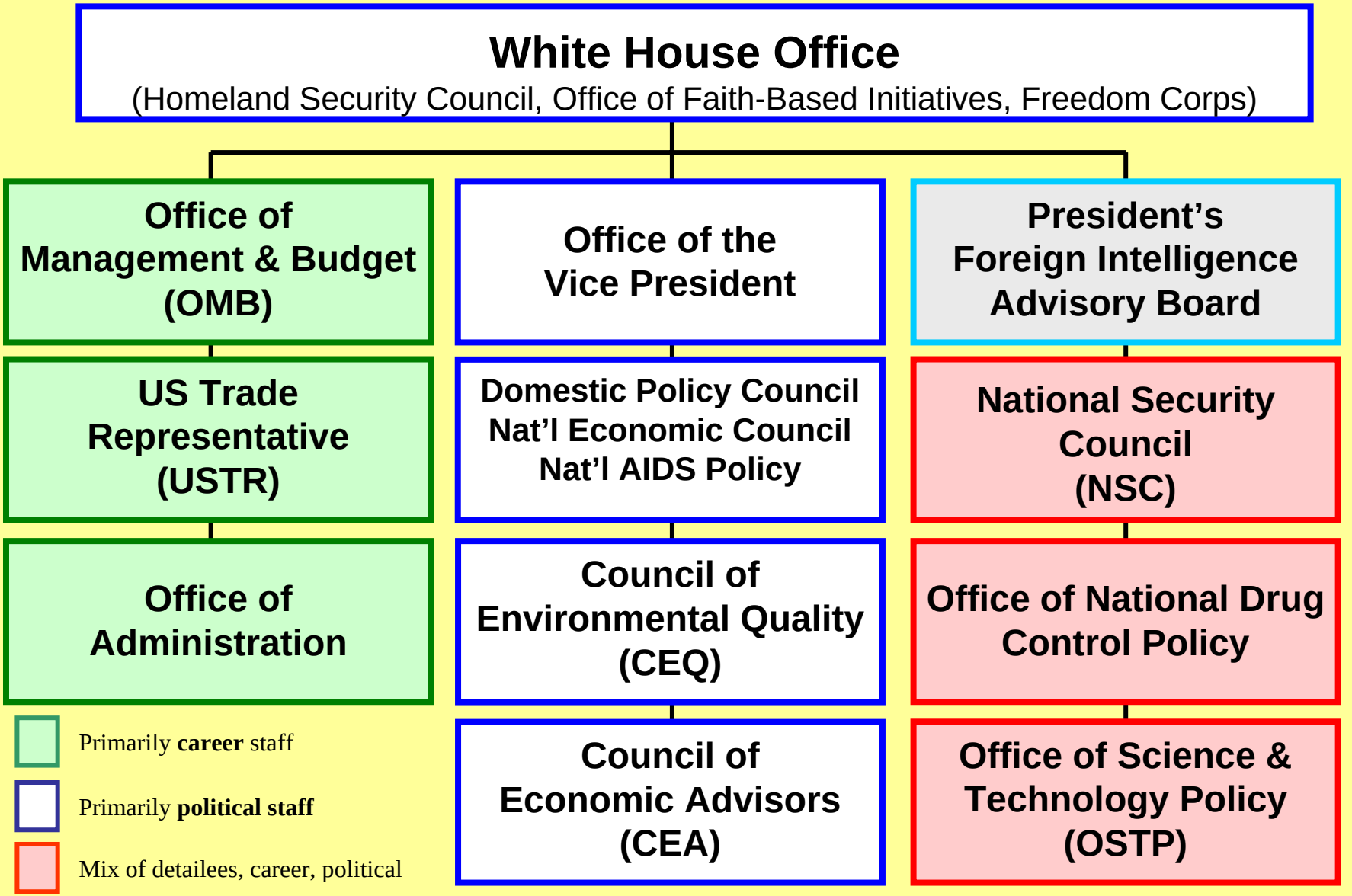
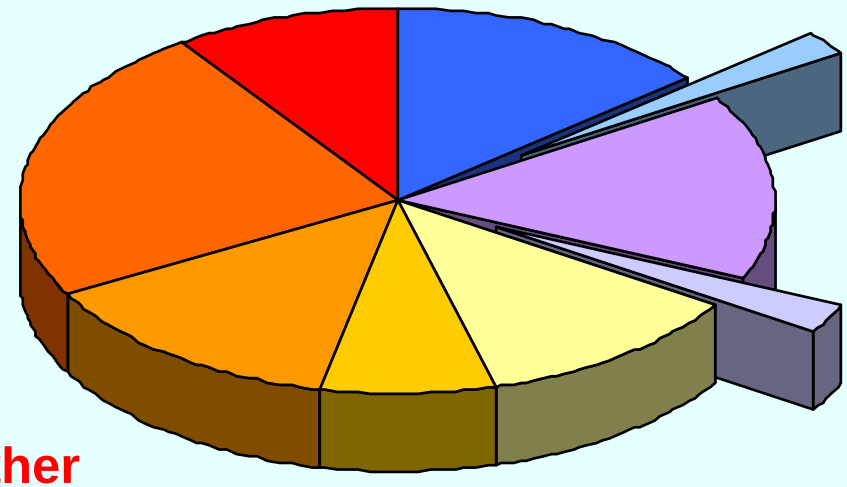
Big Science Policy

Patrick Looney
Assistant Director, Physical Science and Engineering
Office of Science & Technology Policy
Executive Office of the President

Executive Office of the President (EXOP)



FY 2005 Proposed Budget ($2.4 Trillion OL)

