

***A Policy Wonk's Plea For More and  
Better Policy Research and Engagement  
from Computer Scientists***

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**Snowbird CRA Conference**

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# Overview

- I. Background
- II. The President's Review Group on Intelligence and Communications Technology
  - \*\* The need to develop computing experts to shape major policy debates
- III. The policy focus to date – getting funding for (the right) computer science research
- IV. The emerging importance of non-funding policy issues for computer scientists
- V. How you and your colleagues can make a difference

# Swire Early Career

- Princeton:
  - Public policy, economics
  - Interdisciplinary thesis– effects of information technology theory on legal and economic thought
- Yale Law School
  - JD and ABD in political philosophy
- DC jobs in school and after
- Law teaching 1990
  - First law of cyberspace paper 1993
  - Book on US/EU privacy 1998
  - Law professor at UVA, GW, Ohio State

## White House/OMB

- Chief Counselor for Privacy 1999-2001
  - WH coordinator for HIPAA Privacy Rule
  - WH lead on GLBA Financial Privacy Rule
  - Chair, WH Working Group on Encryption for 1999 policy change
  - Chair, WH Working Group to update wiretap laws for the Internet 2000
  - Other cybersecurity, e-Commerce, EU issues

## After 2001

- Research on cyber-security, privacy, FISA etc. 2001-2008
- Security & privacy advisory boards for IBM, Intel, Microsoft, start-ups
- Special Assistant to President Obama for Economic Policy, 2009-10
  - Broadband spending
  - Spectrum allocation
  - Other issues
- Co-Chair, W3C standards process for Do Not Track, 2012-13

# Current Employment

- 2013 arrived at Georgia Tech
  - Scheller College of Business
  - Courtesy – College of Computing, School of Public Policy
  - Co-teach with computer scientists:
    - Privacy, Technology, Policy and Law
    - Cybersecurity Strategy and Policy

## II. The Review Group

- Snowden leaks of 215 and Prism in June, 2013
- August – President's Review Group on Intelligence and Communications Technology formed
  - I pushed for inclusion of a technologist
  - They didn't know one, I think, with the level of insider institutional expertise they were seeking
- 5 members



December 2013: The Situation Room

## Our assigned task

- Protect national security
- Advance our foreign policy, including economic effects
- Protect privacy and civil liberties
- Maintain the public trust
- Reduce the risk of unauthorized disclosure

## Our assigned task (2)

- Protect national security
- Advance our foreign policy, including economic effects
- Protect privacy and civil liberties
- Maintain the public trust
- Reduce the risk of unauthorized disclosure
- **Q: A simple optimization task, and write the algorithm?**
- **A: No – need technical insight, integrated with other policy perspectives**

# Our Report

- Meetings, briefings, public comments
- 300+ pages in December
- 46 recommendations
  - Section 215 database “not essential” to stopping any attack; recommend government not hold phone records
- Pres. Obama speech January
  - Adopted 70% in letter or spirit
  - Additional recommendations under study

# Theme 1: Offense & Defense in Cybersecurity

- Unlike Cold War, now same systems for “our” and “their” communications
- Strong intelligence and military reasons for offensive capabilities
  - Military in the future - Cyber Command, analogous to the way the Air Force became key to offense
  - Where more critical infrastructure is online, then offense against it more valuable

# Defense and Cybersecurity

- Defense today:
  - Over 90% of critical infrastructure privately held
  - If install a patch, then tip off outsiders: can't defend the "good guys" and still attack the "bad guys"
  - Cybersecurity has daily attacks against civilians, so defense is more important
- On balance, the Review Group strongly emphasized defense:
  - Improve security of government systems
    - Address insider threat, etc.
  - Encryption
  - Zero days

## Strong Crypto for Defense

- Crypto Wars of the 1990's showed NSA & FBI interest in breaking encryption (offense)
- 1999 policy shift to permit export globally of strong encryption, necessary for Internet (defense)
- Press reports of recent NSA actions to undermine encryption standards & defeat encryption (offense)
- RG Rec 29: support strong crypto standards and software; secure communications a priority on the insecure Internet; don't push vendors to have back doors (defense)
- RG talked with IT experts but didn't have a member
- No announcement yet on this recommendation

