



Society for the Advancement of
Material and Process Engineering

Partnerships to Meet Critical National Needs

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National Institute of Standards and Technology • U.S. Department of Commerce



Why Are We Here?

Unparalleled opportunities await individuals and companies that prepare for them. A new emphasis on “Green”, renewable energy, and developing technology is coming to Washington, DC.

Changing Times – New Opportunities – Are You Prepared?



National Imperatives

Administration Actions and Priorities

- Employ science, technology and innovation to solve our nation's most pressing problems
 - Affordable Health Care
 - Climate-friendly Energy
 - Modernize Public Safety Networks
 - Advance Biomedical and Stem Cell Research
- A transparent and connected democracy
- Improve America's competitiveness



Rejuvenating American Innovation

- **Resources commensurate with the challenge**
 - Talent - educated and motivated workforce of diverse skills and interests
 - Investment - provide resources for invention and innovation
 - Infrastructure - physical environments to support innovation and business conditions that encourages risk-taking and collaborative endeavors

- **Public private partnerships that engage all tiers of the innovation ecosystem**
 - Local, State, and Federal
 - Foundations, consortia, philanthropists
 - Corporations, venture capitalists, angels, investors

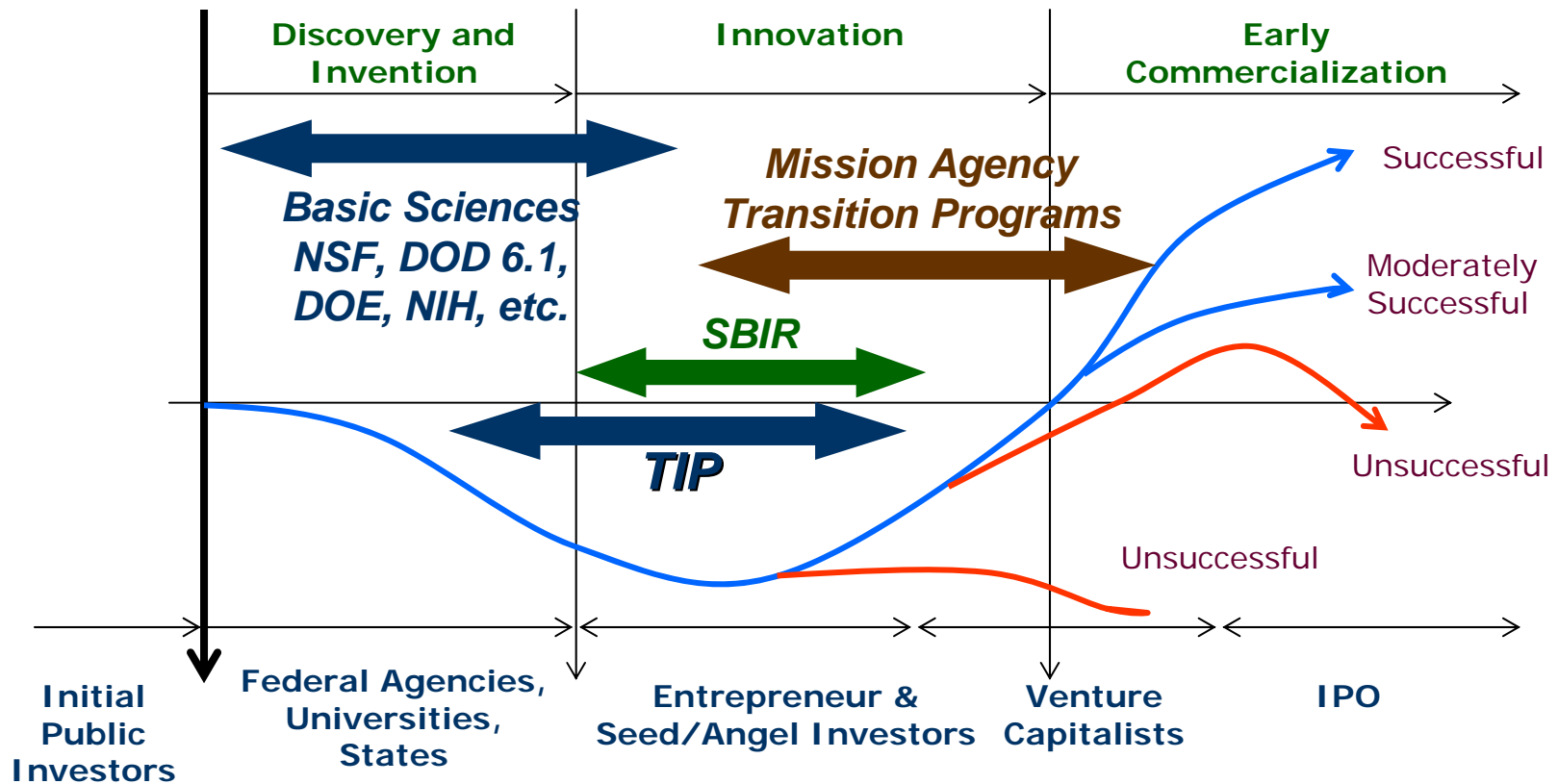
- **Strategies that adjust to the realities and opportunities of the day**
 - Master the practice of clusters, networks, and open innovation
 - Capture talent and resources in social entrepreneurship and innovation

