nuclear issues, technical standards…**

Global Trends in Science: Conduct

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As R&D capabilities expand globally…

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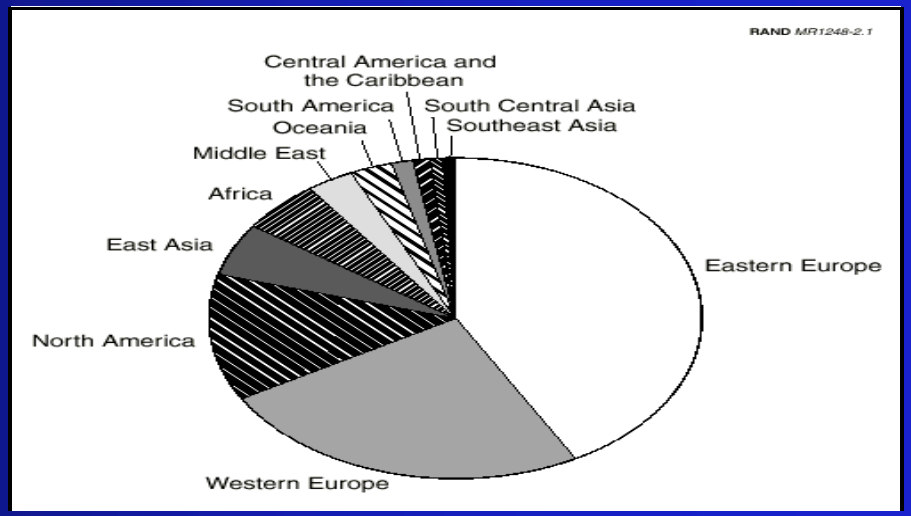

Global Trends in Science: Conduct

As R&D capabilities expand globally…

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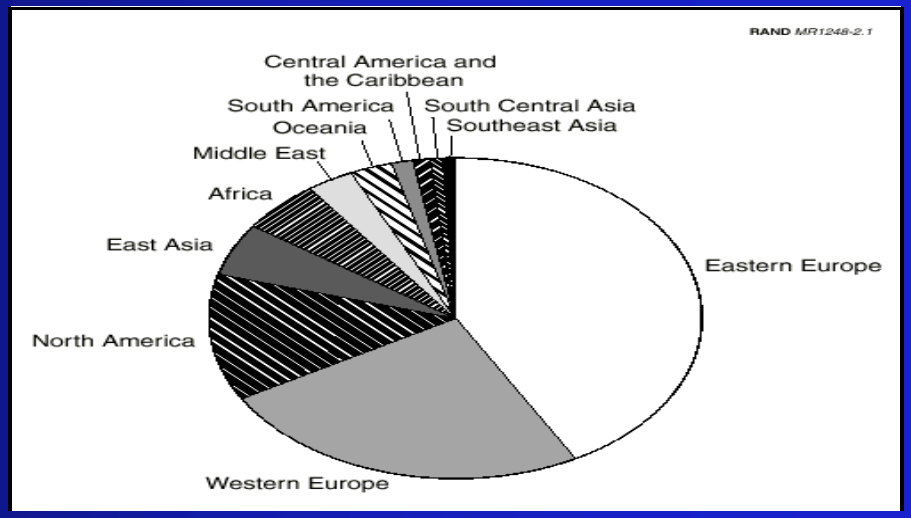
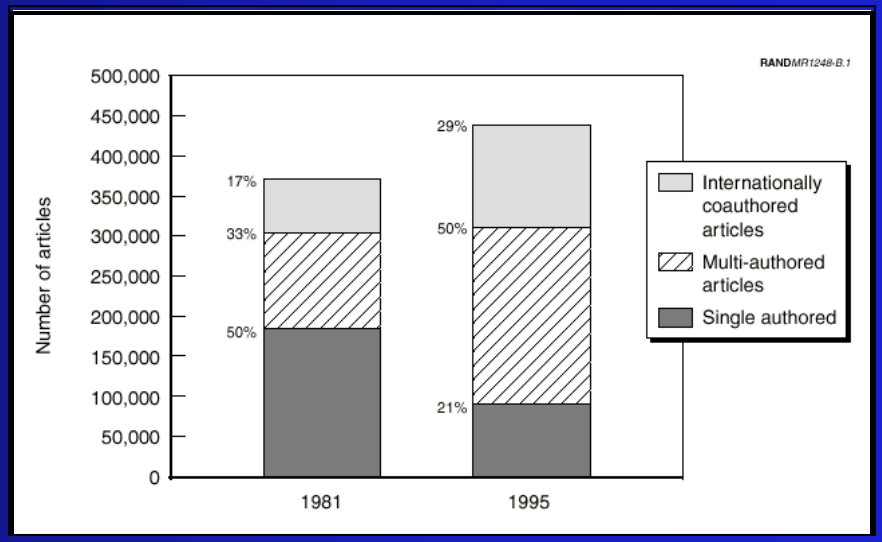
- **more scientists are coauthoring papers and partnering with their international colleagues.**