# Zero Days & the Equities Process

- A “zero day” exploit means previously unused vulnerability, where defenders have had zero days to respond
- Press reports of USG stockpiling zero days, for intelligence & military use
- RG Rec 30: Lean to defense. New WH equities process to ensure vulnerabilities are blocked for USG and private networks. Exception if inter-agency process finds a priority to retain the zero day as secret.
- Software vendors and owners of corporate systems have strong interest in good defense
- WH recently announced basic agreement with this

## Theme 2: One Internet, Multiple Equities

- The same Internet for multiple activities:
  - Intelligence, law enforcement
  - E-Commerce
  - Free speech & political dissent
  - All the fun stuff – cat videos
  - Military theaters of combat

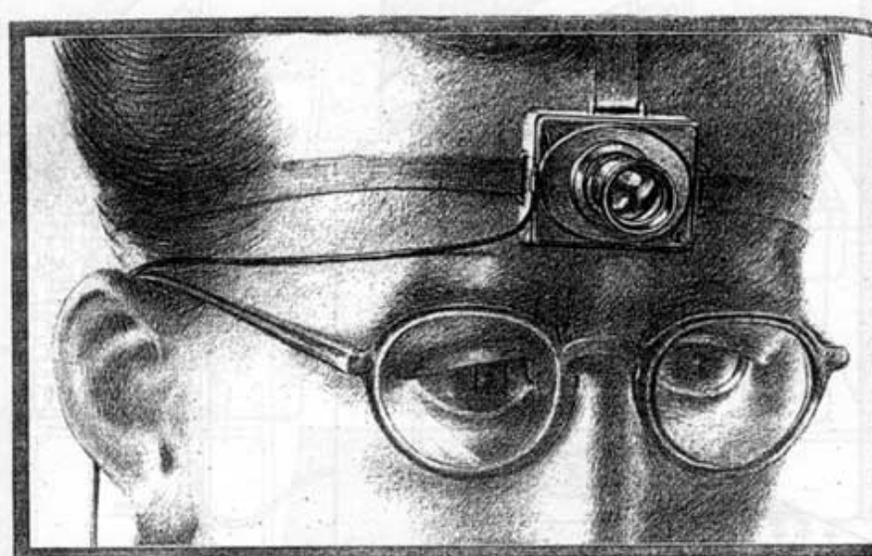
## One Internet, Multiple Equities

- For these activities, have multiple policy goals
  - National security
  - Strengthen cyber-defense
  - Privacy & civil liberties
  - Allies
  - Business and the economy
  - Internet governance
- RG recommendations to integrate these
- No one has research-level expertise in all of these
- An issue to ponder: how can we have leading computing experts with the institutional experience to help shape these decisions?

### III. Getting Funding for (the Right) Computing Research

- A role model – Vannevar Bush
- The importance of research funding for computer science
  - Focus here on U.S., but analysis applies elsewhere
- Your expertise vital for policy about:
  - The level of funding for computing research
  - Funding the “right” research – setting priorities

# Vannevar Bush As Role Model



A SCIENTIST OF THE FUTURE RECORDS EXPERIMENTS WITH A TINY CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE SMALL SQUARE ON THE EYEBRASS AT THE LEFT SHOWS THE OSE

## AS WE MAY THINK

A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD  
IN WHICH MAN-MADE MACHINES WILL START TO THINK

by VANNEVAR BUSH

DIRECTOR OF THE OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT  
Condensed from the *Atlantic Monthly*, July 1945

This has not been a scientists' war; it has been a war in which all have had a part. The scientists, burying their old professional competition in the demand of a common cause, have shared greatly and learned much. It has been exhilarating to work in effective partnership. What are the scientists to do next?

For the biologists, and particularly for the medical scientists, there can be little indecision, for their war work has hardly required them to leave the old paths. Many indeed have been able to carry on their war research in their familiar peacetime laboratories. Their objectives remain much the same.

It is the physicists who have been thrown most violently off stride, who have left academic pursuits for the making of strange destructive gadgets, who have had to devise new methods for their unanticipated assignments. They have done their part on the devices that made it possible to turn back the enemy. They have worked in combined effort with the physicists of our allies. They have felt within themselves the stir of achievement. They have been part of a great team. Now one asks where they will find objectives worthy of their best.

