Celebrating 60 Years of Discovery

Directorate for Engineering
FY 2011 Budget Request

Thomas W. Peterson
Assistant Director for Engineering
March 16, 2010

ENG Use of ARRA Funding

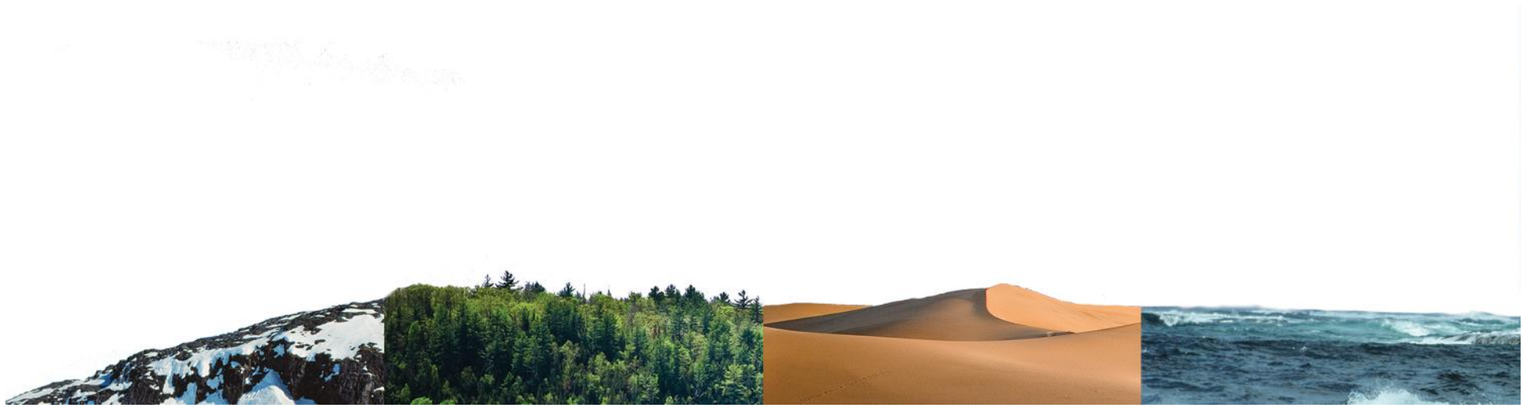
- Young Investigators
- Education and Workforce Development
- High Risk / High Reward
- Translational Research

ENG Use of ARRA Funding

- Young Investigators
  - 80 additional CAREER awards
  - 15 additional BRIGE awards
  - 16 additional GRF in addition to the 80 Women in Engineering (WENG) GRF Fellows funded annually by ENG
  - 1 additional IGERT in the area of energy
- Education and Workforce Development
  - 40 Postdocs in Industry
  - 17 additional REU/RET awards
  - 76 additional Education awards, including 4 for veterans/GI Bill activities
- High Risk / High Reward
  - 7 additional EFRI awards
- Translational Research
  - 257 additional small business awards (50% increase)
  - 9 additional I/UCRC awards
  - 2 additional PFI awards
  - 21 additional GOALI awards

Areas of Emphasis in Engineering

- Students and young investigators
- Potentially transformative research
- Innovation and translational research



Young Investigators

- Research Experiences for Teachers
- Research Experiences for Undergraduates
- Graduate Research Fellowships
- CAREER awards

RET teachers introduce girls to infrastructure renewal concepts. *Credit: Univ. of Cincinnati College of Engineering and College of Applied Science.*

Student researchers sample contaminated sediment. *Credit: Karl Rockne, Univ. of Illinois at Chicago*

Potentially Transformative Research

- Emerging Frontiers of Research and Innovation
- Interdisciplinary research
- Disciplinary research

Engineers examine the scoured trench behind the concrete floodwall next to the catastrophic levee breach at the west end of the Lower Ninth Ward of New Orleans. *Credit: Rune Storesund*

An anatomically correct testbed hand. *Credit: Ellen Garvens, University of Washington*