- **Policy and culture that consistently rewards invention, innovation, and competitiveness**



Science and Technology Funding Transition

Cash Flow for Transformative R&D





TIP's Purpose

- Assist United States businesses and institutions of higher education or other organizations, such as national laboratories and nonprofit research institutions
- Support, promote, and accelerate innovation in the United States through high-risk, high-reward research
- In areas of *critical national need*

*America COMPETES Act, (PL 110-69)
August 9, 2007*



TIP is Part of NIST

Funding

- \$65 million for FY 2009, including management of ongoing TIP and Advanced Technology Program awards

TIP draws upon NIST scientific and technical expertise

- Help identify and select areas of critical national need for TIP funding
- Evaluate proposals

NIST benefits from collaborating with TIP

- Apply understandings of critical national needs to NIST research programs
- Enhance knowledge, skills, abilities through TIP program development





TIP's *Critical National Need* Framework

- TIP uses a *Critical National Need* identification & selection process to shape its competitions and collaborative programs
- What is a *Critical National Need*?
 - *An area that justifies government attention because the magnitude of the problem is large and the societal challenges that need to be overcome are not being addressed, but could be addressed through high-risk, high-reward research*



Societal Challenge

What is a TIP Societal Challenge?

A problem or issue (*not a solution or answer*)
confronted by society that

- when not addressed could negatively affect the overall function and quality of life of the nation, and as such justifies government attention
- can be addressed through high-risk, high-reward research



Key Features of TIP

■ Novel Purpose

- Address societal challenges not being addressed in areas of critical national need with benefits that extend significantly beyond proposers

■ Scientific & Technical Merit

- High-risk, high-reward research

■ Transformational Results

- Strong potential for advancing state-of-the-art and contributing to U.S. science and technology base, and strong potential for transforming the Nation's capacity to deal with major societal challenges



Key Features of TIP

(cont'd)

■ Recipients CAN be

- Small and medium-sized, U.S., for-profit businesses
- Institutes of higher education
- National laboratories (with the exception of NIST)
- Nonprofit research institutes
- Other organizations

■ Large companies (i.e., Fortune 1000 companies)

- MAY participate as a joint venture member and fully fund their participation, a contractor, or an informal collaborator
- MAY NOT directly receive federal funds



TIP Projects

■ Structure

- Single company projects led by a small or medium-sized U.S. company
- Joint venture projects of either:
 - 1) at least two for-profit U.S. companies with the project lead being a small or medium-sized company, or
 - 2) at least one small or medium-sized company and one institute of higher education or other eligible organization with the lead being either the small or medium-sized company or the institute of higher education

■ Funding

- Single company projects up to \$3M over a maximum of three years
- Joint Venture (JV) projects may be funded up to \$9M over a maximum of five years
- Note: TIP funds direct project costs only

■ Cost share

- At least 50% of the yearly total project costs – direct plus indirect
- Composed of both cash and in-kind



National Challenges

- TIP seeks input from a host of external stakeholders and organizations
 - Government agencies and advisory bodies
 - Science and Technology Policy Institute
 - Industry organizations, leading researchers from academic institutions, and others