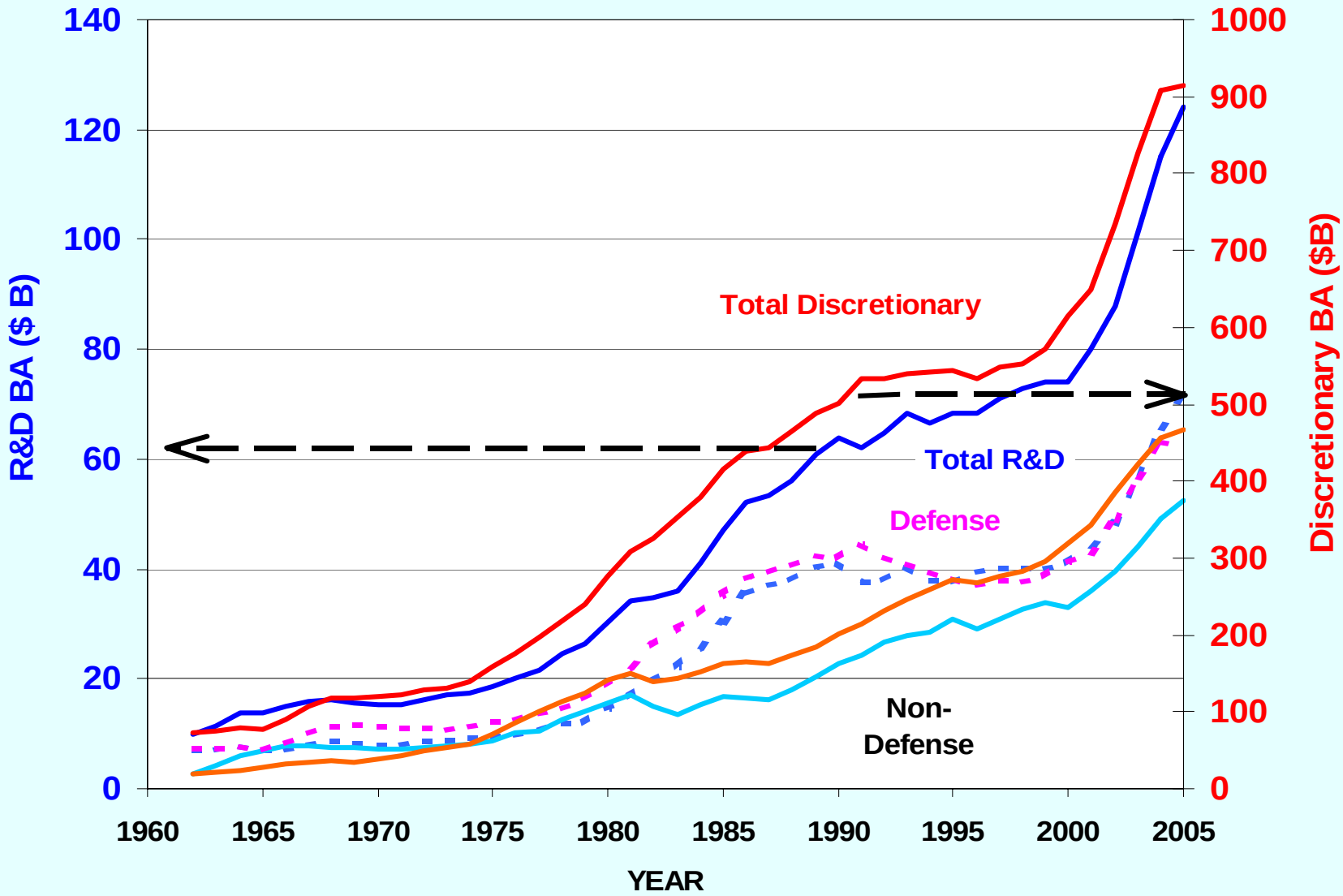


Mandatory Spending

Discretionary Spending

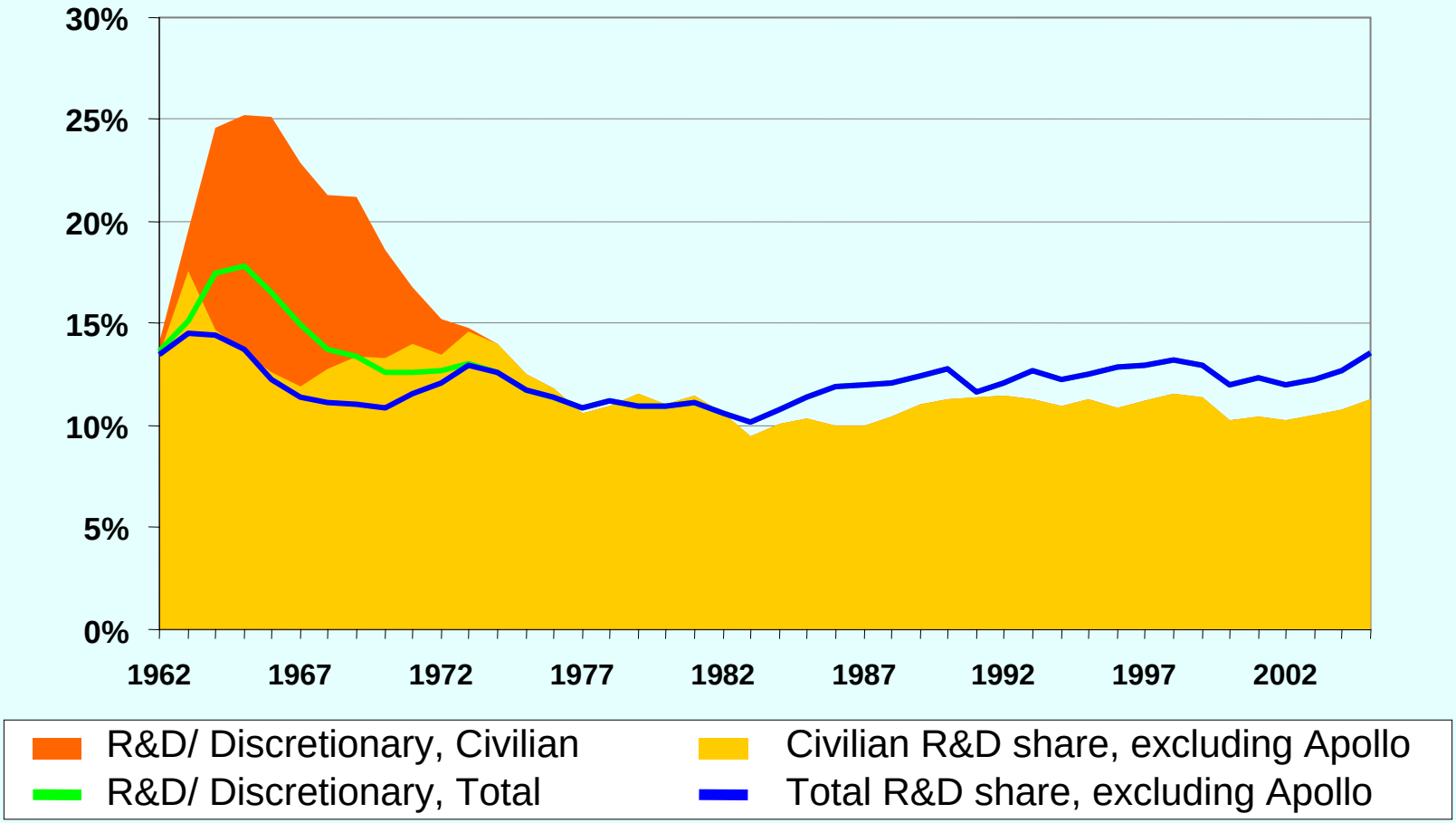
R&D = 14% of discretionary spending