\* \* \*

There is a growing mountain of research. But there is increased evidence that we are being bogged down today as specialization extends. The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for prog-

ress, and the effort to bridge between disciplines is correspondingly superficial.

Professionally our methods of transmitting and reviewing the results of research are generations old and by now are totally inadequate for their purpose. If the aggregate time spent in writing scholarly works and in reading them could be evaluated, the ratio between these amounts of time might well be startling. Those who conscientiously attempt to keep abreast of current thoughts, even in restricted fields, by close and continuous reading might well shy away from an examination calculated to show how much of the previous month's efforts could be produced on call.

Mendel's concept of the laws of genetics was lost to the world for a generation because his publication did not reach the few who were capable of grasping and extending it. This sort of catastrophe is undoubtedly being repeated all about us as truly significant attainments become lost in the shuffle of the inconsequential.

Publication has been extended far beyond our present ability to make use of the record. The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used the days of square-egged ships.

But there are signs of a change as new and powerful instrumentalities come into use. Photocells capable of seeing things in a physical sense, advanced photography which can record what is seen or even what is felt, thermionic tubes capable of controlling potent forces under the guidance

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「LIFE」1945年9月10日号に特集された「AS WE MAY THINK」のページ

「LIFE」1945年9月10日号より引用

「AS WE MAY THINK」From the *Atlantic Monthly*, July 1945

# Vannevar Bush (1)

- MIT EE professor (1919)
- Founded what is now Raytheon (1922)
- Analog computer to solve differential equations (1927)
- Dean MIT School of Engineering (1932)
- Science Advisor to FDR & led Office of Scientific Research & Development (WWII)
  - Thousands of scientists
  - Pushed the Manhattan Project
  - Focus on the policy goal: “Will it help to win a war – *this war?*”
    - Did not push ENIAC, because he thought not ready on time

## Vannevar Bush (2)

- After the war, Bush pushed hard for creation of NSF
  - Created in 1950
  - Military & commercial rationales for federal spending
  - Global leadership required U.S. innovation
- Themes:
  - Bush led on policy outside of his research area
  - Imperative to support research funding
  - Research funding linked to national needs
  - Need to make hard choices about which projects to fund

# The Importance of Computing Research Funding

- I agree with the importance of this
- Let's look at how that gets explained to policy makers

# The Computing Community Consortium

The **mission** of Computing Research Association's Computing Community Consortium (CCC) is to **catalyze** the computing research community and **enable** the pursuit of innovative, high-impact research.

CCC conducts activities that **strengthen** the research community, **articulate** compelling **research visions**, and **align** those visions with pressing **national and global challenges**.

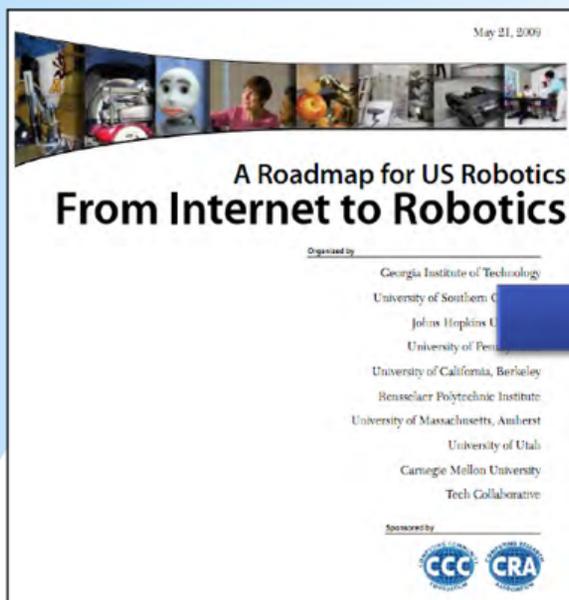
CCC **communicates** the importance of those visions to **policymakers**, government and industry **stakeholders**, the **public**, and the **research community** itself.