- Call for White Papers on Critical National Needs
 - Ongoing, interim due date July 13, 2009
 - “A Guide for Preparing and Submitting White Papers on Areas of Critical National Need” – December 2008
 - Federal Register Notice



Current TIP Critical National Need and Interest Areas

Critical National Need Areas

- *Civil Infrastructure*
- *Manufacturing*

Interest Areas

- *Energy*
- *Green Technologies*
- *Healthcare*
- *Networks*
- *Water*

This is a list of Critical National Need and interest areas that TIP has identified to date. It is not exhaustive and others may be added in the future



Frontiers in Advanced Materials



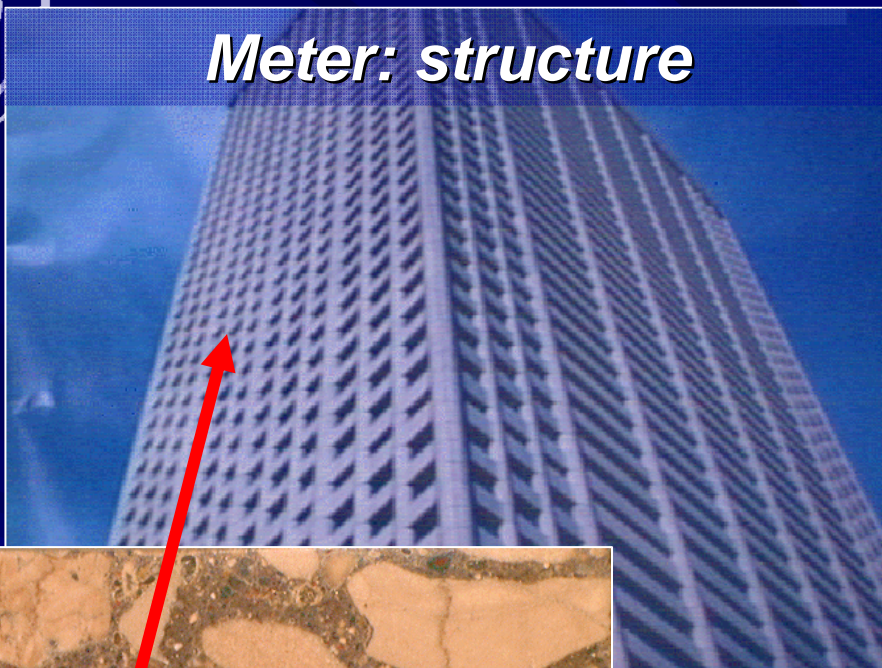
Some examples include:

- High-strength, high-stiffness with light-weight
- Better corrosion resistance and fire performance
- Less maintenance with better environmental durability
- Cost-effective manufacturing processes
- Multifunctional materials
- Expanded (large-scale) commercial and industrial utilization...

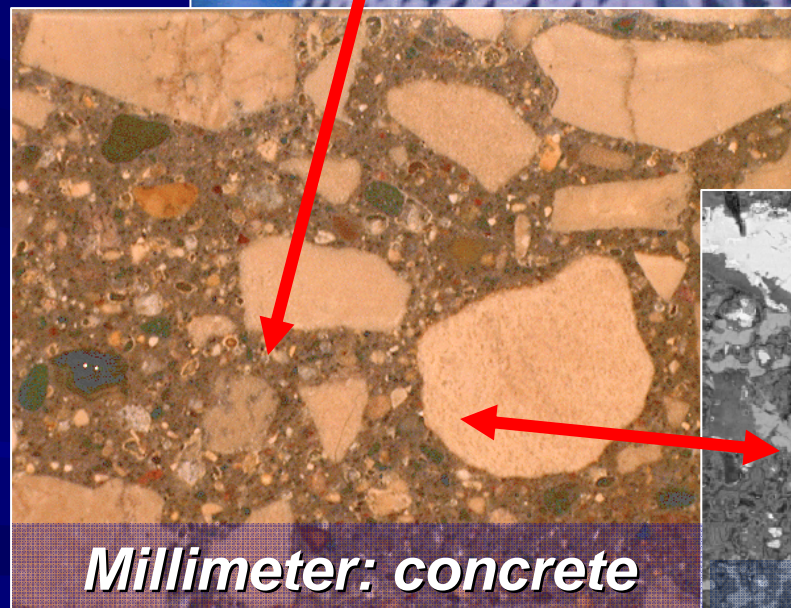
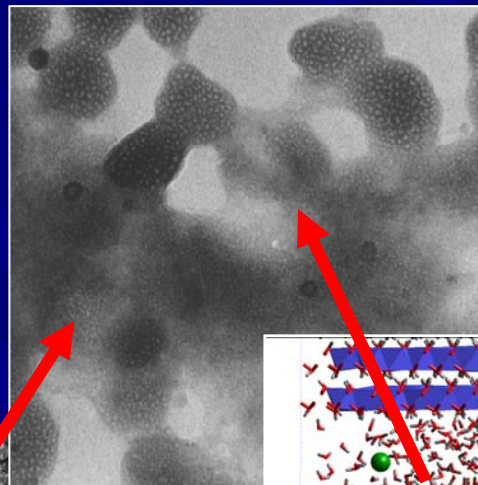
The Length Scales of Concrete



