Outcomes—Telling the Story

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Demonstrate Value

- Convey excitement/significance of major research and educational outcomes
- Capture unique, transformative nature of work
- Demonstrate major societal benefits

Opportunity

- “Make the case” for engineering
  - » Demonstrate how engineers meet societal challenges and shape the future
  - » Put engineering in context
- Highlight emerging areas/opportunities

FY 2010

- Results from March 1, 2009-February 28, 2010
- Reflect geographic diversity
- Include retrospective highlights
  - » major achievements in areas of sustained effort by the center

Focus: Activities that Advance

- Interdisciplinary, high-risk, and potentially transformative research/education
- Translation of promising fundamental research into innovations that can be commercialized
- National security, prosperity, economic competitiveness, and job creation
- Innovative energy technologies
- Health and the quality of life
- New materials and devices

Focus: Activities that Advance

- The infusion of computational thinking into all areas of engineering (NSF 10-506)
- Understanding and development of cyber-physical systems
- World-class engineering workforce and a technically literate population
- Presidential priority programs: Graduate Research Fellowships, CAREER, Advanced Technology Education, Climate Change Education, REgaining our ENERGY Science and Engineering Edge, National Nanotechnology Initiative

Capture

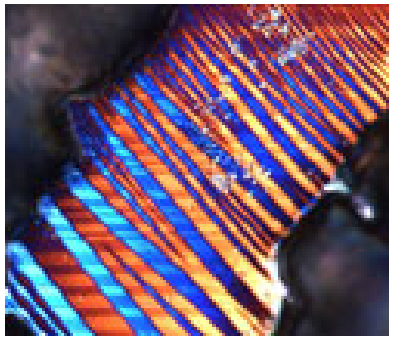
- Research, education, and infrastructure
- Transformative activities—why transformative
- Broader impacts/societal benefits
  - » Broadening participation
  - » Education/workforce
  - » Dissemination

Telling the Story

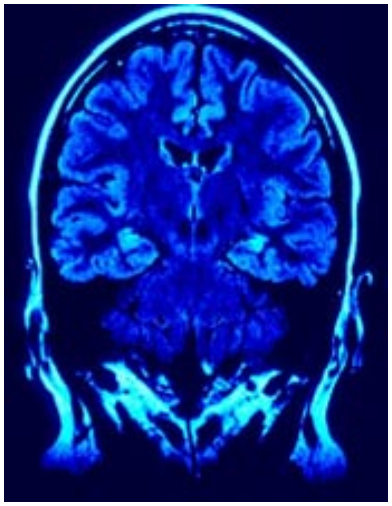
- Clear and concise
- Compelling images
- Intelligent generalist

Images/Video

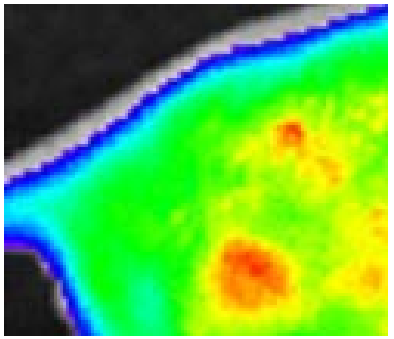
- highest possible quality
- attractive, easy to understand



Magnetic shape-memory alloys
Credit: Markus Chmielus (Boise State Univ./Helmholtz Ctr. Berlin), Xuexi Zhang (Northwestern Univ./Harbin Inst. of Technology), Cassie Witherspoon (Boise State Univ.), David C. Dunand (Northwestern Univ.), and Peter Müllner (Boise State Univ.)



Brain scan
Credit: Morguefile



Mouse hindquarter containing a tumor
Credit: Ji-Ho Park, UCSD

WHY

- Describe the problem/issue that motivated the research
- What are the key knowledge gaps?

WHAT

- Start highlight with a brief summary of the results
- Describe the results and put them in the context of other research

HOW

- Describe the approach and why it is unique

WHO CARES?

- Why is this result important?
- How will it benefit society?

WHAT

SynBERC researchers authored articles in May 2008 in the prestigious journals *Nature* and *Nature Biotechnology* outlining some of the first steps toward custom-programming cells to adopt specific shapes or functions.

Credit: SynBERC

WHAT

Two researchers at the NSF-funded Synthetic Biology Engineering Research Center (SynBERC) at the University of California, San Francisco have demonstrated the possibility of "reassembling" and reprogramming living cells to serve as mini-robots in the body to treat disease.

WHAT

This work by SynBERC Deputy Director Wendell Lim and postdoctoral fellow John Dueber demonstrates the feasibility of reprogramming complex cellular circuits to give them the flexibility and diversity of modern electronic circuits– a major goal for the emerging field of synthetic biology.

HOW

They **engineered designer proteins that can be integrated into cell circuits**, allowing them to be reprogrammed to form a desired shape in response to novel biochemical signals. They induced the cells to form either long, spiked structures (filopodia) or flat, extended sheets (lamellipodia). The change in shapes was triggered by activating a common signaling molecule (protein kinase). The protein transferred a common activating chemical—a phosphate group—to the engineered protein to turn it on.

HOW

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HOW

The researchers also showed that the engineered circuit proteins can be designed to show digital behavior—like the core binary elements found in computer circuits. They engineered a protein that digitally switches on and off its ability to activate the biochemical reactions that drive the change in cell shape.

SO WHAT?

This groundbreaking research advances our understanding of genetic engineering. It demonstrates the feasibility of reprogramming living cells to treat disease and provides the basis for novel, more effective medical technologies.

BROADER IMPACTS

Both graduate and undergraduate students were involved in this research. The results were disseminated through major scientific publications.

Highlights

- Inform A/Cs, COVs, OMB, Congress, taxpayers about NSF-funded activities
- Capture the essence of research and education at the frontiers and convey their excitement
- Highlight emerging opportunities and challenges

Many Uses

- AC/GPA assessment of NSF performance in relation to its strategic goals
- Input to budget, briefings, talks, special events, NSF website, outreach to media, and new public highlights website

Many Uses

- Promote public understanding of science and engineering
- Recruit workforce of the future

Stay in Touch

- Partners in disseminating the results of NSF-funded activities
- Effective communication critical to future success of science and engineering

THANK YOU!!!