

NSF Division of Chemistry

“ACI, NSF-CHE and
HSIs”

University of Texas, El Paso
April 23, 2007

10.16.2006



ACI and NSF

ACI: “America's economic strength and global leadership depend in large measure on our Nation’s ability to generate and harness the latest in scientific and technological developments and to apply these developments to real world applications. These applications are fueled by: **scientific research, ... ; a strong education system that equips our workforce with the skills necessary ... ; and an environment that encourages entrepreneurship, risk taking, and innovative thinking.**”

Being broadly inclusive: seeking and accommodating contributions from all sources while **reaching out especially to groups that have been underrepresented**; serving scientists, engineers, educators, students and the public across the nation; and exploring every opportunity for partnerships, both nationally and internationally. (NSF Strategic Plan)



National Science Foundation
WHERE DISCOVERIES BEGIN



«**Research pays off for our economy**. It leads to breakthroughs that inspire new products and have spawned entire industries. In fact, economists estimate that as much as half of post-World War II economic growth is due to R&D-fueled technological progress. **Today's revolutionary technologies and many of our most popular consumer products have roots deep in basic and applied research**. Long before there were computers or the Internet, scientists were unlocking the secrets of lasers, semiconductors, and magnetic materials upon which today's advanced applications were built. This enterprise was fueled in large part by Federal investment in basic research that was necessary but not necessarily profitable for the private sector to undertake over the long term. »

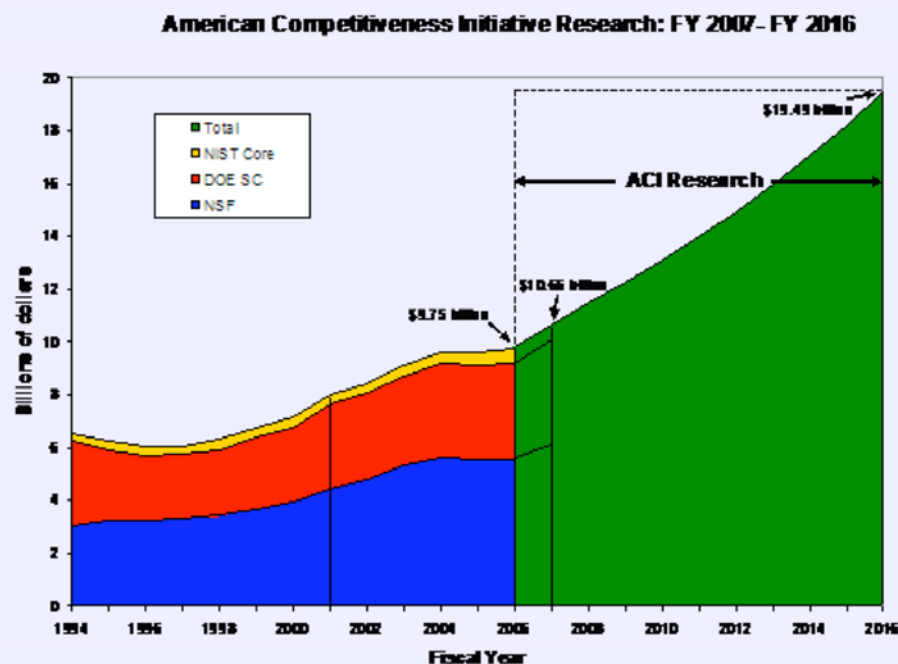


ACI Research Agencies

500 more grants for NSF in 2007

6,400 additional scientists, students, post-doctoral fellows, and technicians to contribute to the innovation enterprise.

Figure 1: ACI Research Funding, 2007-2016.



	FY 2006 Funding	ACI Research FY 2007		ACI Research FY 2016	
	(billions of dollars)	(billions of dollars)	% increase	(billions of dollars)	% increase over FY06
NSF	\$5.58	\$6.02	7.8	\$11.16 ¹	100.0
DoE SC	\$3.60	\$4.10	14.0	\$7.19 ¹	100.0
NIST Core ²	\$0.57 ³	\$0.54	-5.8 ⁴	\$1.14 ¹	100.0
TOTAL	\$9.75	\$10.66	9.3	\$19.49	100.0

¹ ACI doubles total research fund; individual agency allocations remain to be determined.

² NIST core consists of NIST lab research and construction accounts.

³ The 2006 enacted level for NIST core includes \$137 million in earmarks.

⁴ Represents a 24 percent increase after accounting for earmarks.