Historical Discretionary and R&D Spending



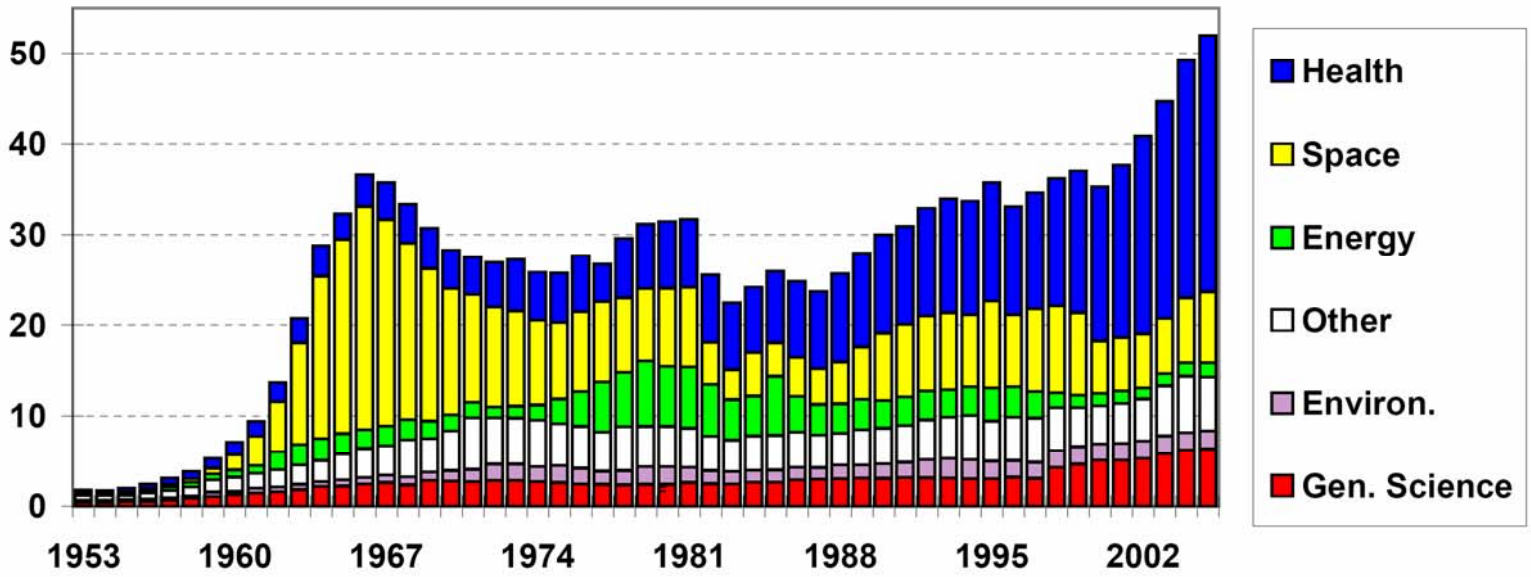
R&D as a Share of Discretionary Spending

It's approximately constant over the last 30 years!