Global Trends in Science: Workforce

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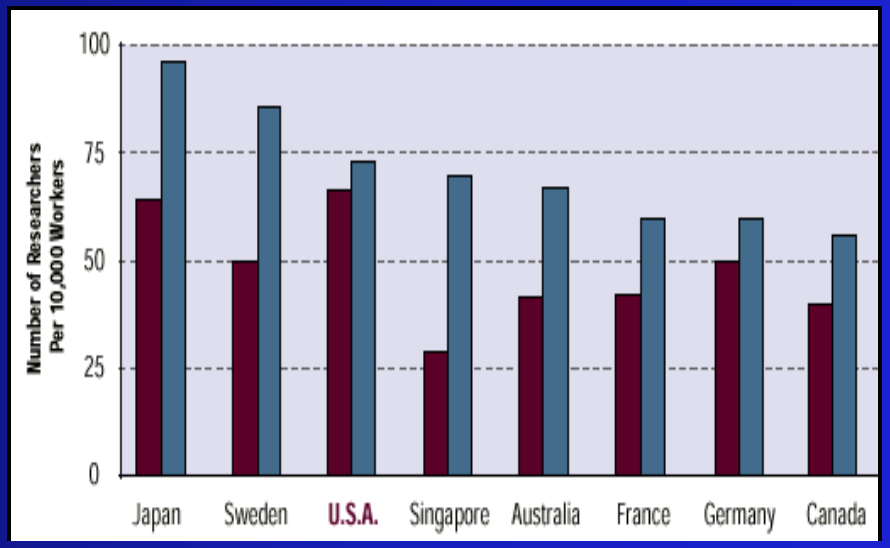
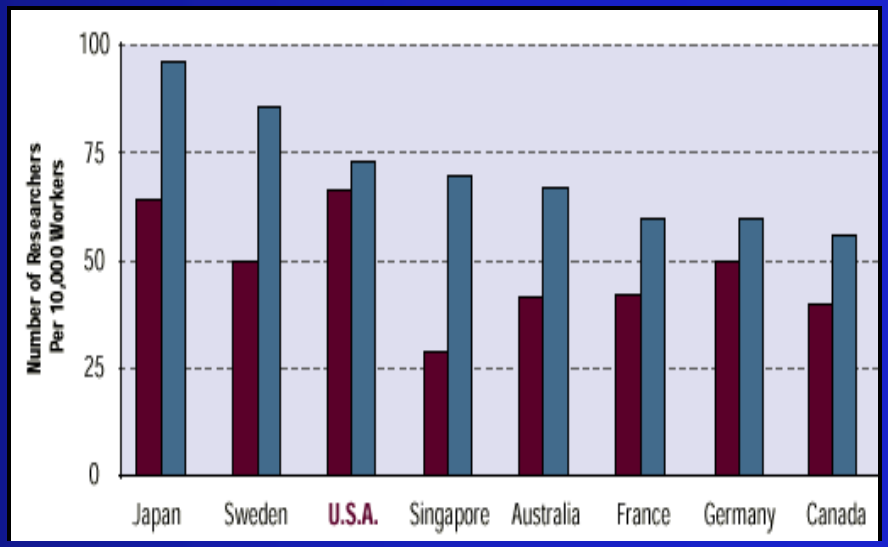
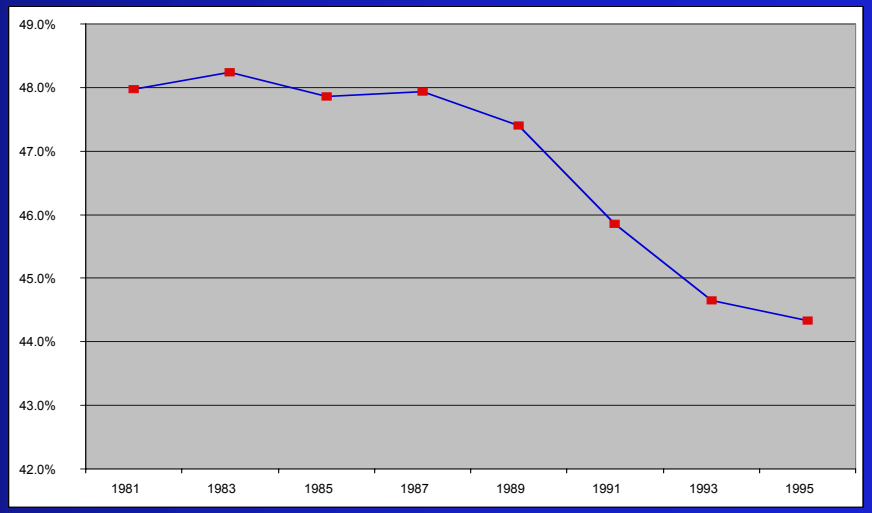