ACI:

Doubles, over 10 years, funding for innovation-enabling research at key Federal agencies that support high-leverage fields of physical science and engineering: the National Science Foundation, the Department of Energy's Office of Science, and the National Institute for Standards and Technology within the Department of Commerce;

Modernizes the Research and Experimentation tax credit by making it permanent and working with Congress to update its provisions to encourage additional private sector investment in innovation;

Strengthens K-12 math and science education by enhancing our understanding of how students learn and applying that knowledge to train highly qualified teachers, develop effective curricular materials, and improve student learning;

Reforms the workforce training system to offer training opportunities to some 800,000 workers annually, more than tripling the number trained under the current system;

Increases our ability to compete for and retain the best and brightest high-skilled workers from around the world by supporting comprehensive immigration reform that meets the needs of a growing economy, allows honest workers to provide for their families while respecting the law, and enhances homeland security by relieving pressure on the borders.



Goals for ACI Research (Selected NSF Relevant)

While expected new innovations are impossible to predict with specificity, certain capabilities and technology platforms can be anticipated as a result of the ACI:

- World-class capability and capacity in **nanofabrication and nanomanufacturing** (NSF, DoE, NIST)
- Chemical, biological, optical, and electronic **materials** breakthroughs critical to cutting-edge research in nanotechnology, biotechnology, alternative energy, and the hydrogen economy through essential infrastructure (DoE, NIST, NSF)
- World-leading **high-end computing capability** (at the petascale) and capacity, coupled with advanced networking, to enable scientific advancement through modeling and simulation at unprecedented scale and complexity across a broad range of scientific disciplines and important to areas such as intelligent manufacturing, accurate weather and climate prediction, and design of safe and effective pharmaceuticals (NSF, DoE)
- Overcoming technological barriers to the practical use of **quantum information processing** to revolutionize fields of secure communications, as well as quantum mechanics simulations used in physics, chemistry, biology, and materials science (DoE, NIST, NSF)
- Overcoming technological barriers to efficient and economic use of hydrogen, nuclear, and solar **energy** through new basic research approaches in materials science (DoE, NSF, NIST)
- Addressing gaps and needs in **cyber security** and information assurance to protect our IT-dependent economy from both deliberate and unintentional disruption, and to lead the world in intellectual property protection and control (NSF, NIST)
- Improvement of **sensor and detection capabilities** that will result in world-leading automation and control technologies with a broad range of applications important to areas such as national security, health care, energy, and manufacturing (NSF)
- Advances in materials science and engineering to develop technologies and standards for improving structural performance during hazardous events such as earthquakes and hurricanes (NIST, NSF)

American Competitiveness Initiative: Education

Training and Recruiting Highly Qualified Teachers

Encouraging Students to Major in STEM Fields (opportunity for URMs)

Research-Based Teaching Materials and Methods

American Competitiveness Initiative: Workforce Training

A Commitment to Community Colleges

American Competitiveness Initiative Goals:

300 grants for schools to implement research-based math curricula and interventions

10,000 more scientists, students, post-doctoral fellows, and technicians provided opportunities to contribute to the innovation enterprise

100,000 highly qualified math and science teachers by 2015

700,000 advanced placement tests passed by low-income students

800,000 workers getting the skills they need for the jobs of the 21st century



MPS FY 2008 Focus Areas

(Astronomy, Chemistry, Materials, Mathematics, Physics)

- **Physical sciences at the nanoscale**
- **Science beyond “Moore’s Law”**
- **Physics of the universe**
- **Complex systems**
- **Fundamental mathematical and statistical science**
- **Sustainability**
- **Cyber-enabled Discovery and Innovation**



National Science Foundation
WHERE DISCOVERIES BEGIN



AMERICAN
COMPETITIVENESS
INITIATIVE



Preparing Workforce of 21st Century

Workforce and Learning:

Alignment of ACI with NSF Strategic Goals

- **MPS investments in Foundation, Directorate, and Division activities support workforce development throughout the educational continuum**
- **Support for young investigators (*e.g.*, CAREER),**
- **Enhancing educational and career opportunities for undergraduate students (*e.g.*, REU, URC),**
- **Enhancing professional development of K-12 science educators through research experiences (*e.g.*, RET),**
- **Broadening Participation (*e.g.*, Research Partnerships for Diversity).**

ACI Fellows

MPS will pilot an ACI fellows activity that will:

- **Respond directly to ACI workforce goals of increasing number of globally competitive US students & research scientists in MPS areas,**
- **Link undergraduate, graduate, postdoctoral, and early- to mid-career faculty research experiences,**
- **Address ACI-relevant and MPS focus areas,**
- **Tailored to each discipline's needs & strengths.**

TRANSFORMATIVE RESEARCH

Enhancing Support of Transformative Research at the National Science Foundation
– adopted by NBS on March 29, 2007 (subject to editing)

“There exists a substantial external perception that NSF does not support transformative research.”