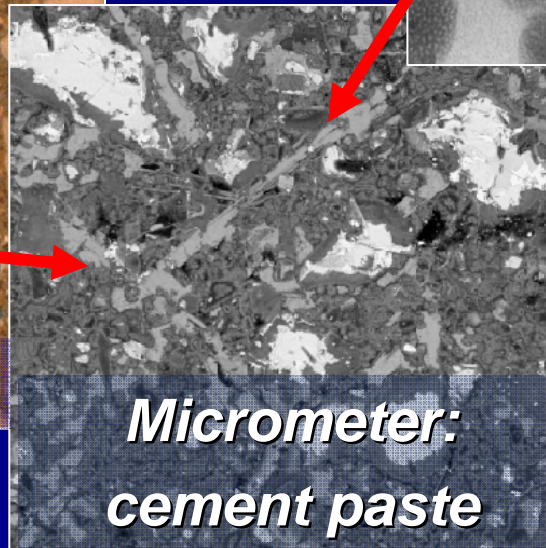
Meter: structure



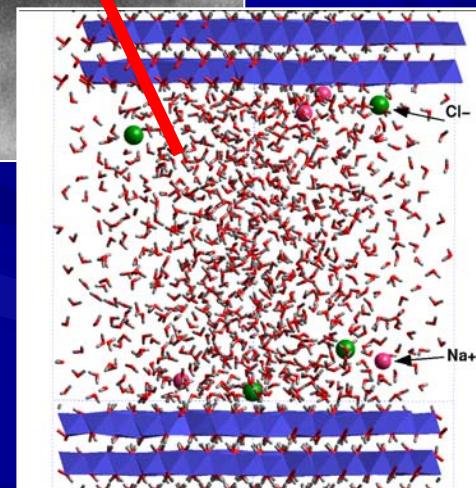
Nanometer: C-S-H



Millimeter: concrete



Micrometer: cement paste



Angstrom: C-S-H layers



What can SAMPE do?

- **Champion technology innovation in material and process**
 - Materials and process innovation important for addressing national challenges
- **Promote multidisciplinary research**
- **Catalyze industry-university research partnerships through Federal research fund**



What TIP Needs from You

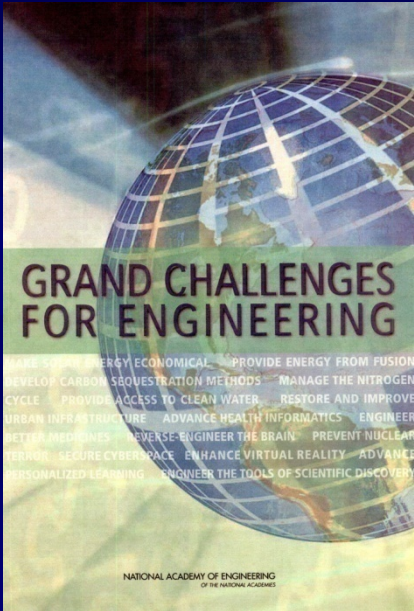
- Industry, non-proprietary white papers that present your views on areas of critical national need
- Innovation community members – academic, industrial, national/private laboratories – with a commitment to transform the nation
- Innovators that will strengthen U.S. global competitiveness

Visit TIP's website for more information

<http://www.nist.gov/tip>



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... the century ahead poses challenges as formidable as any from millennia past. As the population grows and its needs and desires expand, the problem of sustaining civilization's continuing advancement, while still improving the quality of life, looms more immediate.