Global Trends in Science: Workforce

As countries expand their science and technology capabilities…

- researchers are becoming a growing portion of the global workforce.
- US scientists & engineers engaged in R&D as a percentage of G-7 total is decreasing.





Global Trends in Science: Workforce
US Science & Engineering Pipeline

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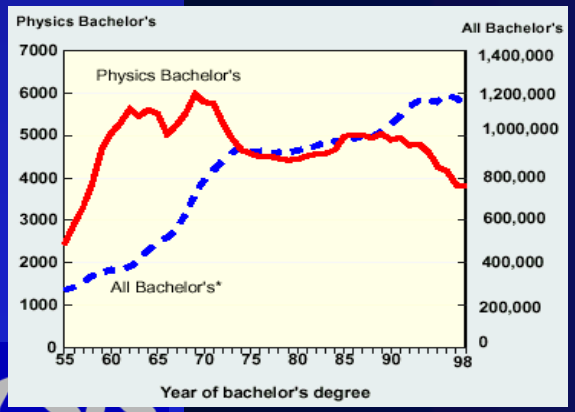
Undergraduates



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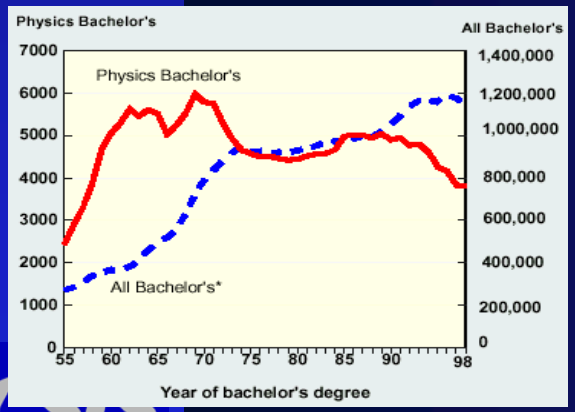
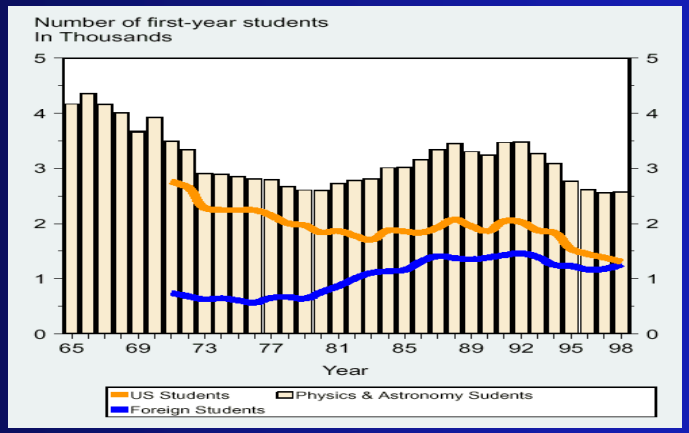