“Transformative research is defined as research driven by ideas that stand a reasonable chance of radically changing our understanding of an important existing scientific or engineering concept or leading to the creation of a new paradigm or field of science or engineering. Such research also is characterized by its challenge to current understanding or its pathway to new frontiers.”

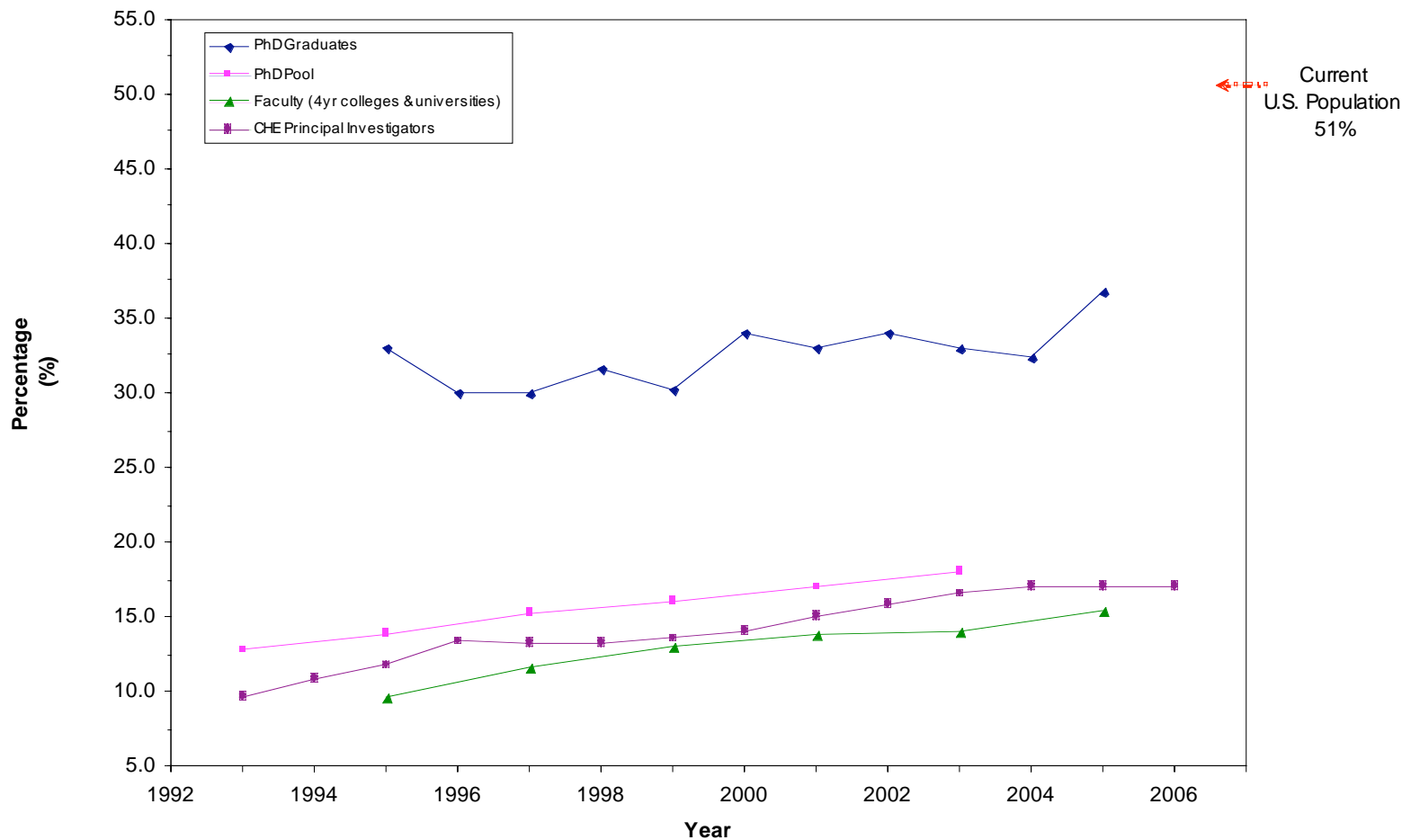
Key Recommendation: That “NSF develop a distinct, Foundation-wide **Transformative Research Initiative (TRI)** distinguishable by its potential impact on prevailing paradigms and by the potential to create new fields of science, to develop new technologies, and to open new frontiers.”

MPS will pilot an effort in transformative research in FY 2008

Major focus will be on program and division-level activities with coordination at the directorate level.