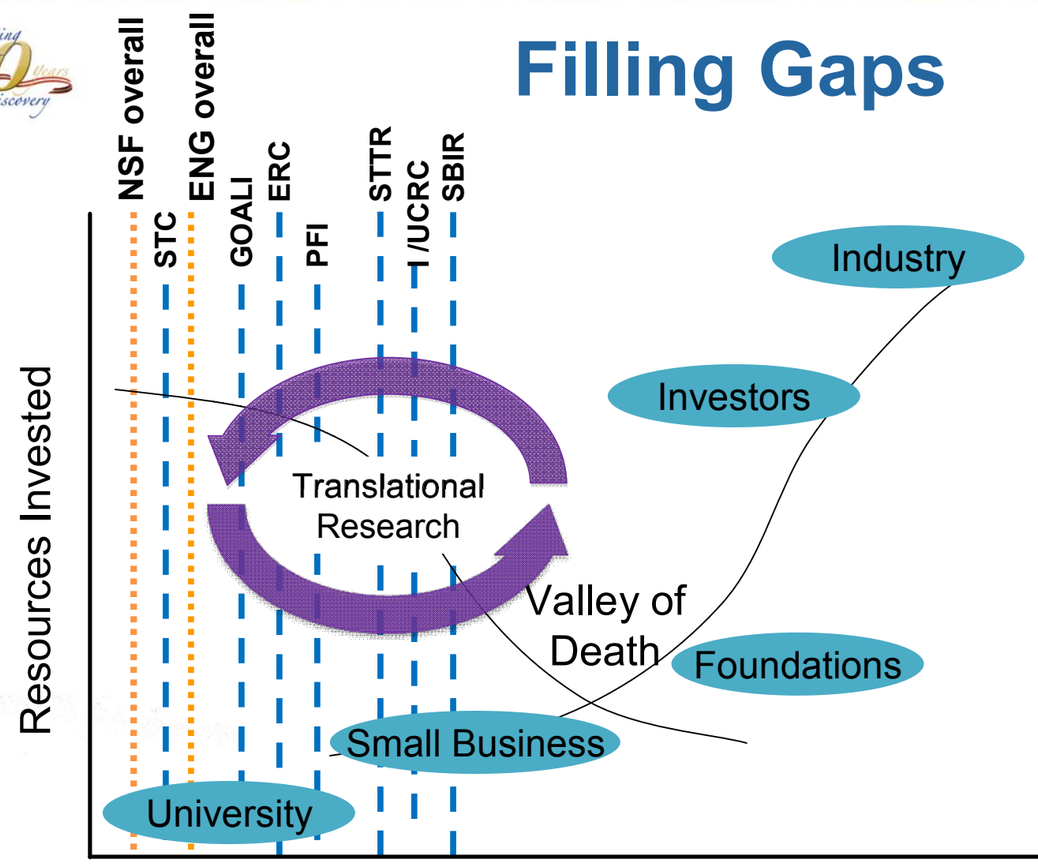
Growing microalgae for renewable fuel. *Credit: Phillip Savage, Univ. of Michigan*

Innovation

- Engineering Research Centers
- Industry/University Cooperative Research Centers
- Partnerships for Innovation
- Small Business Innovation Research/Small Business Technology Transfer

The leaves of *Artemisia annua*, the sweet wormwood tree, are the source of artemisinin. *Credit: Lawrence Berkeley National Laboratory*