Trends in Nondefense R&D by Function, FY 1953-2005

outlays for the conduct of R&D, billions of constant FY 2004 dollars

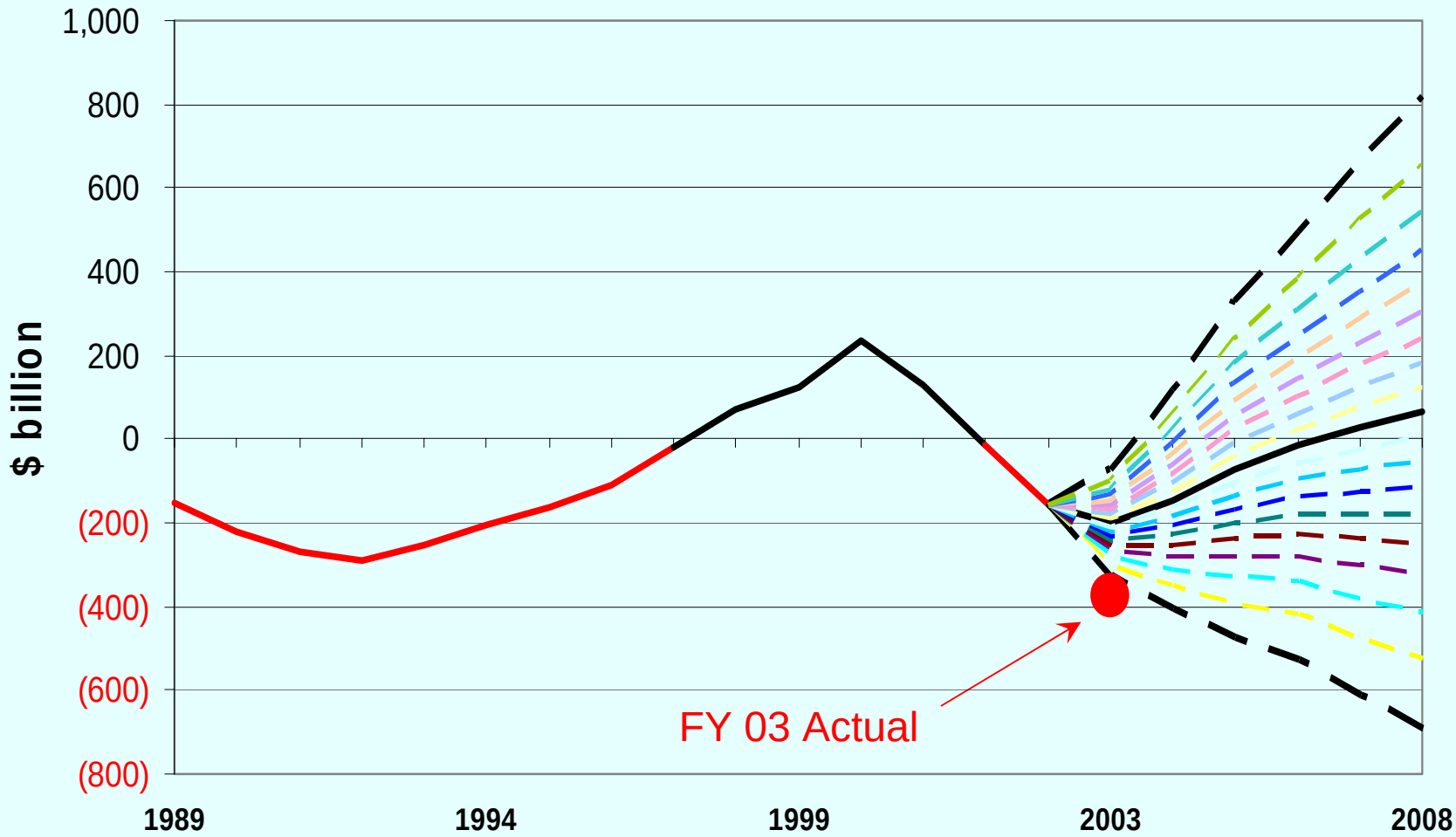


Source: AAAS, based on OMB Historical Tables in *Budget of the United States Government FY 2005.* Constant dollar conversions based on GDP deflators.
FY 2005 is the President's request.
Note: Some Energy programs shifted to General Science beginning in FY 1998.