Status of Ph.D. Women in Chemistry

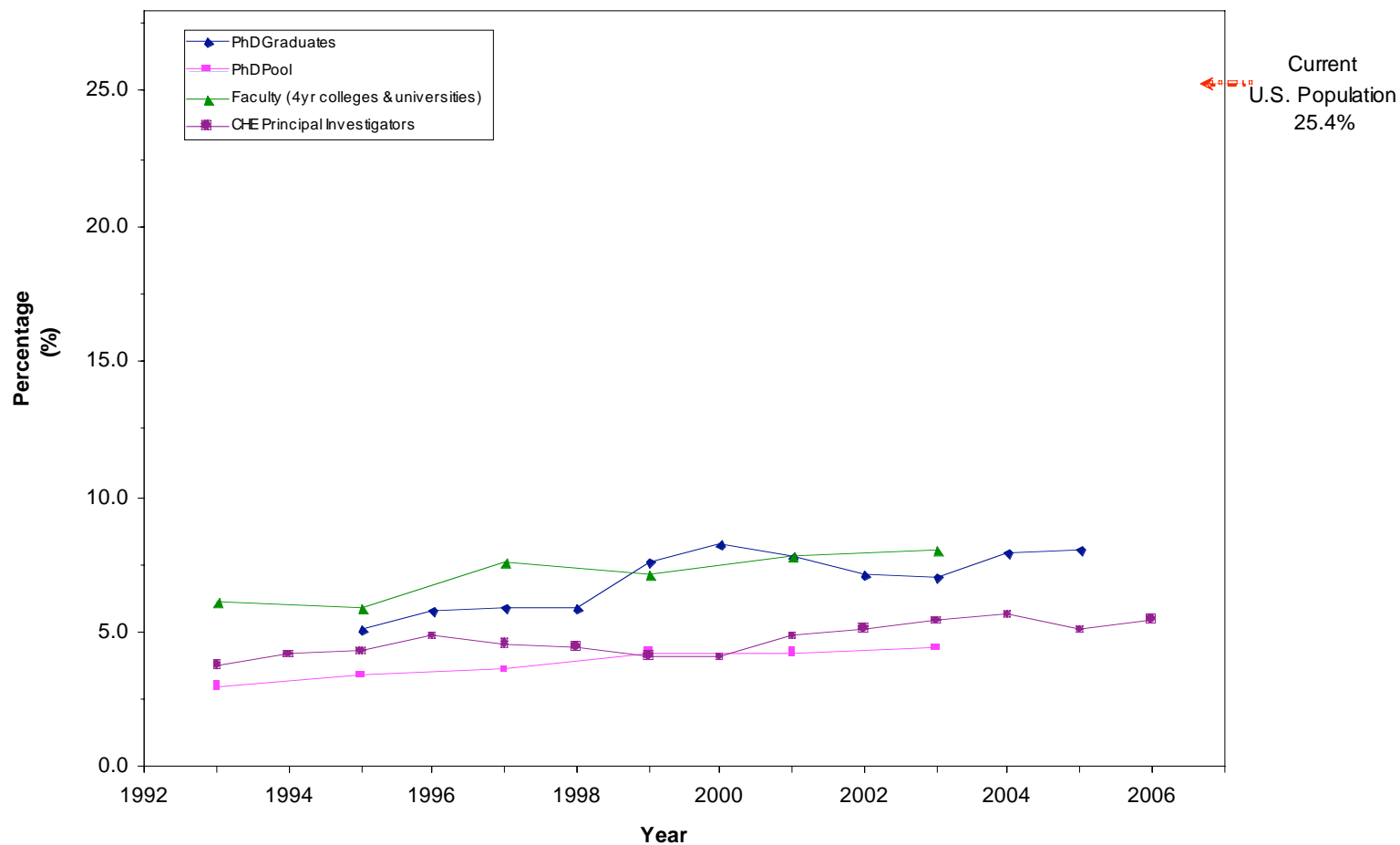
% Females in Chemistry



Status of Ph.D. URM in Chemistry

% Under-Represented Minorities in Chemistry

(African American, Hispanic, Native American including American Indian/Alaskan Native, Native Hawaiian or Pacific Islander)



CHE FY06

- January 2006 “Gender Equity in Academic Chemistry” Workshop
 - “top 50” -> 55 dept. chairs plus other invitees
 - NSF/NIH/DOE funding & senior mgmt. presence
 - plenaries (incl. Sen. Wyden); data
 - interactive skit; implicit bias; Title IX; agency programs (e.g., ADVANCE)
 - panels/breakouts: depts., institutions, funding agencies



FY07 and Beyond

- CHE panel presentation on evaluation bias
- New CHE CRIF:MU proposal requirement of department plan for broadening participation
- CHE Broadening Participation Plan adopted unanimously Nov. 2006
- Study of bias in CHE MRR's with SRS
- Follow-up to Gender Equity Workshop
 - Leadership training for chairs at CCR Meeting in April 2007
- Workshop on URM in chemistry in September 2007