Excerpted from the FY 2011 Budget Roll-Out Mathematical and Physical Sciences

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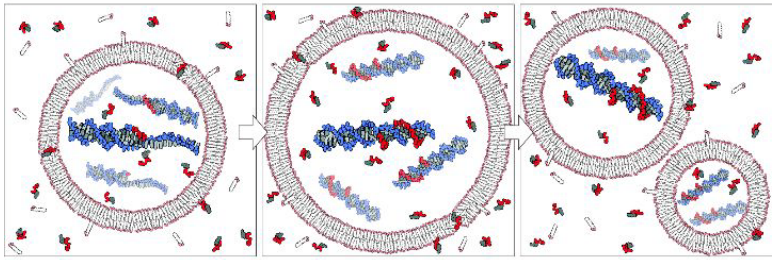
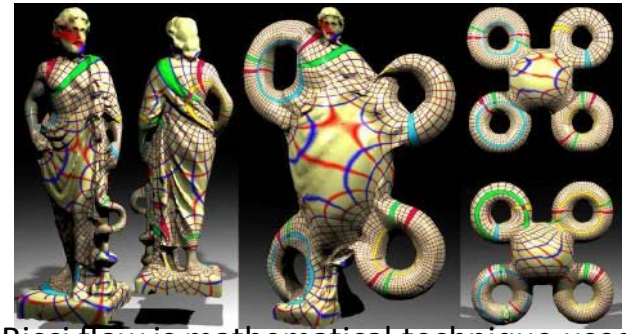
MPS Core Programs

- MPS core programs supports researchers to investigate
  - Structure/evolution of the universe , fundamental particles, processes of matter
  - Behavior and control of molecules at the nanoscale, complexity of their chemical interactions in materials and life processes
  - New mathematical structures and theories, connections to computation, experiment, observation
- MPS research fundamental for advances in
  - Other S&E areas
  - Technical and health-related disciplines
  - Industrial and technological development



Self-Replicating Nucleic Acids and Artificial Cells: 2009 Nobel Prize winner and MPS-supported researcher, Dr Jack Szostak is developing a chemical system that undergoes Darwinian evolution by developing a simple protocell system composed of a self-replicating genetic polymer, and a self-replicating membrane compartment.



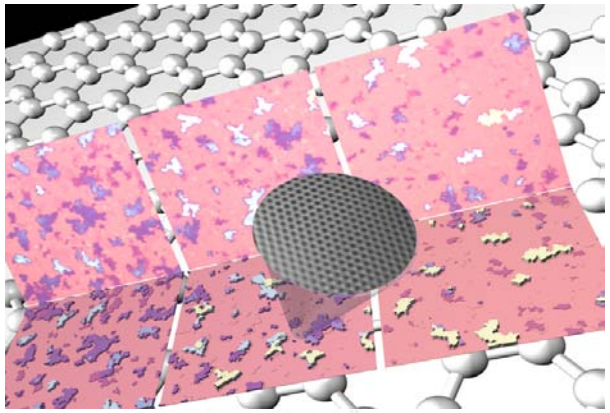
Ricci flow is mathematical technique used to understand the deformation of a surface

Science and Engineering Beyond Moore's Law (SEBML)

Research Investments for Economic Competitiveness

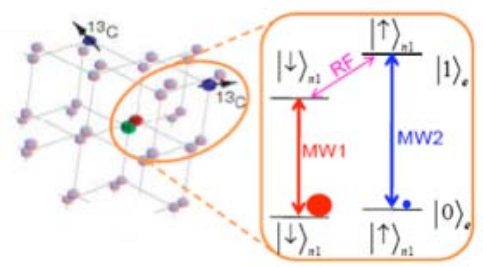
SEBML request: + 72% (+$13.5M)

Goal: To position the U.S. at the forefront of communications and computation capability beyond the physical and conceptual limitations of current technologies.



Materials for ultra-fast computing: MPS-supported research on graphene materials could lead to microchips that operate at much higher speeds than is possible with today's standard silicon chips.

Quantum Information Science is a promising area of SEBML. Quantum information is fragile and susceptible to loss. Recent progress in electron spin quantum memory improved robustness by controlling interactions with nuclear spins in diamond.