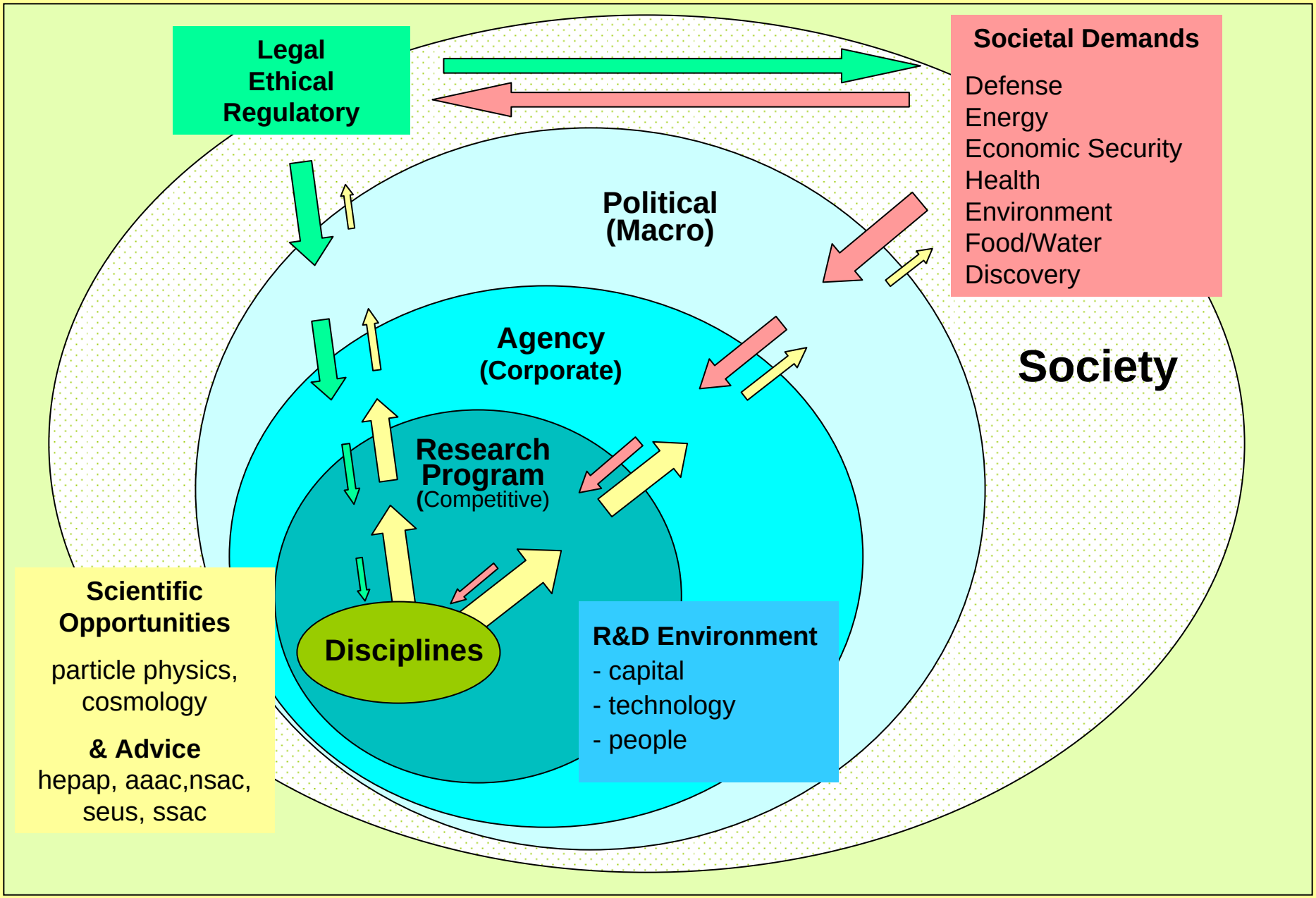
AAAS

CBO Baseline Surplus Forecast, January 2003

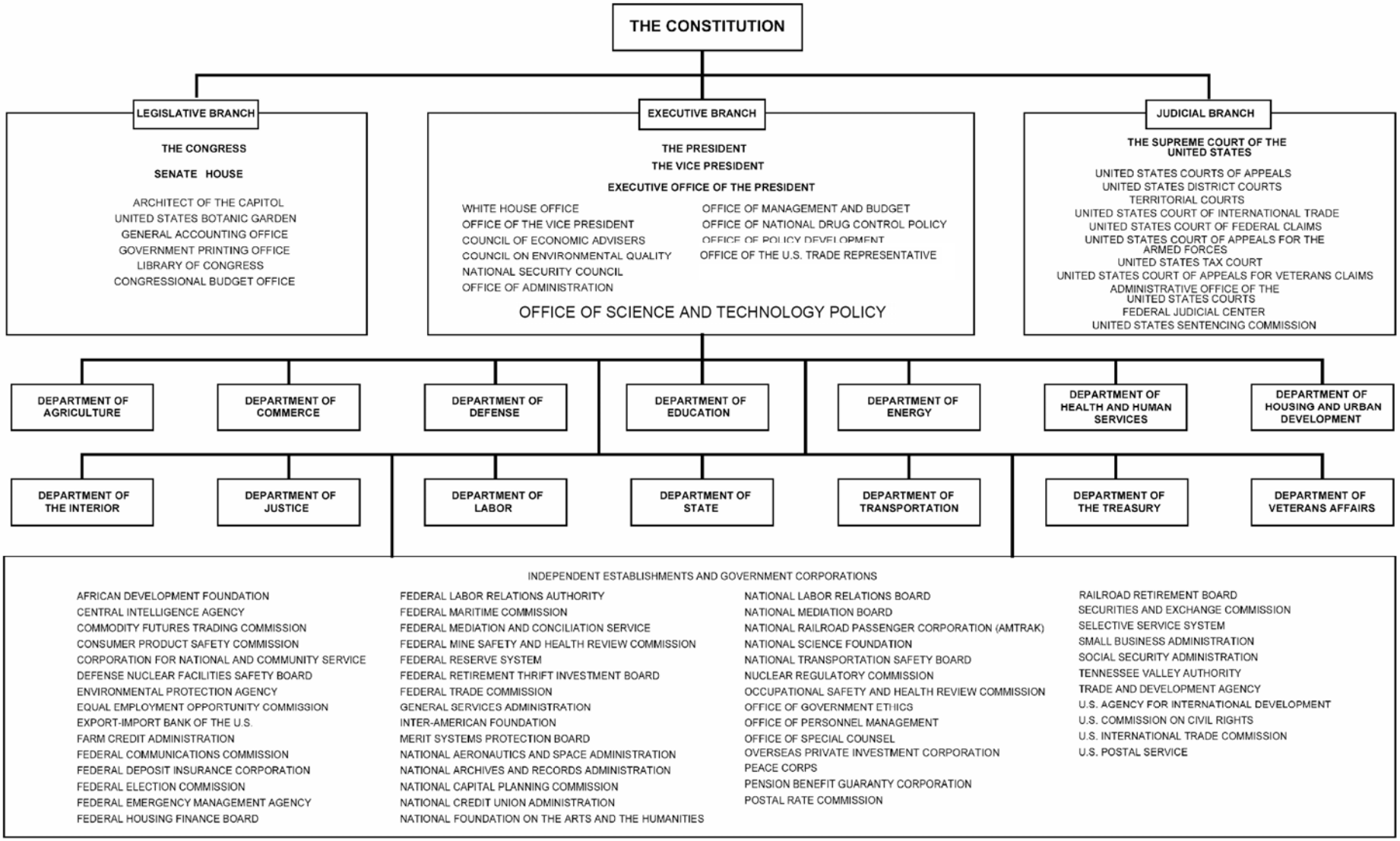
Great uncertainty looking forward



“Business Environment” for Government R&D



THE GOVERNMENT OF THE UNITED STATES



DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

Secretary
Dr. Samuel Bodman

Deputy Secretary*

Under Secretary for Nuclear Security/ Administrator for National Nuclear Security Administration
Linton F. Brooks