Graduate Students



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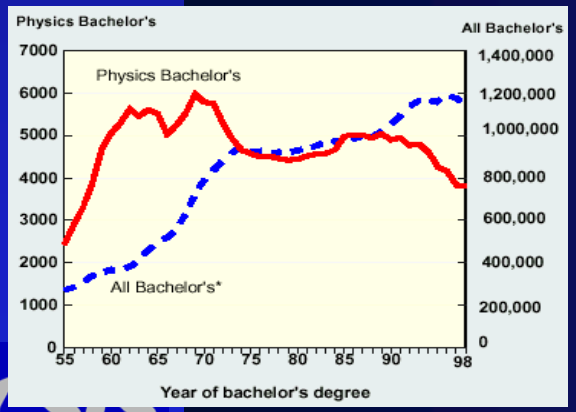
- US physics and astronomy graduate students prefer academia or industry to government labs.

Undergraduates



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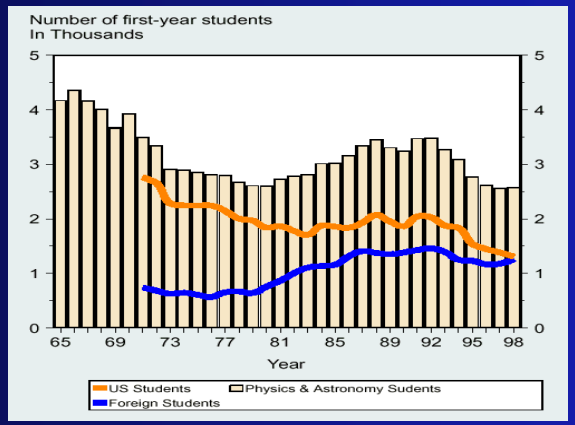
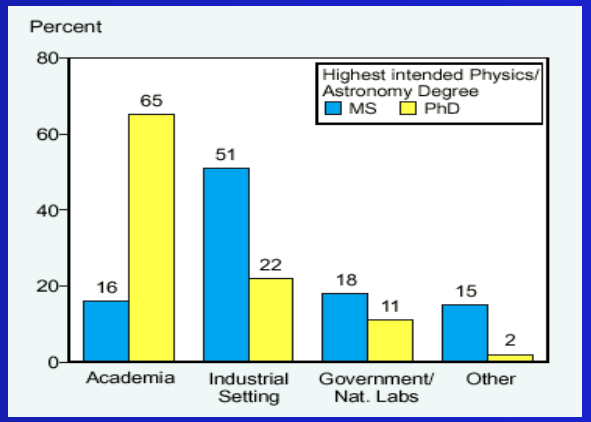


Career Preferences (FY97)



Global Trends in Science: Summary

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- **Resources** ↑ **Increasingly Distributed Internationally**

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- **Nature**
  - ↑ Increased Emphasis on Simulation and Modeling