Filling Gaps

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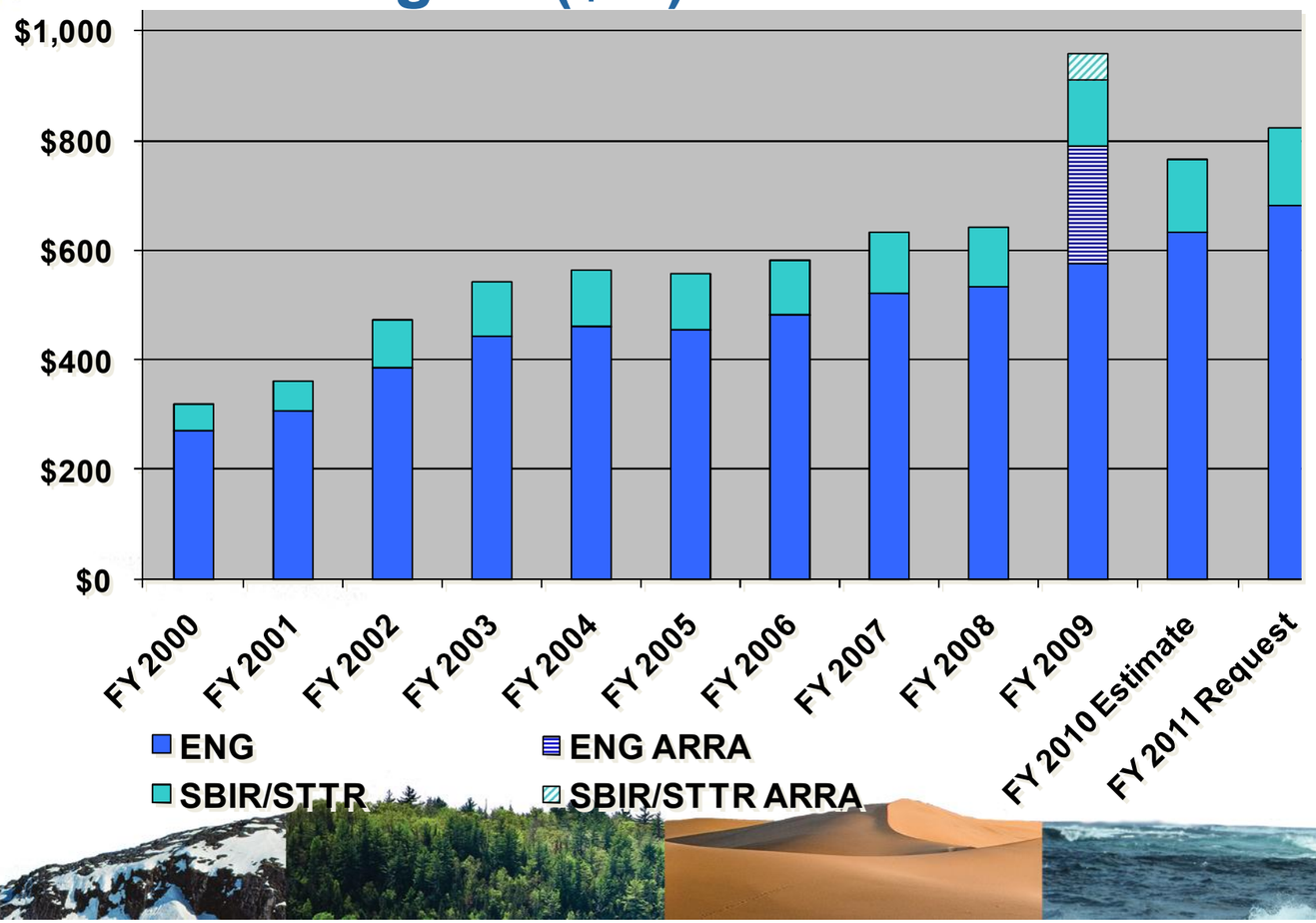
ENG Request
Overview