- Deputy Administrator for Defense Programs
- Deputy Administrator for Defense Nuclear Nonproliferation
- Deputy Administrator for Naval Reactors
- Deputy Under Secretary for Counter-terrorism
- Emergency Operations
- Associate Administrator for Infrastructure & Environment
- Associate Administrator for Management & Administration
- Associate Administrator for Defense Nuclear Security

Under Secretary for Energy, Science & Environment

- Assistant Secretary for Environmental Management
- Assistant Secretary for Fossil Energy
- Science
- Electric Transmission & Distribution
- Assistant Secretary for Energy Efficiency & Renewable Energy
- Nuclear Energy, Science & Technology
- Civilian Radioactive Waste Management
- Legacy Management

- Assistant Secretary for Policy & International Affairs
- Assistant Secretary for Congressional & Intergovernmental Affairs
- Assistant Secretary for Environment, Safety & Health
- General Counsel
- Management, Budget & Evaluation/CFO
- Energy Information Administration
- Economic Impact & Diversity
- Energy Assurance
- Secretary of Energy Advisory Board Support Office
- Counterintelligence
- Intelligence
- Security & Safety Performance Assurance
- Inspector General
- Chief Information Officer
- Public Affairs
- Hearings & Appeals
- Departmental Representative to the DNFSB
- Power Marketing Administrations

* The Deputy Secretary also serves as the Chief Operating Officer

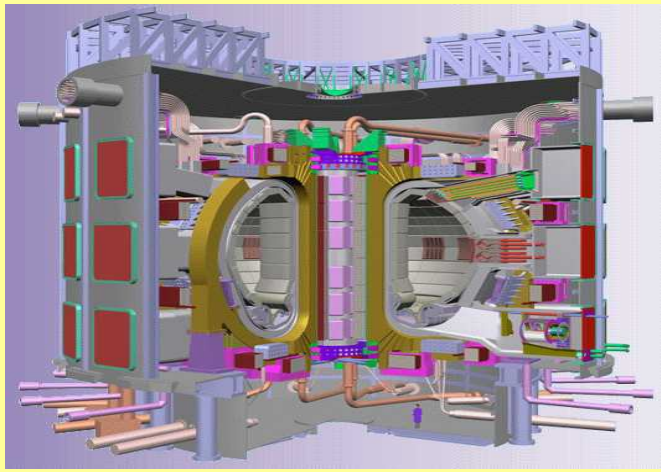
1 FEB 05

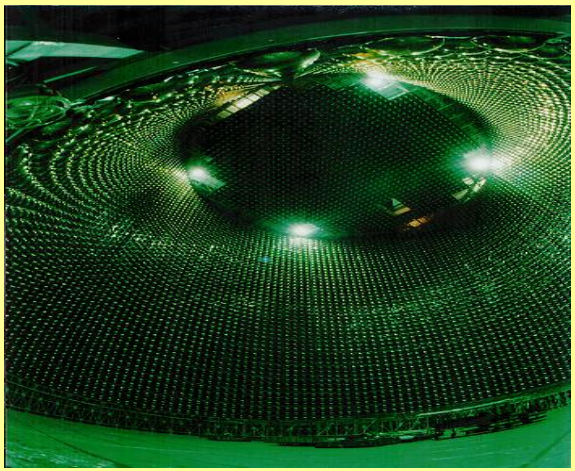
Government/Business Environment

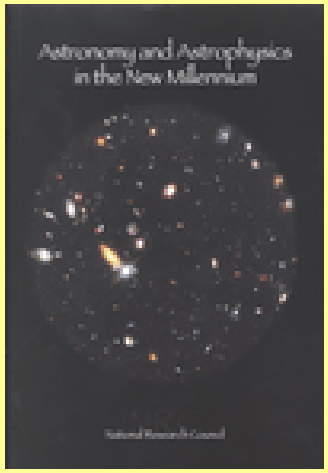
- **Political Level (President, Congress)**
  - How does the science benefit society? (jobs, economy, defense,…)
  - How does this address/define administration priorities?
  - How does this alleviate/placate constituent concerns? (budget growth?)
  - How has the program been managing and performing?
  - What have we gotten for our investment to date?
- **Agency Head/ Department Secretary Level**
  - How does the science address administration priorities?
  - How does the science further the mission of the agency?
  - How does the science impact or strengthen other programs or related activities across the Government?
  - Who is your competition?
- **Competitive Environment (Program Level)**
  - How does the investment advance the program's objectives?
  - What is the scientific return on the investment? (bang for buck)
  - Who is your competition?
- **Internal Environment (Particle Physics)**
  - International
    - What is the international context?
    - Is there an international vision/consensus?
  - National
    - What is the status of the field?
    - Where are we in the life cycle of the tools?

