

Technology Surprise—Why should we worry?

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Tech Surprise: Why worry?



Surprise is the most essential factor of victory ...

nothing makes a leader greater than
the capacity to guess the designs of the enemy ...

to recognize, to grasp the situation & take advantage of it as it arises ...

new and sudden things catch armies by surprise.

*Niccolo Machiavelli,
The Art of War, 1520*

Our military forces—and our adversaries—are increasingly enabled by technology.



Perspective/Background



- Committee on DIA Technology Forecasts and Reviews
 - ◆ Ad hoc committee (1-year) of the National Research Council
 - ◆ Sponsored by DIA's Technology Warning Division
 - ◆ "Avoiding Surprise in an Era of Global Technology Advances"

- Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER)
 - ◆ Standing Committee of the National Research Council
 - ◆ Sponsored by Defense Intelligence Agency

Will NOT try to predict what technologies may be disruptive!



"Avoiding Surprise . . ."



- Finding 1: There is a multitude of evolving technologies for which advances are being driven by the nongovernmental, global, scientific and technical communities.
 - ◆ **New/different players . . . new/different motivations**
- Finding 2: New intelligence indicators are likely to be needed to provide technology warning for the diverse spectrum of evolving technologies that are being driven by commercial forces in the global marketplace.
 - ◆ **New potential sources and new observables**
- Finding 3: The landscape of potentially important evolving technologies is both vast and diverse.
 - ◆ **Emerging technologies . . . innovative integrations**

Potential for surprise is growing—that's why we should be worried!



Changing Nature of Defense Technology (Carter et al. 2000)



Cold War



Future

Defense Technology

Defense Technology

Originates in defense technology base



Originates in commercial technology base

that is embedded in defense companies



that is embedded in commercially driven companies

residing in the US



that are global

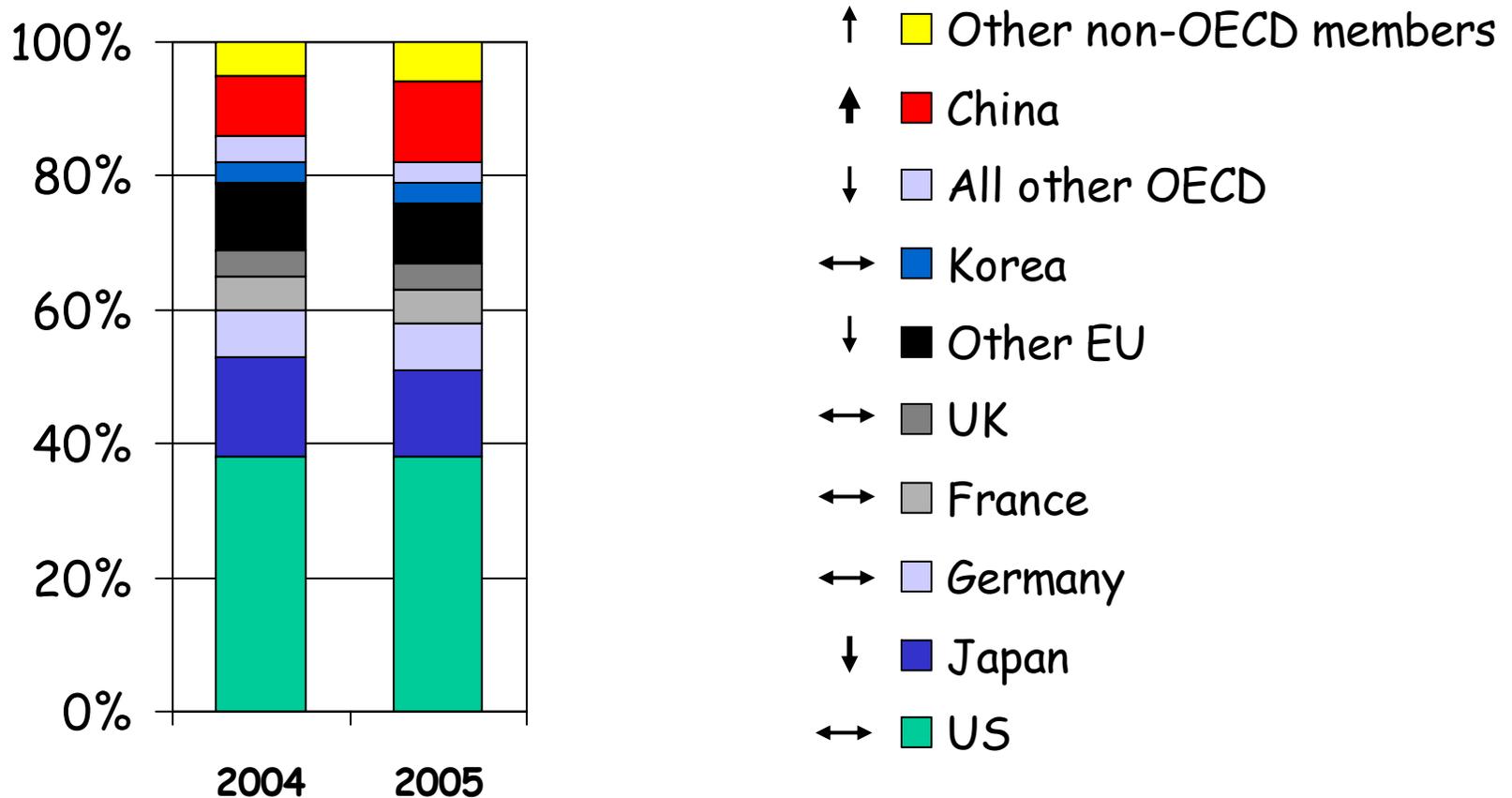
for which defense is main driver.



