The Emergence of S&T Priorities in the U.S.

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The Second International Conference on Technology Foresight

February 27, 2003

Some common questions

- Technology Foresight
  - What technology foresight activities are done in the U.S?
  - Why doesn't the U.S. do technology foresight?
- How does the U.S. set technology priorities?
  - Who does the planning for U.S. S&T?
  - Who is in charge of U.S. S&T?
  - Where do new national initiatives (e.g. nanotech) come from?

Common assumption: U.S. has a clear process of S&T policy prioritization

Reality: U.S. S&T Policy is complex, variable and changing -- not easy to define

U.S. activities related to technology foresight:

- Workshops and more workshops
- Technology roadmapping
- Think tank, advisory committee, National Research Council and other studies
- Private market/technology studies
- Critical technologies assessments

Workshops

- Huge number of workshops (877 NSF awards since 2002 include “workshop” in the title or abstract; many at NIH, DOE, other agencies)
- Many assess research priorities in the field
- Some address socio economic implications (e.g. IT, nanotechnology)
- Collectively involve broad technical community
- Collectively create much information on promising research areas

Technology roadmapping

- Determine trajectory of technology; developments needed for trajectory
- Some consider market needs
- Examples, semiconductors, optoelectronics, aluminum, glass, others
- Industry-based but many have government support
- Usually do not consider social effects

See Kostoff, R.N. and Schaller, R.R. (2001), 'Science and Technology Roadmaps', IEEE Transactions on Engineering Management, 48 (2), pp. 132-143.

Policy studies

- Think tanks
- Advisory committees
- National Research Council
- Often expert committees
- Often consider broader effects/ make recommendations for future research needs

Critical Technologies

- Many critical technology studies (late 80s-late 90s)
  - DOD critical for defense
  - NIST emerging technology
  - Council on Competitiveness -critical for industry
  - OSTP/Critical Technologies Institute National Critical Technologies list
- Focused attention on technology policy
- Not rigorous basis for priority setting
- Little attention to social impact
- Largely discontinued