Jiang et al., Science **326**, 267 (2009)

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

MPS is partnering with other NSF Directorates to invest in climate and energy research.

SEES request: $110.50 M

- Energy
  - Energy Storage
    - MPS researchers demonstrate changes in battery materials that could lead to ultra-fast recharging of devices.
  - SOLAR program researchers
    - Develop novel earth-abundant materials for solar energy harvesting, creating efficient, solid-state solar cells
    - Investigate high-efficiency photoelectrochemical devices for the direct conversion of solar photons into hydrogen fuel via water electrolysis

- Climate modeling
  - MPS researchers have developed computational atmospheric and oceanic simulations that deal with structural instabilities in climate statistics, which typically hamper climate change predictions

CAREER and GRF

Supporting Young Investigators

CAREER request: + 5.8% (+$2.76M)

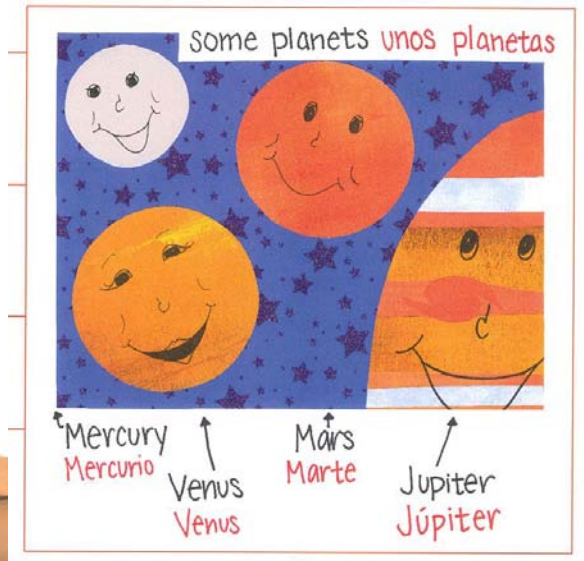
GRF request: + 61% (+$2.51M)

Investing in the next generation of the S&T workforce is a goal of the Obama Administration

MPS invests heavily in CAREER; about 1 in 4 of all NSF CAREER dollars come from MPS. CAREER awardees:

- Address important science issues such as optical studies of quantum dot nanostructures, materials for next generation electronic devices, gamma-ray bursts, and algorithms for photochemical processes in DNA.
- Have large impact in outreach and education.
- Innovative university curricula are developed, as well as outreach efforts to middle schools and minority-serving institutions.