for which defense is niche player.

Question: Is the "Future" here today?

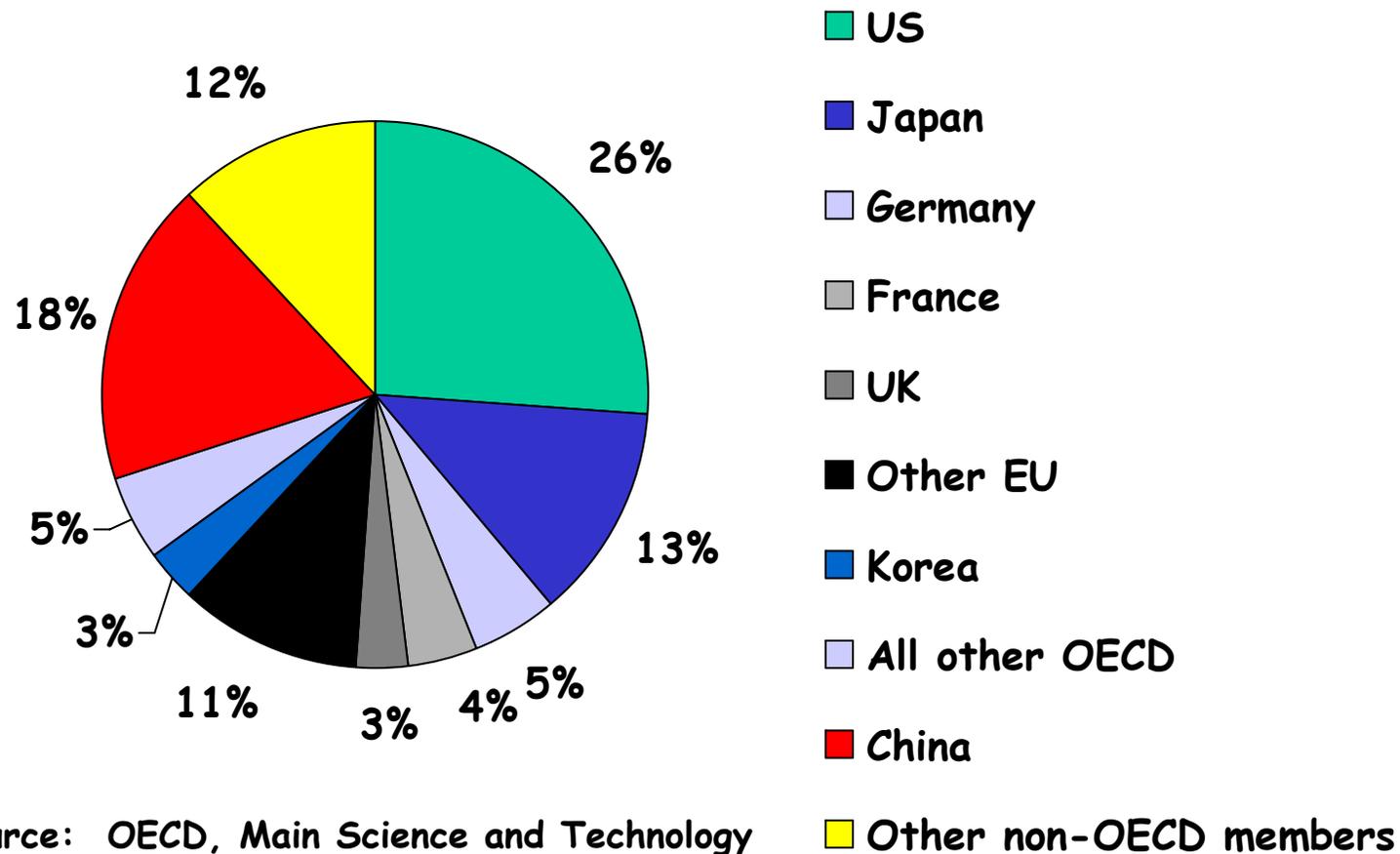
Shares of Total World R&D



Source: OECD, Main Science and Technology Indicators. 2004 (2003 data); 2005 (2004 data). AAAS Website. Total World R&D increased from \$764B to \$836B during period.

US still dominates but other nations' shares have changed dramatically.