## From 2013 CCC Blog

- “Lazowska sang a familiar refrain:
  - Research often takes a long time before it pays off – often 15 years or more.
  - Research often pays off in unanticipated ways – we can’t predict what the biggest impact will be.
  - Advances in one sector enable advances in other sectors.
  - The research ecosystem is fueled by the flow of people and ideas back and forth between academia and industry.
  - Every multi-billion-dollar IT industry sector has a clear relationship to Federal research investment. Federal investment doesn’t supplant private sector investment – it complements it.”

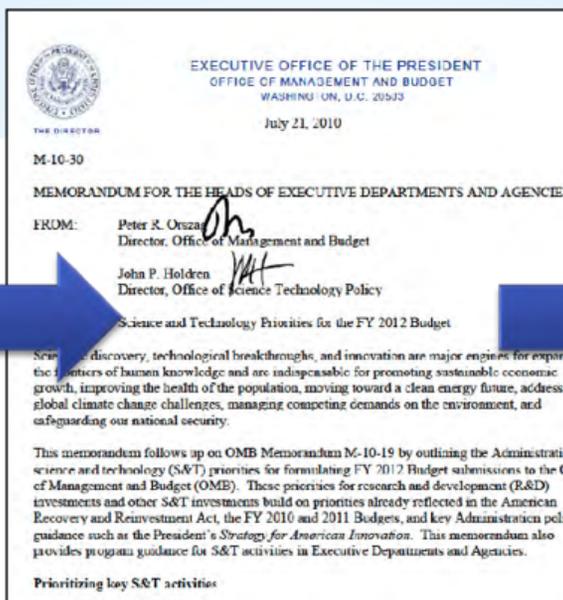
# Example: Robotics



4 meetings during summer 2008

Roadmap published May 2009

*Extensive discussions between visioning leaders & agencies*



OSTP issues directive to all agencies in summer 2010 to include robotics in FY 12 budgets

Henrik Chistensen  
Georgia Tech



National Robotics Initiative announced in summer 2011



<http://cra.org/ccc>



# The Consensus on This Agenda

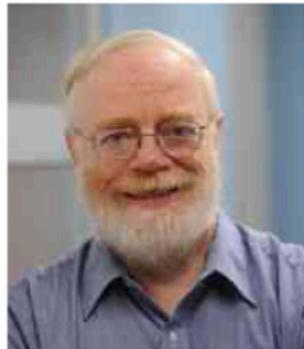
- Compelling on the substance
  - Dramatic, life-changing results from federal funding in computing research
  - Research in this area pays off in concrete ways that matter to policy makers – jobs, economy, military
- Also, not surprising to see consensus in the computing research community
  - Who is against greater funding for this research?

# Implications for national leadership

- If you care about national security, the financial system, access to justice, precision agriculture, the balance of trade, health care, urban ecology, transportation efficiency, energy independence, education, scientific discovery, ... *then you need to care about advances in computer science!*
- Issues such as online privacy and security, Internet governance, software patents / intellectual property, electronic voting, etc., are now front-and-center on the policy agenda and require a combination of technical, legal, and sociological approaches.



Ed Felten



Steve Bellovin



Latanya Sweeney

Chief Technologists of the  
Federal Trade Commission

Source: Ed Lazowska

<http://lazowska.cs.washington.edu/Wenk.pdf>

## What An Outsider Notices

- If you care about national security and other issues, ***“then you need to care about advances in computer science.”***
- I agree with that
- Note: the emphasis is on more research funding
  - Interesting that the word cloud last night for CRA did not include the word “policy”
- What does this community have to say about all the other policy issues?
- Where else can/should your domain knowledge help policy and society?