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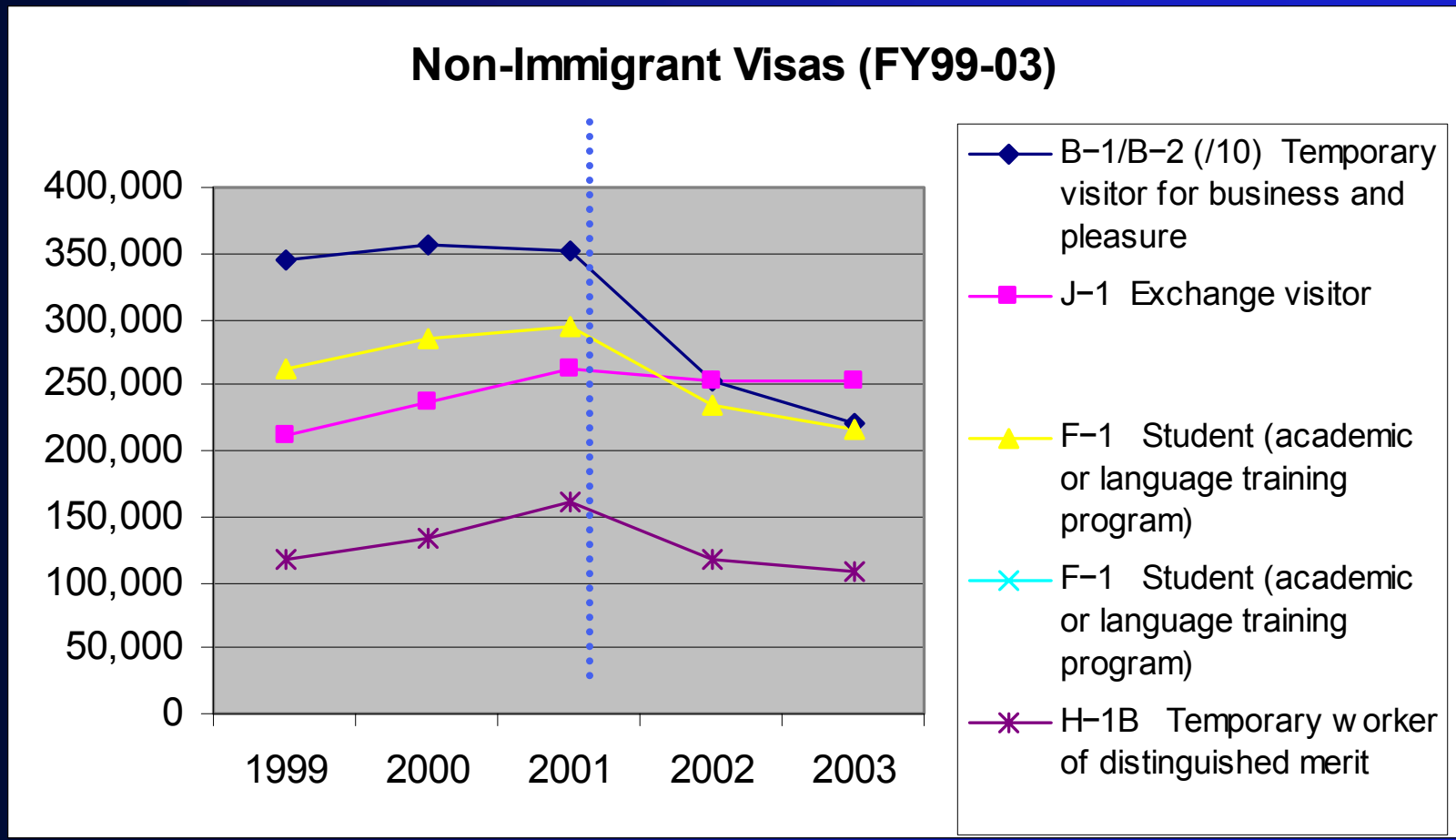
Trends in Flows of People to the U.S.