Shares of World S&E Researchers, 2003

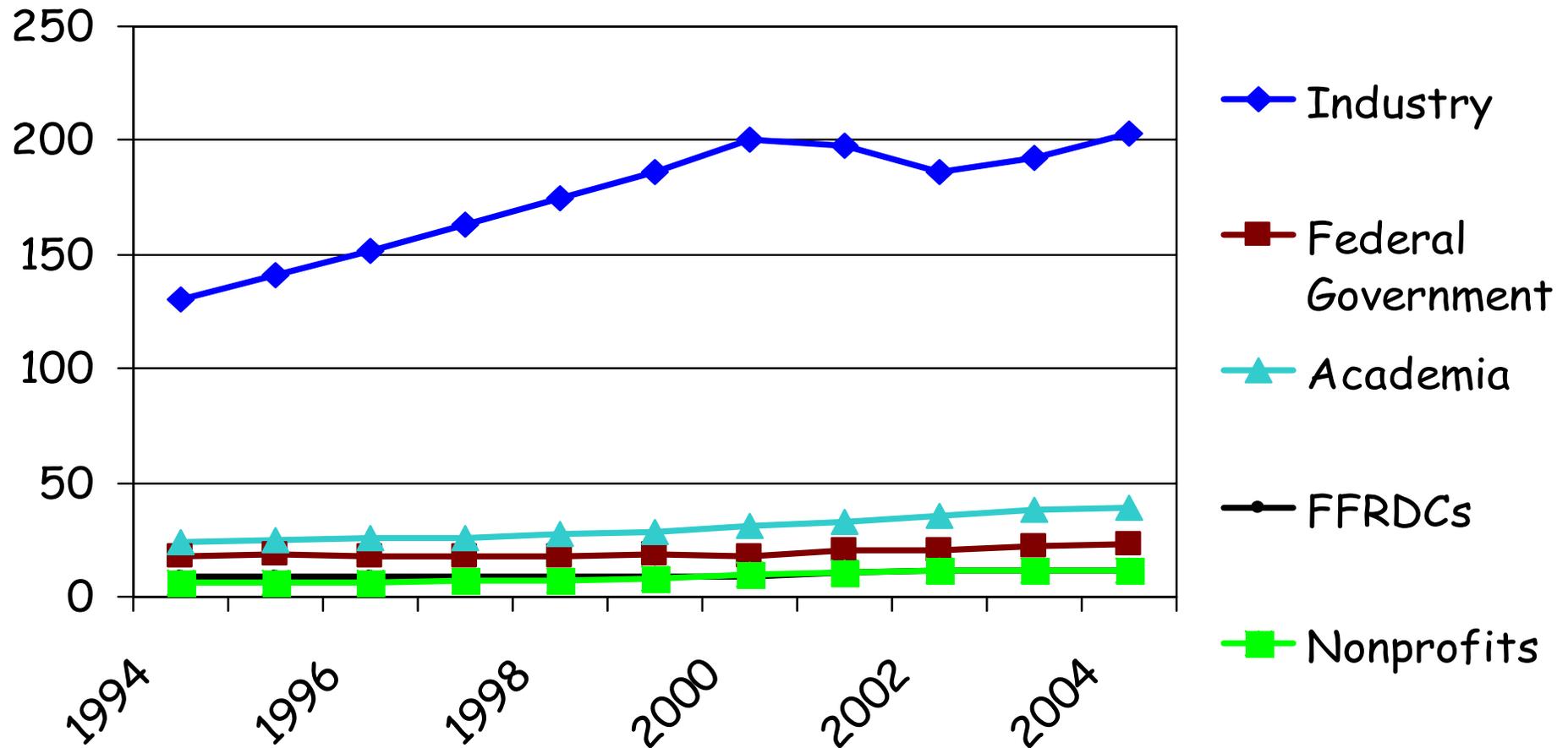


Source: OECD, Main Science and Technology Indicators. AAAS Website

US also dominates R&D performance, but the gap is narrower.