# Implications for national leadership

- If you care about national security, the financial system, access to justice, precision agriculture, the balance of trade, health care, urban ecology, transportation efficiency, energy independence, education, scientific discovery, ... *then you need to care about advances in computer science!*
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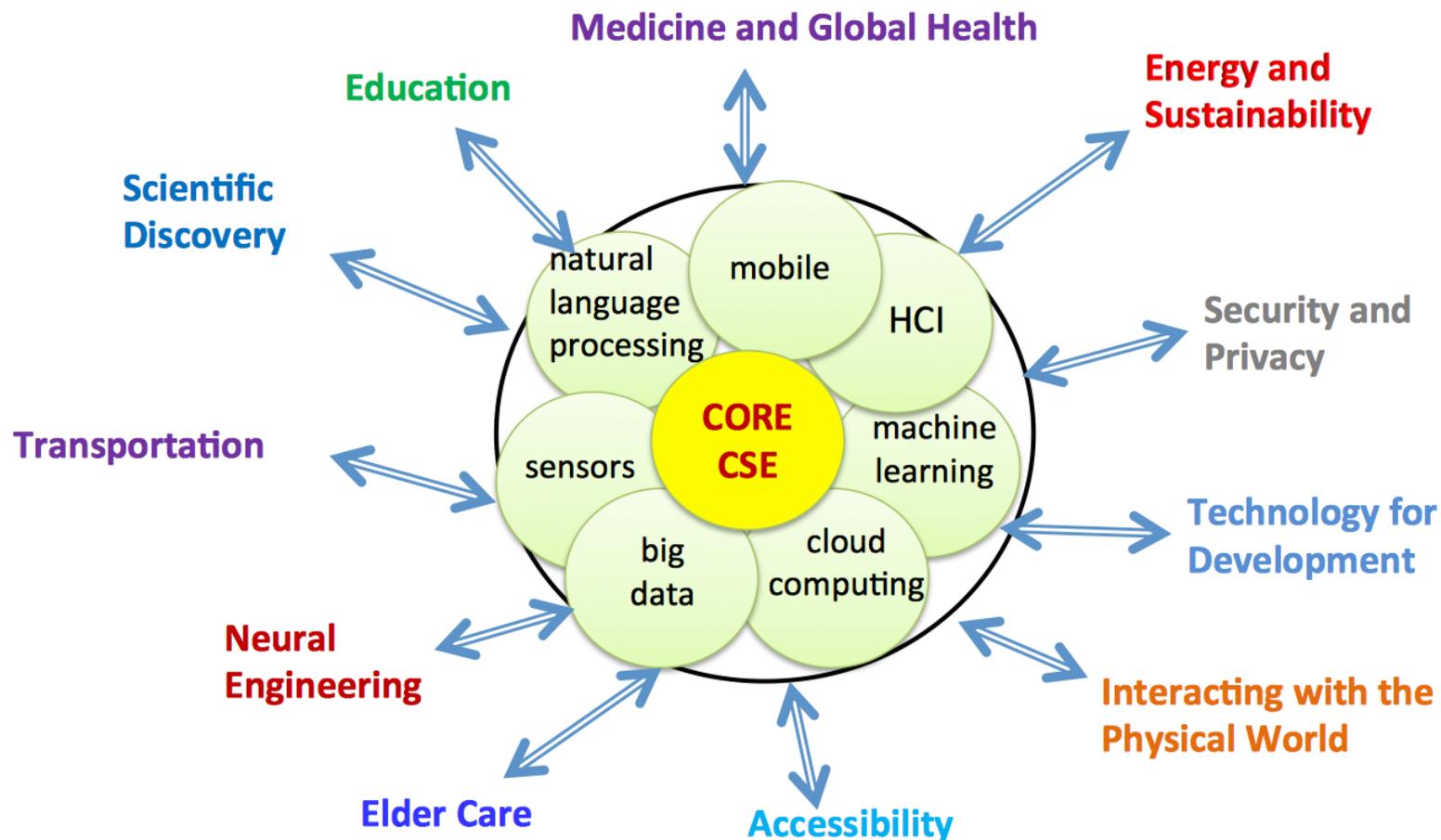
<http://lazowska.cs.washington.edu/Wenk.pdf>

# The Role of the CTO at the FTC

- 2008 Paper: The FTC @ 100 & The Future of Consumer Protection
  - <http://www.americanprogress.org/issues/regulation/news/2008/10/30/5091/the-ftc-100-and-the-future-of-consumer-protection/>
- Top recommendation “Appoint a Chief Technology Officer for the FTC”
- Felten, Bellovin, Sweeney are *not focused* on funding for computer science research
- They *are focused* on privacy, encryption, de-identification as applied to policy issues of the agency