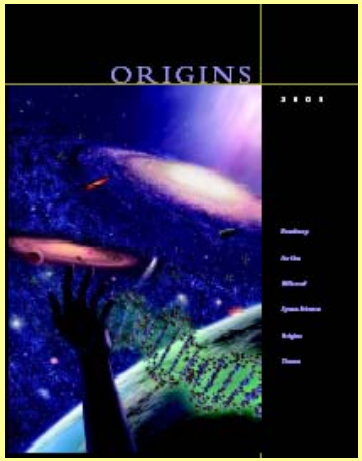
Significant Trends & Outlook (3 – 10 years)

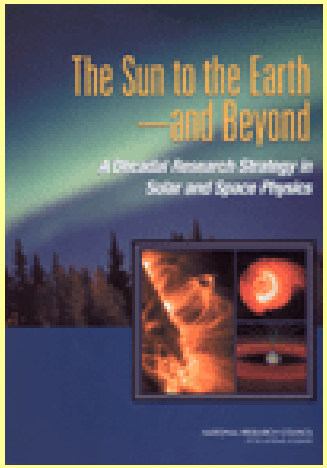
- **Significant Pressure on the discretionary budget (R&D will feel same).**
  - **R&D captures 11% – 14% of the discretionary budget annually (up, down, flat).**
- **Appropriate emphasis on science for the public good will continue, grow.**
  - **The large-scale mix of investments will continue to change in response to societal issues/concerns. (60's Space, 70's Energy, 80's Defense, 90's Health, 00's Homeland, Energy?)**
- **Emphasis on R&D investments that lead to innovation, job creation, and economic strength. This emphasis will continue, grow.**
- **Emphasis on Performance and Management of R&D Programs.**
  - **Greater emphasis by the administration/congress on understanding what we are getting for our investment & maximizing return on large existing investment base.**
  - **There will be a greater emphasis on project risk management, longer lead time for larger project approval, more R&D upfront.**
- **There will be a increasing scrutiny of the national labs: their role, purpose, and management.**

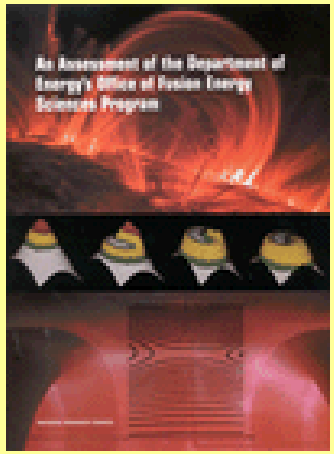




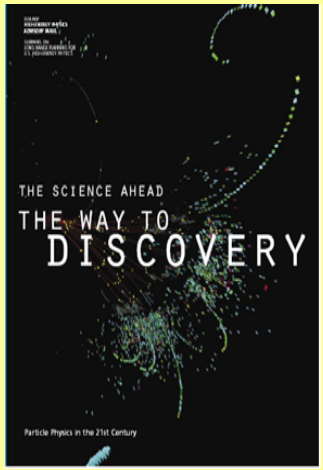

Astronomy and Astrophysics in the New Millennium


ORIGINS

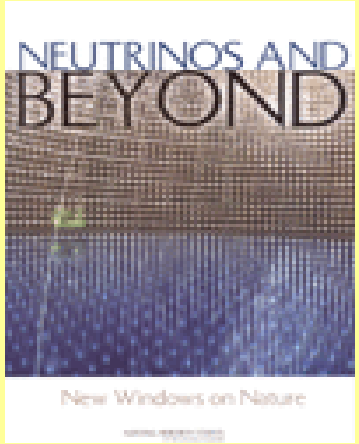

The Sun to the Earth —and Beyond
A Decadal Research Strategy in Solar and Space Physics

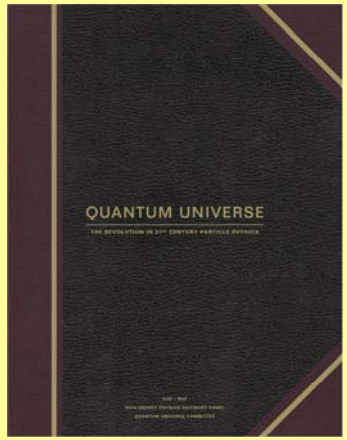

An Assessment of the Department of Energy's Office of Fusion Energy Sciences Program

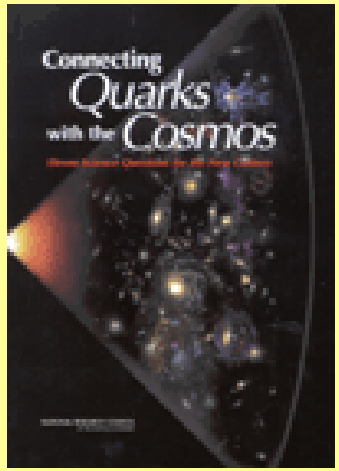

Major Facilities for Materials Research and Related Disciplines

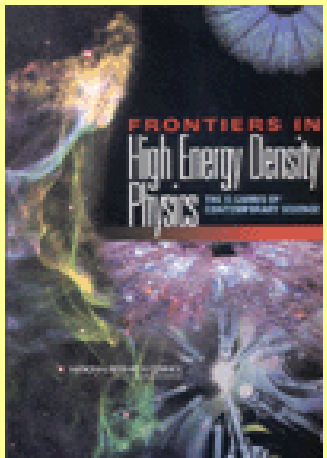

THE SCIENCE AHEAD
THE WAY TO DISCOVERY
Particle Physics in the 21st Century

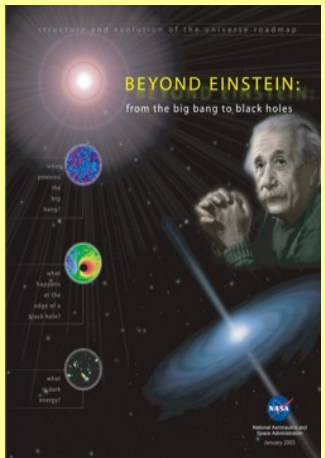

OPPORTUNITIES IN NUCLEAR SCIENCE
A Long-Range Plan for the Next Decade
April 2002