US R&D by Performing Sector

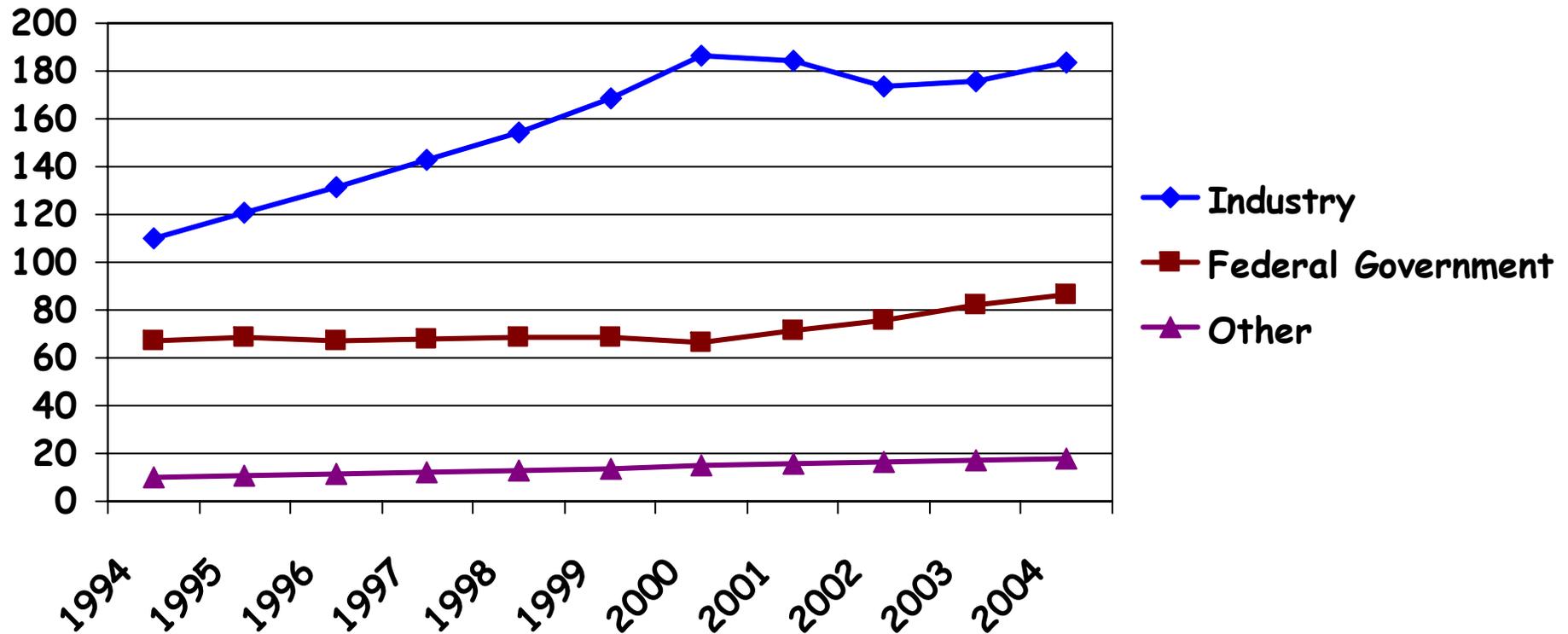


Source: National Science Foundation/Division of Science Resources Statistics, National Patterns of R&D Resources. Constant 2000 dollars (billions).

Industry dominates performance of research & development in the US.



US R&D by Funding Sector



Source: National Science Foundation/Division of Science Resources Statistics, National Patterns of R&D Resources. Constant 2000 dollars (billions).

Industry also dominates funding of research & development in the US.



"Avoiding Surprise . . ."



- New/different players . . .new/different motivations
 - ◆ Recommendation 1: . . . establish an ongoing collaborative relationship with scientific and technical communities in the industrial and academic sectors.

- New potential sources and new observables . . .
 - ◆ Recommendation 2: . . . establish, maintain, and systematically analyze a comprehensive array of indicators pertaining to globalization and commercialization of science and technology to complement and focus intelligence collection and analysis.

- Emerging technologies . . . innovative integrations
 - ◆ Recommendation 3: . . . adopt a capabilities-based framework within which to identify and assess potential technology-based threats.

Committee strongly encouraged increased attention to this growing challenge.



Observation



- NDIA/ODDR&E: 6-7 September 2006
 - ◆ "Seeking the Capability Before the Capability is the Surprise"

- S&T Surprise Working Group: 11-12 October 2006
 - ◆ Symposium: The Electronic Environment

- Wright Patterson AFB: 17-19 October 2006