# III. The Emerging Importance of Non-Funding Policy to Computer Scientists

A modern view of the field



Source:  
Ed  
Lazowska

# III. The Emerging Importance of Non-Funding Policy to Computer Scientists

- Factual claims for you to consider;
  - More policy issues are and will be facing computer scientists beyond the traditional research funding questions
  - Better policy outcomes will result from computer scientist engagement
  - The nature of pervasive computing means you may face more policy constraints in your research
- Three examples
  - Kinetic effects
  - Internet of Things/Internet of Devices
  - Big Data/Analytics

## Kinetic Effects (1)

- Claim: when your software has direct physical effects, then the regulators of those physical effects will scrutinize your actions
- To date, software has had little interference from the tort system
  - Bug in software does *not* result in liability
    - Can't win damages from Microsoft if Windows has a vulnerability
  - This creates enormous freedom to innovate, make mistakes, and learn by doing
  - It is largely an unnoticed freedom – you don't need lawyers to second-guess your code
  - You don't need FDA-style trials for new offerings
  - A key legal doctrine – plaintiffs rarely win damages for mere “economic loss”

## Kinetic Effects (2)

- Thought experiment:
  - A driver-less car crashes into people due to a software bug
  - Car company liable to injured person?
  - Software writer liable either to injured person or car company?
  - From mere “economic loss” to physical damages
  - Also, today software defendants rely on the terms of service
    - That won't work for the driverless car
    - Especially for the person hit by the car who did not consent

# Examples of Kinetic Effects

- Robot research and deployment
  - Research lab and OSHA safety issues?
  - Prototypes of powerful metal objects and what is “reasonable care”?
- Kinetic effects of cyber-security attacks
  - Most experts believe cyber-attacks are *not* an act of war in the absence of kinetic effects
  - But, when take out the power grid or unleash water from a dam, that may be an act of war
    - Role of software researchers and writers when creating these capabilities?

# Internet of Things/Internet of Devices

- Terminology:
  - Many “things” won’t be networked – trees, stars
  - Sensors in devices will be pervasive and networked
  - With Antón and others, IoD privacy and security
- Importance of pervasive networking
  - Networking enables action at a distance
  - By unknown others
  - Proliferation of possible threats

# Internet of Things/Internet of Devices

- Software will be embedded in vast array of every-day objects
- Policy issues proliferate
  - Audio/video recording and surveillance by property owners or people near you (in locker room)
  - Video feed informs the burglar when you leave home
  - What is “open” or “proprietary” or “private”?
  - Kinetic effects of devices – home appliances that glitch and cause harm

# Big Data and Analytics

- Sensors and databases create Big Data
  - *Security*: Big Data breaches
  - *Privacy*: “insights” as privacy invasions
- White House report
  - Possible discriminatory effects: what if target marketing is linked to race or national origin for costly sub-prime loans?
  - Lessons from fair lending for “fair marketing”
    - May need to have procedures in place to detect and mitigate discriminatory effects on suspect classes
  - Those procedures not in place for most analytics today

# Summary on Emerging Importance of Non-Funding Issues

- Computer scientists are core experts for:
  - Physical effects of software
  - Sensors and networking for Internet of Devices
  - Algorithms and other Big Data analytics
- Themes:
  - You are domain experts to contribute to many non-funding issues
  - More non-funding issues may affect your research
- The “grand challenge” for this talk:
  - ***How can the community of computing researchers best inform and shape these policy issues?***

## V. How You and Your Colleagues Can Make a Difference

- Factual claims
  - More policy issues are and will be facing computer scientists beyond the traditional research funding questions
  - Better policy outcomes will result from computer scientist engagement
- To achieve better policy outcomes for society:
  - What you can do as department or school chair
  - What you and your colleagues can do as individuals

# What You Can Do As School/Department Chair

- Send the message that policy engagement is valuable and valued by your school and nation
  - For state/land grant universities, institutional goal to give back to the state and general public
- Provide recognition for public service
  - Recognition within your school/department
  - Highlight policy work by faculty/students to university leadership and the general public
- Value policy-related service during promotion
  - Georgia Tech Faculty Handbook: participation on policy committees is part of employment, *not* “consulting”

# What Should Count as a Scholarly Contribution

- Consider how and when to include non-peer reviewed writing for promotion and salary:
  - Agency commissions paper for its public workshop
  - Professor participates on NRC/NAS study
  - Professor writes testimony, white papers, and other policy-relevant materials
- Include participation on policy boards as indicia of prominence in the field for promotion & salary

## What Individuals Can Do

- Multiple ways to contribute
- Professional organizations:



- Provide helpful domain expertise
- Keep participating
- You may wake up one day as a chair!