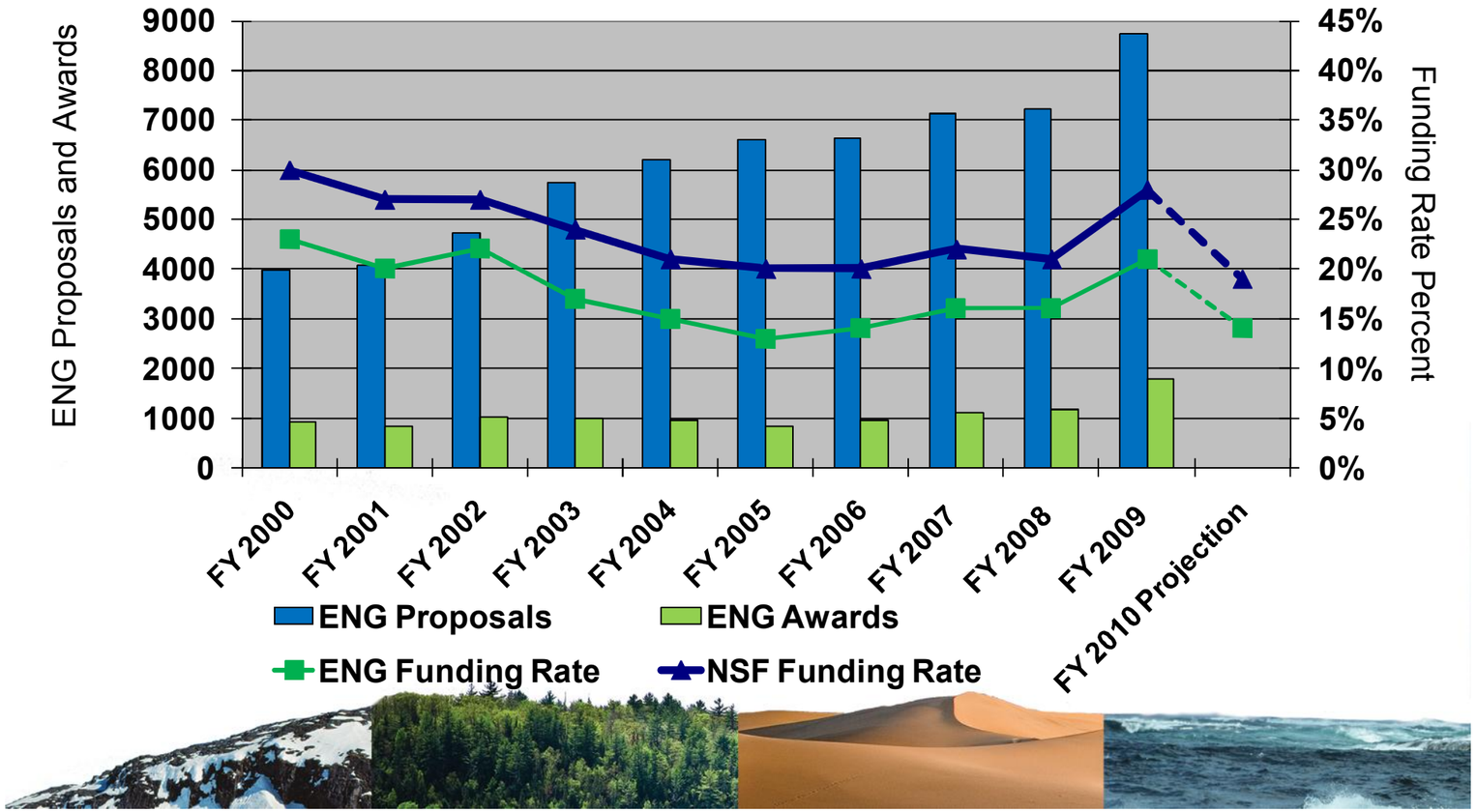
NSF R&RA Budget ($M)