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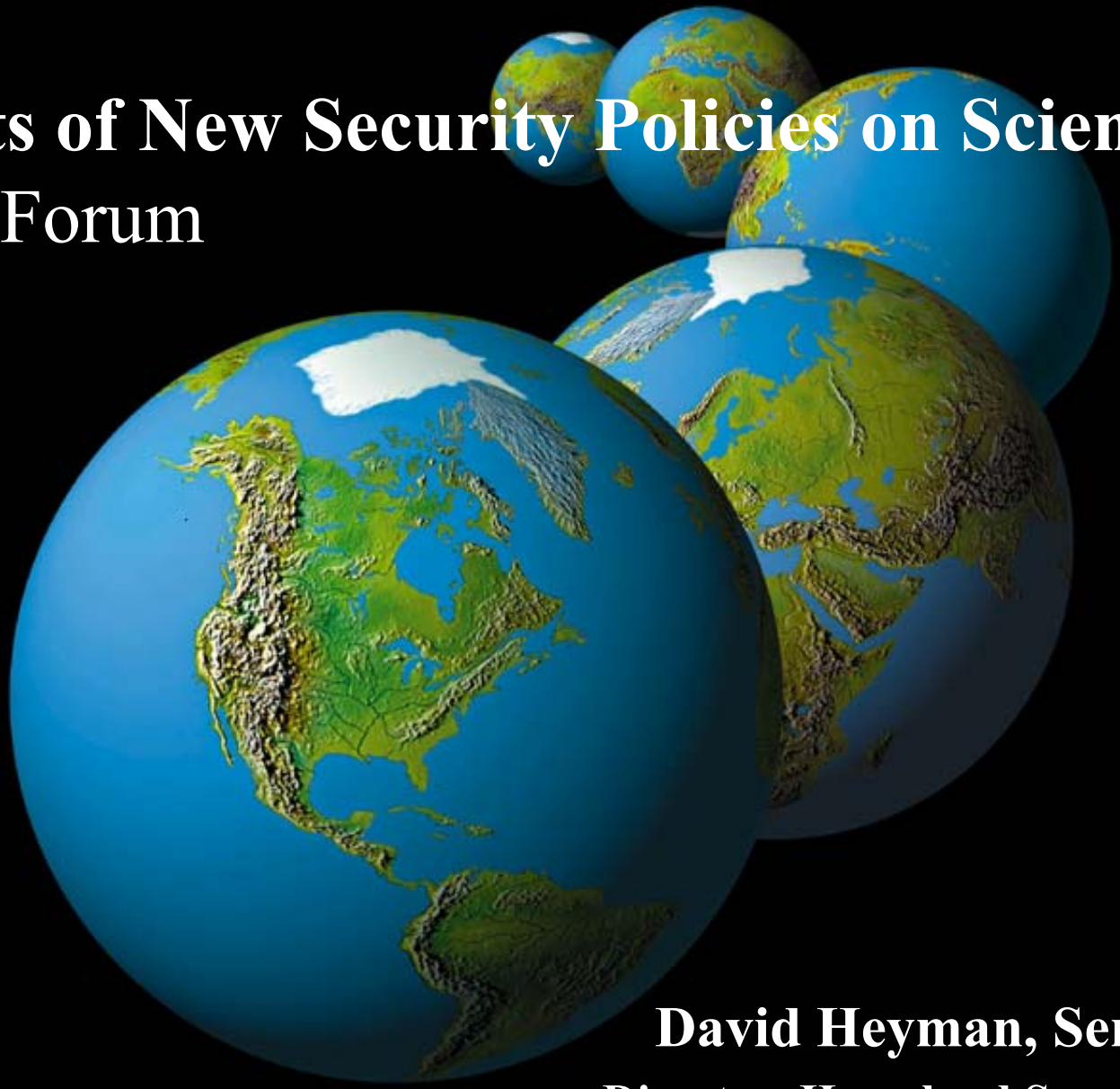