## Ways to Engage

- CRA / Fred Schneider's public policy boot camp
- Revive CRA Digital Government Fellows Program
  - Present relevant work at agencies
  - Build relationships and experience
  - Learn how good academic research can converge with national needs
- Summer internships or short-term details
  - Congressional committees
  - Agencies as a scholar-in-residence
    - May be able to get an office if you have salary from elsewhere
    - *Current example:* Randy Bryant @ OSTP

# Federal Advisory Committees

- Approximately 950 federal advisory committees
- About 62,000 members
- Advise policymakers on a wide array of important and challenging issues
- They often crave more technologists
  - (And fewer lawyers and lobbyists)
- Enlist your university government relations office to look for opportunities for nominations

Source: Antón, CRA LISPI Slide

# Many Agencies Can Use Your Help

- **Military**
  - DoD, Air Force Science Board, Navy Science Study Board, etc.
  - NSA Advisory Board and Councils
  - Others
- **Civilian**
  - FTC
  - FCC
  - Commerce Department
  - Many others

# Just Do It

- In Do Not Track standards process, had individuals accredited to participate
  - Jonathan Mayer, CS grad student, one of the most active participants
  - In a consensus process, your expertise can make a big difference
- Write public comments
  - 2008 CS professor (Antón) and law professor (Swire) co-authored FTC comments on technical/policy flaws in cookies
  - Well cited, and was an impetus for the Do Not Track standards process
  - Can do comments within or outside of ACM, CRA, etc.



**Putting it all together to  
have an impact ...**

**(With thanks on the next slide to Professor Antón)**

# How to be effective ...

- ❑ Must be perceived as independent and balanced.
- ❑ Don't push your own agenda or partisan ideology.
- ❑ Must be free from significant conflicts of interest.
- ❑ Must leverage your expertise, rather than your ideology.
- ❑ Read ahead & do your homework.
- ❑ Speak up when you have valuable context, facts, questions, insights.
- ❑ Always thank / complement the briefer before diplomatically pointing out the obvious things they've overlooked or ignored!
- ❑ Be constructive and proactive!
- ❑ If you're a woman, when interrupted (& you will be) speak louder to finish your statement when interrupted by the men, including the 4-stars!

## One Other Tip on Being Effective

- Biggest tip from one expert in computing and policy – find the right level of generality in a law/reg/proposal
- Each computing expert has his or her own priority
  - Fund *exactly this* project
  - Fix *exactly* my problem with a rule
  - Please pass a law with laser focus on that!
- **Warning:** this laser focus on your priority violates the first rule of advocacy: **know your audience.**
  - What are their concerns?
  - What do they need from this meeting?