Directorate	FY 2009 Omnibus Actual	FY 2009 ARRA Actual	FY 2010 Estimate	FY 2011 Request	FY 2011 Request			
					Change over FY 2009 Omnibus		Change over FY 2010 Estimate	
					Amt	%	Amt	%
BIO	$656.62	$260.00	$714.54	$767.81	$111.19	16.9	$53.27	7.5
CISE	574.50	235.00	618.83	684.51	110.01	19.1	65.68	10.6
ENG *(less SBIR/STTR)*	574.60	215.08	618.16	682.81	108.21	15.8	64.65	10.5
SBIR/STTR	90.39	49.91	125.77	142.86	52.47	36.7	17.09	13.6
GEO	808.53	347.00	889.64	955.29	146.76	18.2	65.65	7.4
MPS	1243.88	474.97	1,351.84	1,409.91	166.03	13.3	58.07	4.3
SBE	240.56	84.97	255.25	268.79	28.23	11.7	13.54	5.3
OCI	199.23	80.00	214.28	228.07	28.84	14.5	13.79	6.4
OISE	47.45	13.98	47.83	53.26	5.81	12.2	5.43	11.4
OPP	473.55	171.89	505.16	527.99	54.44	11.5	22.83	4.5
IA	241.58	129.85	275.04	295.93	54.35	22.5	20.89	7.6
U.S. Arctic Research Commission	1.50	0.00	1.58	1.60	0.10	6.7	0.02	1.3
Research & Related Activities	$5,152.39	$2,062.64	$5,617.92	$6,018.83	$866.44	16.8	$400.91	7.1

ENG and SBIR/STTR Budgets ($M)



ENG and NSF Research Grant Proposals and Awards



NSF ENG Organization

Emerging Frontiers in Research and Innovation (EFRI)
Sohi Rastegar

Office of the Assistant Director
Thomas Peterson, Assistant Director
Michael Reischman, Deputy Assistant Director

Senior Advisor for Nanotechnology
Mihail Roco

Program Director for Diversity
Omnia El-Hakim

Engineering Education and Centers (EEC)
Allen Soyster

Chemical, Bioengineering, Environmental, and Transport Systems (CBET)
John McGrath

Civil, Mechanical, and Manufacturing Innovation (CMMI)
Steven McKnight

Electrical, Communications, and Cyber Systems (ECCS)
Robert Trew

Industrial Innovation and Partnerships (IIP)
Kesh Narayanan

ENG Budget ($M)

	FY 2009 Omnibus Actual	FY 2009 ARRA Actual	FY 2010 Estimate	FY 2011 Request	Change over FY 2009 Omnibus		Change over FY 2010 Estimate	
					Amt	%	Amt	%
CBET	$146.00	$60.57	$156.82	$169.07	$23.07	15.8	$12.25	7.8%
CMMI	174.93	57.96	188.00	206.50	31.57	18.0	18.50	9.8
ECCS	87.21	45.57	94.00	103.00	15.79	18.1	9.00	9.6
EEC	118.23	32.18	124.11	138.40	20.17	17.1	14.29	11.5
IIP	112.12	54.70	152.00	177.70	65.58	58.5	25.70	16.9
SBIR/STTR	*90.39*	*49.91*	*125.77*	*142.86*	*52.47*	*58.0*	*17.09*	*13.6*
EFRI	26.50	14.00	29.00	31.00	4.50	17.0	2.00	6.9
ENG TOTAL	$664.99	$264.99	$743.93	$825.67	$160.68	24.2%	$81.74	11.0%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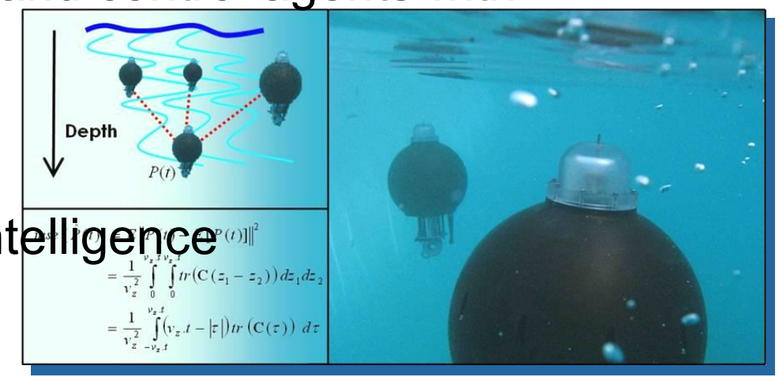
Collaborative
Investments