U.S. S&T Priority Setting Process -- Metaphors

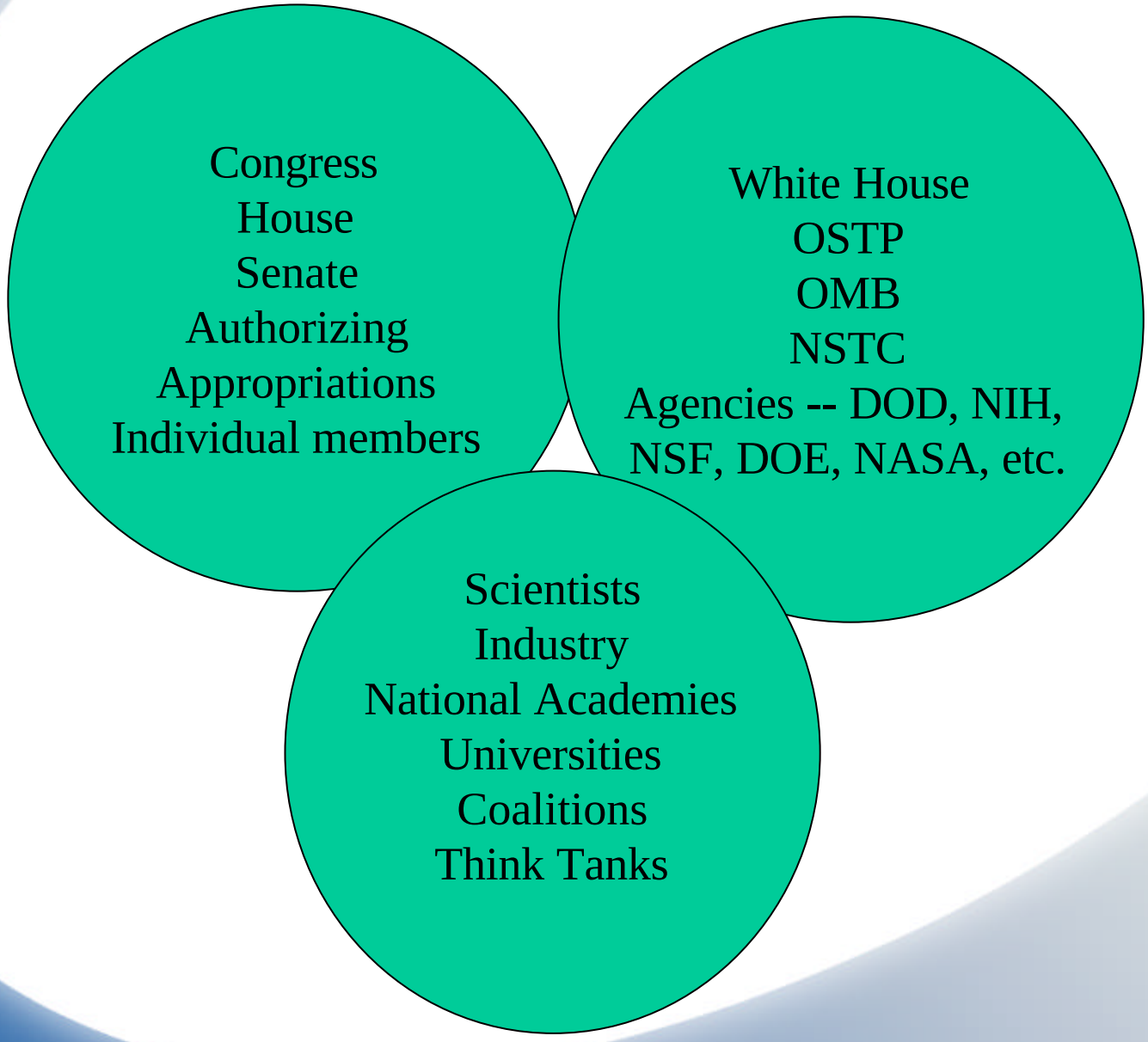
- Marketplace of ideas
- Sausage factory

  "Anyone who loves the law or sausages should never watch either of them being made."

- Termite mounds

  (Complex adaptive system with emergent behavior)

http://www.ozoutback.com.au/postcards/postcards_forms/wa_bungles/Source/1.htm


Congress
House
Senate
Authorizing
Appropriations
Individual members
White House
OSTP
OMB
NSTC
Agencies -- DOD, NIH,
NSF, DOE, NASA, etc.
Scientists
Industry
National Academies
Universities
Coalitions
Think Tanks

The real U.S. S&T priority setting process

- Chaotic, unpredictable, each time is different
- Existing programs
  - Budgets change on margins
  - Budget process is key
  - Agencies and their communities largely decide
- New initiatives
  - Often emerge bottom up from community
  - Each one has a different history, different players

Examples

- Internet
  - Early development by DARPA
  - Expansion funded by NSF, multi agency initiative
  - Came from technical people in computer science community, scientific computing users
  - Congressional, White House support in late 80s, 90s
- Nanotechnology
  - Led by policy entrepreneurs in agencies and White House
  - Got White House support
  - Build coalition in science and engineering community

  Source: www.technopoli.net
- Current priorities likely to follow different patterns
  - Homeland security
  - FreedomCAR

Why no (formal) U.S. Technology Foresight?

- No client?
- No central planning for U.S. S&T
  - OSTP coordinator not manager
- Congress
  - Had Office of Technology Assessment but closed it
- Agencies
  - Mission agencies (DOE, NASA, DOD) focus on own missions
  - NSF, NIH have their own bottom-up processes

Does lack of technology foresight hurt U.S.?

- System works fairly well
  - Identifies new opportunities well
  - Addresses social implications reasonably
- Are alternatives demonstrably better?
- System could benefit from more systematic examinations of social needs and the social effects of future technology (if anyone would use the results)
- What works for the U.S. may not work for smaller economies