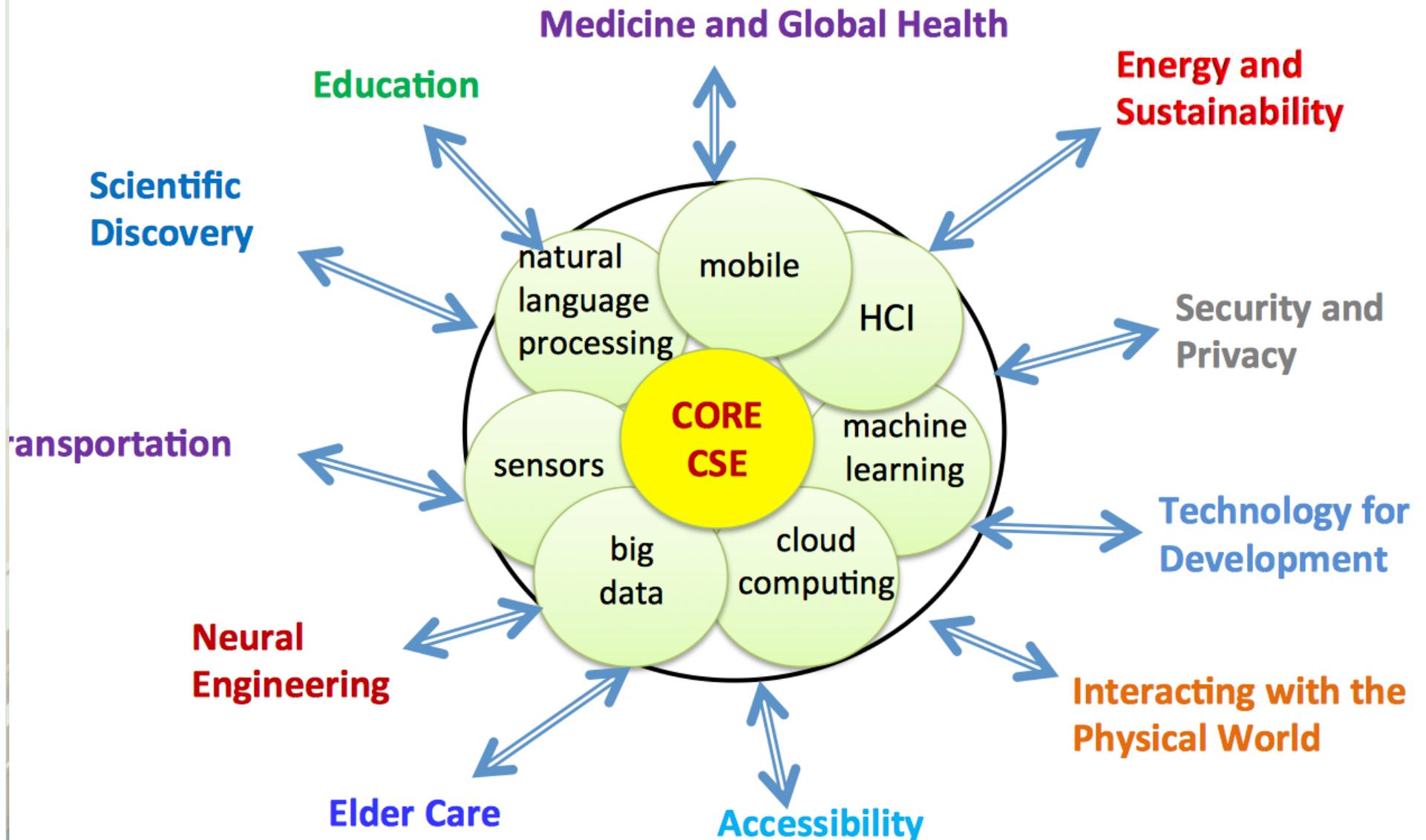
# Advice When Speaking to Policy Maker

- Laws must apply more broadly than one individual's or group's concern
- National laws and regulations
  - Are national (330 million people)
  - Need support from a diverse coalition
  - Often change at long intervals
    - HIPAA law 1996, first amended 2009
- ***The moral:*** provide enough flexibility in the rule to apply across time (a decade or more) and space (national)
  - Know your “ask” – what is needed to fix your problem, but without naming a specific technology
  - Put yourself in the shoes of that policy maker who needs a more general answer

# Lessons Thus Far

- Review Group:
  - No one has research expertise on all of the relevant issues
  - How to build a portfolio of experience so you can be selected to participate and then be effective
- The focus on research funding for computing
  - Funding is vitally necessary
  - Even more necessary as computing becomes increasingly central to our society
- With that said, better not to appear only with your hand out for funding
  - More effective to build relationships on other policy issues & contribute in substantive ways

# A modern view of the field



# Addressing the Grand Challenge

- “Ask not what your country can do for you; ask what you can do for your country”
  - Policy is more than the funding the taxpayers provide to you
  - You are key domain experts
  - You have so much to offer
- The “**grand challenge**” for this talk:

*How can this community of computing researchers best inform and shape these policy issues?*

## Finally, Two Quotes

- “Just because you don’t take an interest in politics doesn’t mean it won’t take an interest in you.”

Pericles, 490-424 B.C.

- “If not me, who? If not now, when?”

Hillel, 1<sup>st</sup> century B.C.

**Thank you!**

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