MPS has requested a large increase for Graduate Research Fellowships

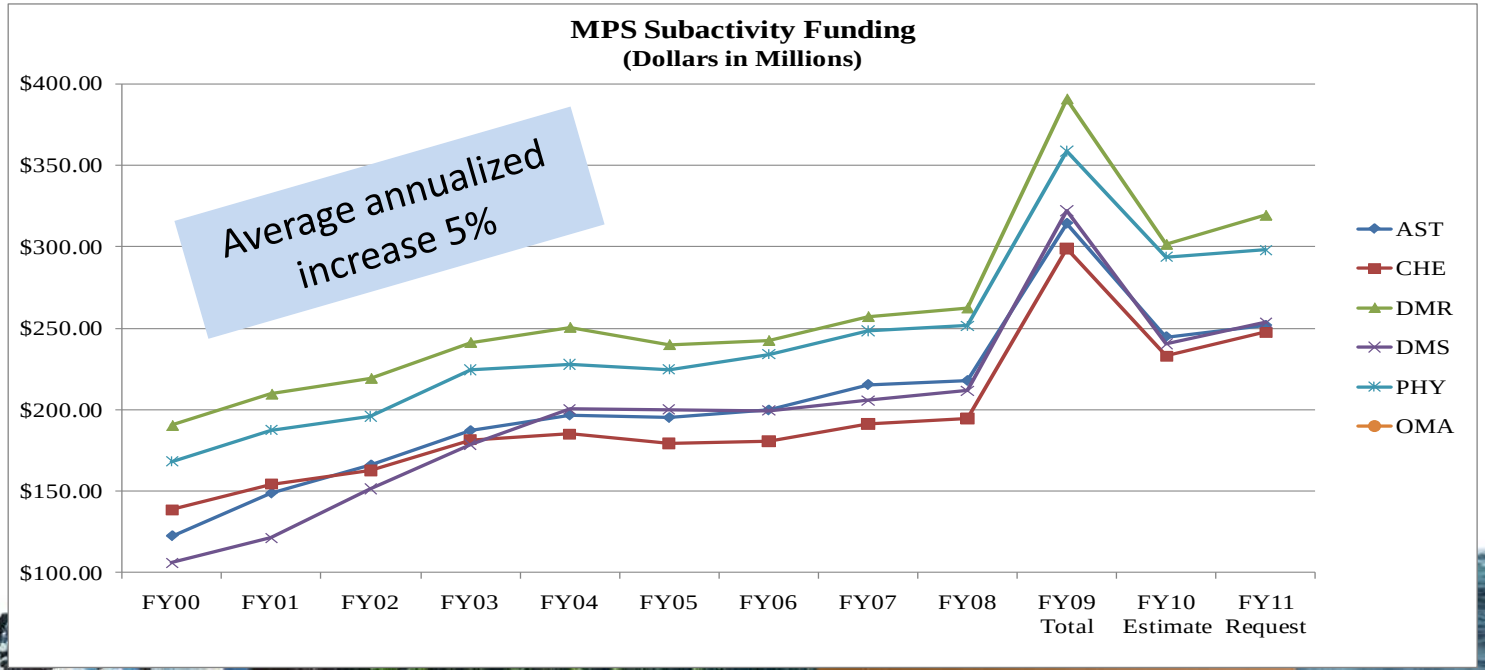


MPS FY 2011 Budget Request

Discovery +6.7%

(Dollars in Millions)

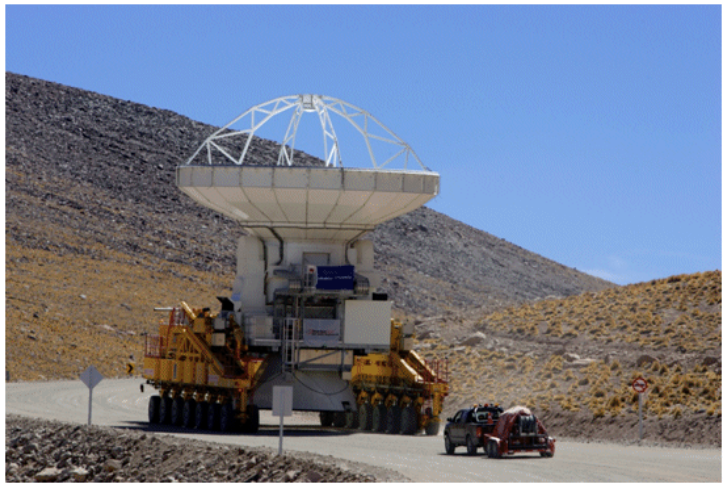
	FY 2009 Omnibus Actual	FY 2009 ARRA Actual	FY 2010 Estimate	FY 2011 Request	Change Over FY 2010 Estimate Amount	Change Over FY 2010 Estimate Percent
Astronomical Sciences	$228.67	$85.80	$245.69	$251.77	$6.08	2.5%
Chemistry	211.67	87.36	233.73	247.56	13.83	5.9%
Materials Research	282.52	108.17	302.67	319.37	16.70	5.5%
Mathematical Sciences	224.84	97.34	241.38	253.46	12.08	5.0%
Physics	262.47	96.30	290.04	298.19	8.15	2.8%
OMA	33.70	-	38.33	39.56	1.23	3.2%
Total, MPS	**$1,243.88**	**$474.97**	**$1,351.84**	**$1,409.91**	**$58.07**	**4.3%**



MPS Funding for Facilities

(Dollars in Millions)