 - ◆ "Disruptive Digital Technology—Avoiding Tech Surprise"

- IC/National Labs: 14-16 November 2006
 - ◆ Emerging Technologies and Avoiding Tech Surprise

Concern/focus is evident within the National Security community.



Sage advice from 1976 . . .



- "Guarding Against Technological Surprise"
 - ◆ Dr. George Heilmeier

- "The real difference between the surpriser and the surprised is usually not the unique ownership of a piece of new technology."

- "The key difference is in the recognition or awareness of the impact of that technology and decisiveness in exploiting it."

Source: www.airpower.maxwell.af.mil/airchronicles/aureview/1976/sep-oct/

Recall Machiavelli!



For your consideration . . .



- Maintain the technological initiative.
- Ensure that intelligence is timely.
- Develop options.
- Develop mechanisms that provide for an orderly response when a technological surprise suddenly appears.
- Make tactical and doctrinal flexibility part of our training and test and evaluation processes.
- Create an atmosphere of cooperation and exchange between technologists and commanders of real forces.
- Finally, make sure that there will be a close working relationship between defense-oriented scientists and engineers and their colleagues in the industrial and in the university technical communities.

Heilmeier: Steps which a free society can take to prevent technological surprise.



The bottom line . . .



The challenge of avoiding technology surprise is not new
but success in the 21st century
will require new thinking and new partnerships.

US has no monopoly on either technological advances or disruptive innovations.