*Grand Challenges for Engineering
National Academy of Engineering
2008*



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Addendum

2009 TIP Competition Civil Infrastructure Manufacturing



TIP 2009 Competition

Area A: Civil Infrastructure



- Over 4 million miles of the nation's poorly conditioned roads cost the U.S. \$54 billion a year in repairs
- More than 27% of the nation's 600,000 bridges are rated structurally deficient or functionally obsolete
- Water main leakages and breaks consume 6 billion gallons of treated water each day

Failure to reverse a trend of increasing highway infrastructure deterioration will lead to reductions in national and economic security, lower worker productivity, and an overall reduction in the quality of life



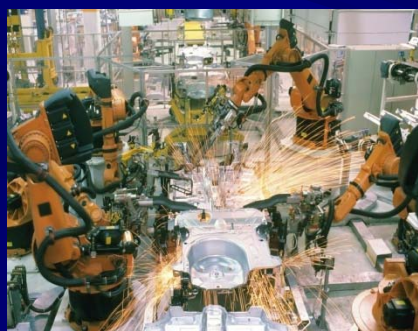
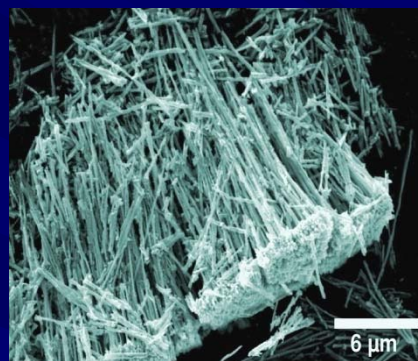
2009 Competition

Area A: Civil Infrastructure

- Critical National Need
 - Civil Infrastructure
- Societal Challenge
 - Managing the structural integrity of the United States' infrastructure
 - The absence of cost-effective means for establishing accurate assessments of the integrity and condition of civil infrastructure elements and for providing long-lived repairs to deteriorating infrastructure
- TIP's Response for 2009
 - “Advanced Sensing Technologies and Advanced Repair Materials for the Infrastructure: Water Systems, Dams, Levees, Bridges, Roads, and Highways”
 - Two elements:
 - Inspection and/or Monitoring Technologies
 - Repair/Retrofit Materials and Application Technologies



TIP 2009 Competition Area B: Manufacturing



- Manufacturing is a significant part of the U.S. economy
 - In 2007, represented 11.7% of U.S. GDP, 10.1% of U.S. employment
- Manufacturing sector struggling
 - In 2002, the U.S. manufacturing sector represented 5th largest economy in the world, by 2007 had fallen to 8th largest
 - Institute for Supply Management New Orders Index remains negative for 15 consecutive months

Failure to invest in technology advances that can be implemented by the manufacturing sector will result in continued reductions in economic security, and an overall reduction in the quality of life



2009 Competition Area B: Manufacturing

- Critical National Need
 - Manufacturing
- Societal Challenge
 - Providing manufacturers and end users
 - Improved access to adequate quantities of advanced materials at competitive costs
 - That allow evaluation and utilization of these materials in innovative ways
- TIP Response
 - “Accelerating the Incorporation of Materials Advances into Manufacturing Processes” (limited to: *nanomaterials; superalloys, alloys and smart materials; and composites*)
 - Two elements:
 - Process scale-up, integration, and design of advanced materials
 - Predictive modeling for advanced materials and materials processing



2009 TIP Competition Important Dates

- The Competition is currently **OPEN**
- Paper submission or electronic submission via Grants.gov
- The **deadline** is: **Tuesday, June 23, 2009**

*For more information, please see www.nist.gov/tip
Follow link to FY 2009 Competition*