Advanced Manufacturing

- Transformative manufacturing technologies, including
  - **Nanomanufacturing** research and the application of nanotechnology to existing manufacturing industries;
  - Fundamental research associated with **Science and Engineering Beyond Moore's Law** (SEBML), its manufacturing challenges and opportunities; and
  - Basic research efforts on **manufacturing enterprise systems** and **complex systems design and manufacturing**

Cyber–Physical Systems

- Integration of information and control agents with physical hardware.
  - Devices
  - Components
  - Systems with built-in intelligence
- Applications in
  - Medicine
  - Energy distribution and control
  - Environmental monitoring and sensing
  - Education and training
- Joint activity between ENG and CISE



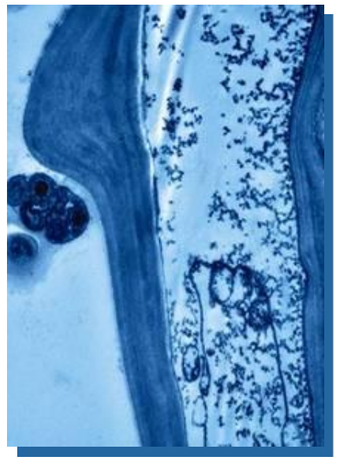
Sensor-equipped underwater drifters self-localize through networked underwater communications and smart formation selection. *Credit: UCSD*

Innovation Ecosystem

- Partnerships for Innovation will provide research grants to universities in partnership with other institutions to increase the economic and social impacts of university research to:
  - Increase the engagement of faculty and students across all disciplines in the innovation and entrepreneurship process;
  - Increase the impact of the most promising university innovations through commercialization, industry alliances, and start-up formulation; and
  - Develop a regional community that supports the “innovation ecosystem” around the university.

National Nanotechnology Initiative

- Nanomaterials and nanodevices
  - Computing
  - Communications
  - Sensing
  - Energy (for example, solar)
- Nanosystems
- Nanomanufacturing
- Environment, health, and safety



Uptake of C70 nanoparticles and their aggregation within a rice plant leaf cell.
Credit: JoAn Hudson, Sijie Lin, and Pu Chun Ke, Clemson University

Science and Engineering Beyond Moore's Law (SEBML)

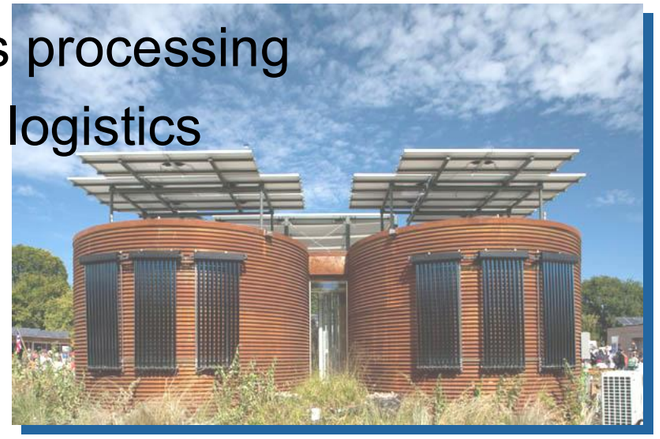
- Doubling ENG support to $20 million for investigations into:
  - Devices
  - Systems and architecture
  - Multi-scale modeling and simulation research
  - Quantum information science and engineering
  - Design of efficient and sustainable manufacturing equipment, processes, and facilities

Science, Engineering, and Education for Sustainable Well-Being (SEES)

- Integrates energy, environment, and climate research and education
- Supports advances in:
  - Materials engineering and device technologies
  - Manufacturing for energy, particularly from renewable sources
  - Micro-grid and smart-grid approaches to power distribution and control systems
  - Resilience and sustainability of complex, interdependent infrastructure systems

RE-ENERGYSE

- Collaboration with DOE to support undergraduate and graduate research in sustainable energy, including the areas of:
  - Manufacturing for energy
  - Energy-efficient materials processing
  - Energy supply chain and logistics



Cornell University home for Solar Decathlon 2009.
Credit: Jim Tetro, U.S. Department of Energy Solar Decathlon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Questions