	FY 2011 Request
Adv. Tech. Solar Telescope (ATST)	*$2.00*
Atacama Large Millimeter Array (ALMA)	*23.50*
Cornell High Energy Synchr. Source (CHESS)/ Cornell Electron Storage Ring (CESR)	*13.45*
GEMINI Observatory	*19.58*
IceCube Neutrino Observatory	*2.50*
Large Hadron Collider (LHC)	*18.00*
Large Interfer. Grav. Wave Observatory (LIGO)	*30.30*
Nat'l Astronomy and Ionosphere Ctr. (NAIC)	*6.00*
Nat'l High Magnetic Field Laborary (NHMFL)	*34.00*
Nat'l Nanotechnology Infra. Network (NNIN)	*3.38*
Nat'l Optical Astronomy Observatory (NOAO)	*33.33*
Nat'l Radio Astronomy Observatory (NRAO)	*44.37*
National Solar Observatory (NSO)	*9.51*
Nat'l Superconducting Cyclotron Lab (NSCL)	*21.50*
Other MPS Facilities	*7.65*



Transporting a 100-ton ALMA antenna to the 16,500 ft site in Chile. ALMA recently achieved three antennas working as a nascent array and is ramping-up to start science operations with sixteen antennas in 2011, dozens more when completed.

LIGO aims to detect gravitational waves, predicted by Einstein a century ago. It recently achieved a science milestone by placing limits on waves from the Big Bang. It may detect waves soon, or more likely, after upgrading to Advanced LIGO is complete (installation begins next year).

MPS Funding for Facilities

(Dollars in Millions)						
	FY 2009 Omnibus Actual	FY 2009 ARRA Actual	FY 2010 Estimate	FY 2011 Request	Change Over FY 2010 Estimate	
					Amount	Percent
Adv. Tech. Solar Telescope (ATST)	*$3.57*	*$3.10*	*-*	*$2.00*	*$2.00*	*N/A*
Atacama Large Millimeter Array (ALMA)	*11.00*	*-*	*17.57*	*23.50*	*5.93*	*33.8%*
Cornell High Energy Synchr. Source (CHESS)/ Cornell Electron Storage Ring (CESR)	*13.60*	*14.99*	*9.00*	*13.45*	*4.45*	*49.4%*
GEMINI Observatory	*18.71*	*-*	*19.10*	*19.58*	*0.48*	*2.5%*
IceCube Neutrino Observatory	*2.16*	*-*	*2.15*	*2.50*	*0.35*	*16.3%*
Large Hadron Collider (LHC)	*18.00*	*-*	*18.00*	*18.00*	*-*	*-*
Large Interfer. Grav. Wave Observatory (LIGO)	*30.30*	*-*	*28.50*	*30.30*	*1.80*	*6.3%*
Nat'l Astronomy and Ionosphere Ctr. (NAIC)	*9.60*	*3.10*	*8.40*	*6.00*	*-2.40*	*-28.6%*
Nat'l High Magnetic Field Laborary (NHMFL)	*26.50*	*5.00*	*35.56*	*34.00*	*-1.56*	*-4.4%*
Nat'l Nanotechnology Infra. Network (NNIN)	*3.71*	*-*	*3.38*	*3.38*	*-*	*-*
Nat'l Optical Astronomy Observatory (NOAO)	*30.48*	*5.60*	*31.50*	*33.33*	*1.83*	*5.8%*
Nat'l Radio Astronomy Observatory (NRAO)	*49.79*	*5.40*	*49.52*	*44.37*	*-5.15*	*-10.4%*
National Solar Observatory (NSO)	*7.83*	*1.40*	*9.10*	*9.51*	*0.41*	*4.5%*
Nat'l Superconducting Cyclotron Lab (NSCL)	*20.50*	*2.00*	*21.00*	*21.50*	*0.50*	*2.4%*
Other MPS Facilities	*5.60*	*4.99*	*7.02*	*7.65*	*0.63*	*9.0%*

Backup Slides

MPS contributions to Presidential Initiatives and NSF Investments

(Dollars in Millions)						
	FY 2009 Omnibus Actual	FY 2009 ARRA Actual	FY 2010 Estimate	FY 2011 Request	Change Over FY 2010 Estimate	
					Amount	Percent
Science and Engineering Beyond Moore's Law (SEBML)	36.53	9.82	18.68	32.18	13.50	72.3%
Science, Engineering and Education for Sustainable Well-being (SEES)	-	-	87.00	110.50	23.50	27.0%
Faculty Early Career Development (CAREER)	$53.53	$49.23	$47.92	$50.68	$2.76	5.8%
Graduate Research Fellowships (GRF)	-	17.40	4.11	6.62	2.51	61.1%