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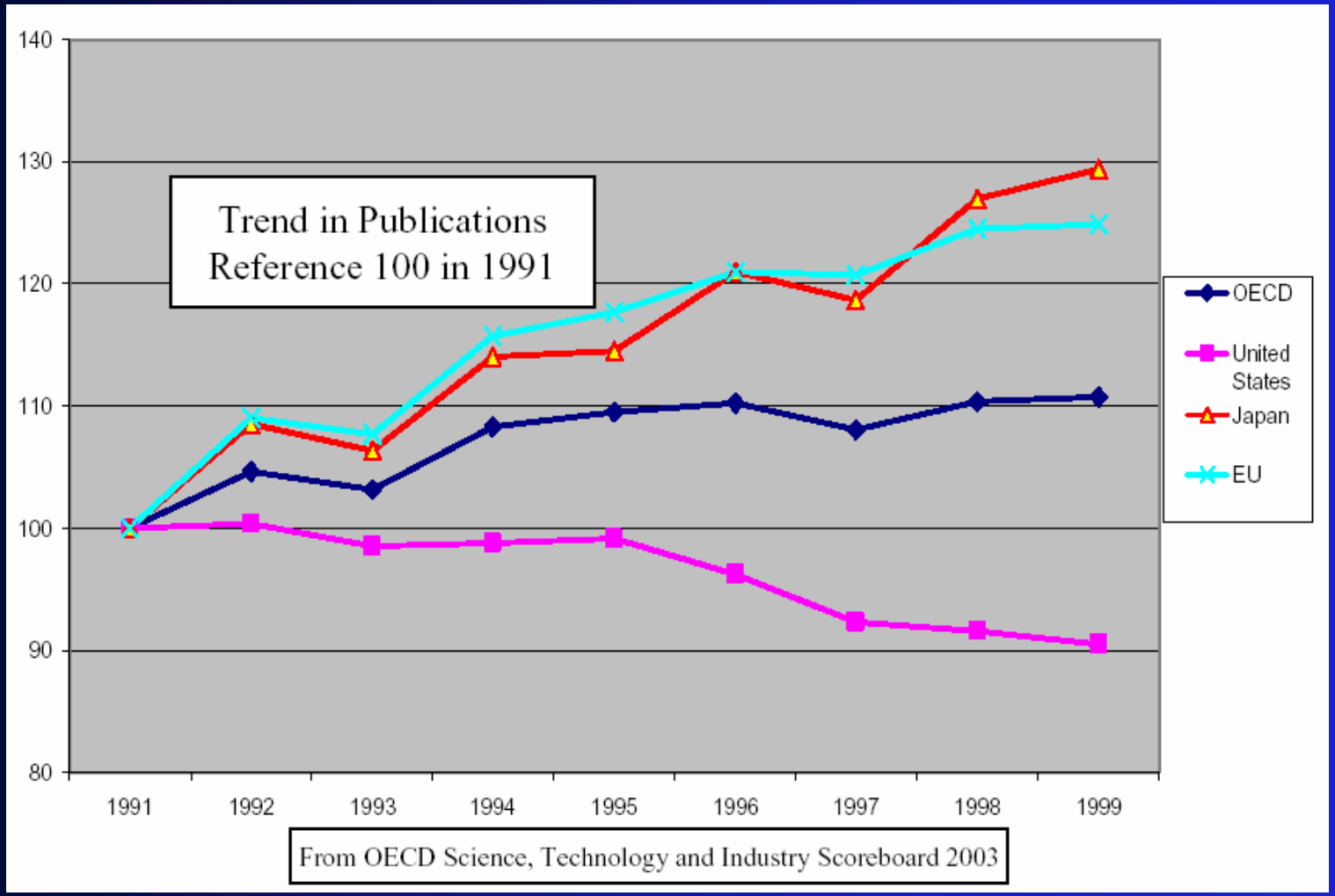
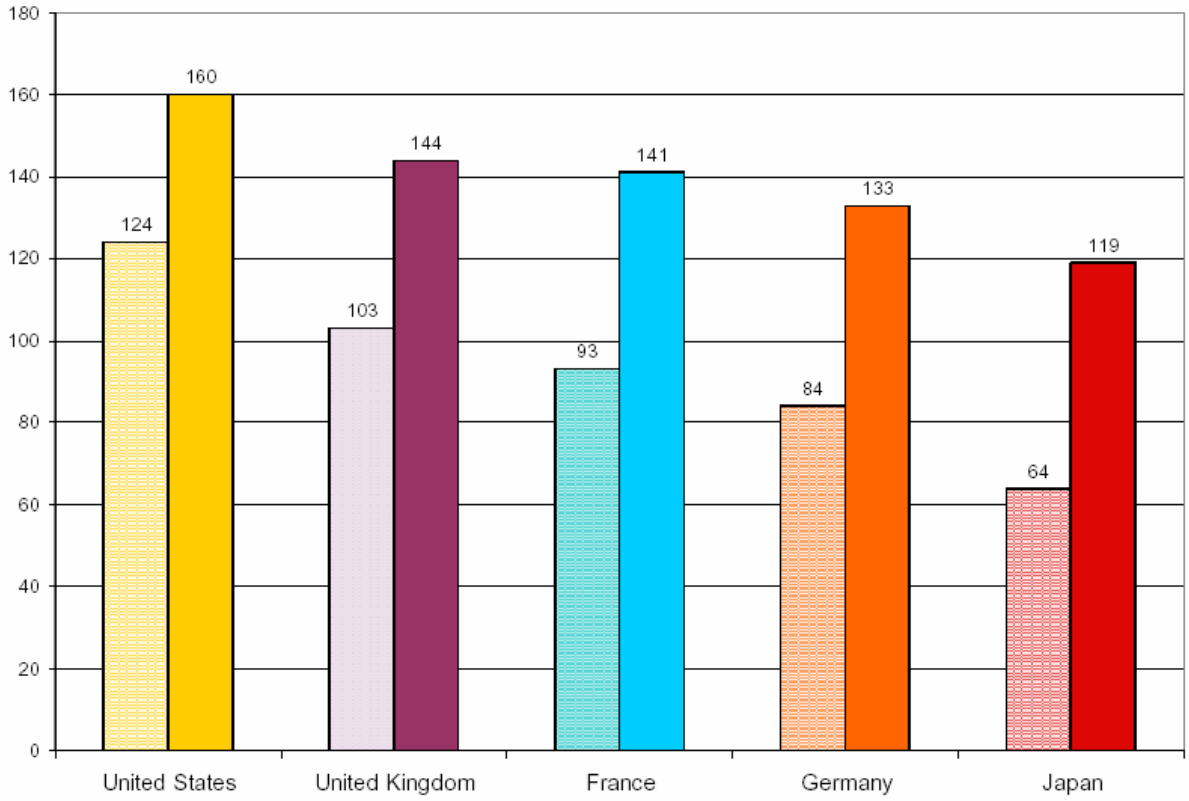
Trends in Publications



Collaborating Countries



Number of Collaborating Countries 1986 and 1999
From NSF Science & Engineering indicators 2002

Fifty Years of United States Investments in R&D

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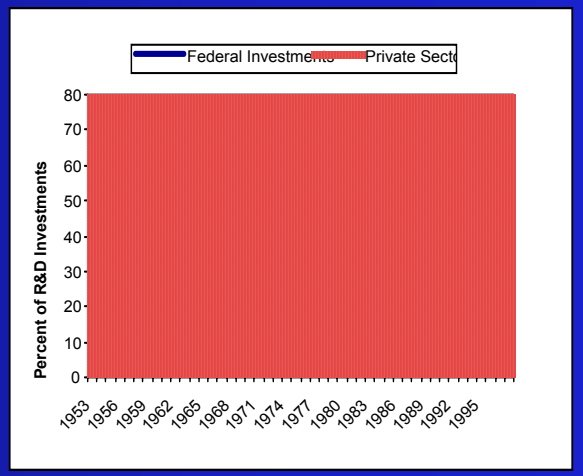

Fifty Years of United States Investments in R&D

US investments in R&D have shifted…

- **from the public sector to the private sector.**
- **and from defense to non-defense R&D with an increased emphasis on health sciences and a decrease in the physical sciences.**