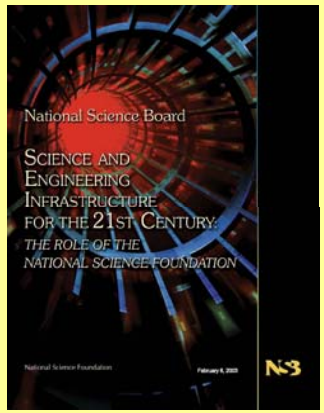

NEUTRINOS AND BEYOND
New Windows on Nature


QUANTUM UNIVERSE

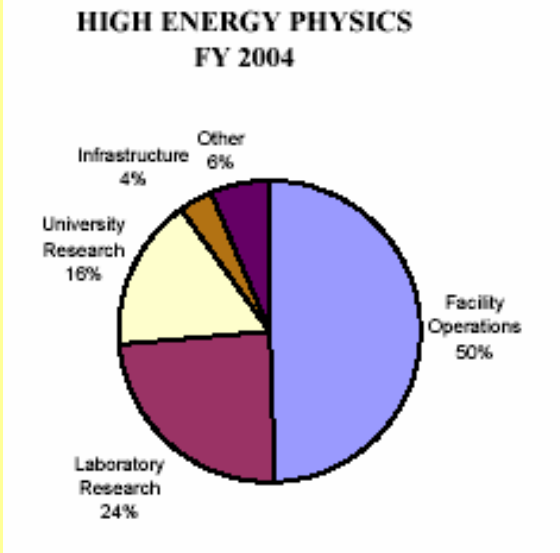

Connecting Quarks with the Cosmos


FRONTIERS IN High Energy Density Physics


BEYOND EINSTEIN:
from the big bang to black holes


National Science Board
SCIENCE AND ENGINEERING INFRASTRUCTURE FOR THE 21ST CENTURY:
THE ROLE OF THE NATIONAL SCIENCE FOUNDATION

A Brief History of Large Scale Science



- LSS traditionally the realm of High Energy Physics, Nuclear Physics, Astronomy and Space Science.

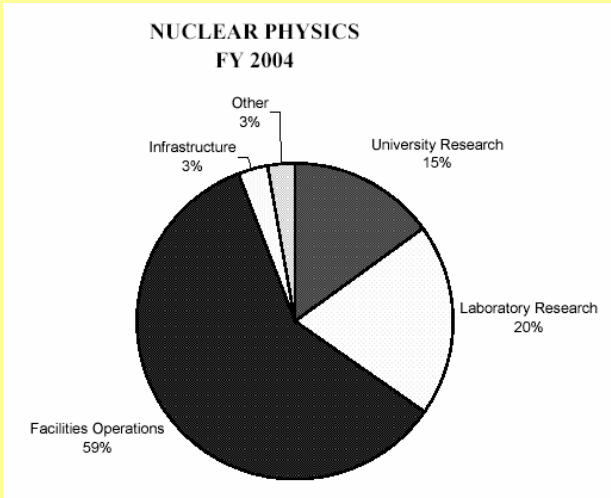
- Many of these activities born in a cold war era.

- Traditional fields have matured; motivations have changed.

- Balance of operations, research, new and existing facilities a chronic issue but serious issues loom for paths forward.

- Success from HEP and NP accelerators and reactors; development of the highly successful materials characterization facilities. Not as mature - but similar stewardship issues exist.

- Computer, Microelectronics, IT & Networking advances in the 80's and 90's enabling new LSS Projects.



Trends for Facilities

- More new facilities recommended than can be funded under the most optimistic budget scenarios (by factors of 2-4).
  - Do we really need them all?
  - Which are the most important for goals of the R&D enterprise?
  - Non-traditional fields now looking for large facility investments. (competition for scarce resources)

- Chronic tension between new/existing facilities, program research budgets continues. Sustainability.
  - Will this force a debate on future of facilities and labs that house them?
  - There is a large installed base of facilities.
    - Do we need them all? Could we use the money more productively?
  - There is a need to find graceful end of life pathways for aging facilities.

- In tight budget era, only the most deserving facilities will be fundable.
  - Scientific impact (breadth and depth), nature of discovery.
  - National Imperative: not regional, not stewardship.
  - Sustainability of the DOE Laboratory System

Large Projects in Discovery-Oriented Physical Sciences

Rules of Thumb

How big is it?

< $100M	**interagency coordination probably not a requirement** **international participation probably not a requirement** **mild political interest**
$100M - $1B	**interagency coordination highly likely** **international participation probably needed** **moderate political interest**
> $1B	**assume global planning & realization required** **definite high-level political interest**

Large Scale Science Projects: Two Major Classes

1.) National Security or Economic Impact

- US tends to plan its facilities to meet its own goals
  - Conception, Design, Construction.
  - Int'l participation welcome, collaborative mode, but not needed.

2.) Discovery-Oriented Research

- Look to forge international consensus
- Insistence on widest possible sharing of costs
- Work with international partners in conception, design, construction…

ILC Comments

- **Not an easy path forward. BE REALISTIC ABOUT YOUR ENVIRONMENT.**
- **This is not really a global science project – but it is the most inclusive.**
- **The path will have to be segmented.**
  - **R&D, EDA, Construction decisions will need to be considered individually.**
- **For the US, a construction decision will be influenced by election cycles.**
- **First results from LHC are needed for a construction decision.**
- **The EDA phase should include centrally-coordinated R&D.**
- **There will have to be sacrifice from the HEP program.**
- **For the US to consider hosting, there will have to be international consensus that it is 'our turn.'**