Research at the University of Michigan

A Report to the Regents

Stephen R. Forrest
Vice President for Research

January 18, 2007

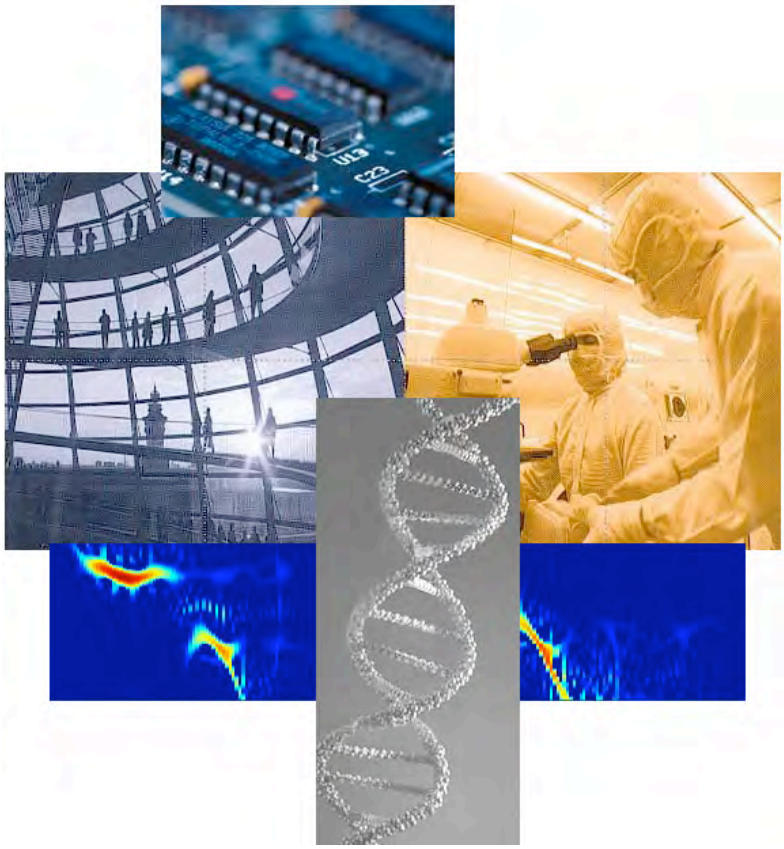


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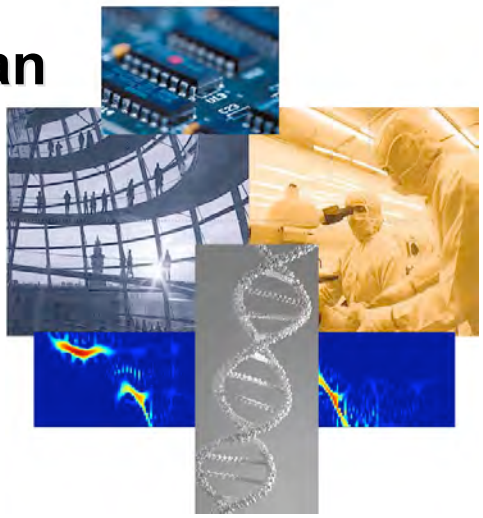
Research Expenditures (FY2005-2006) By Sponsor

Research Expenditures (FY2002-2006) By School/College/Unit

Energy Science, Technology and Policy Symposium Poster

UM Workshop on Energy Flyer

Research at the University of Michigan



Annual Report to the Regents

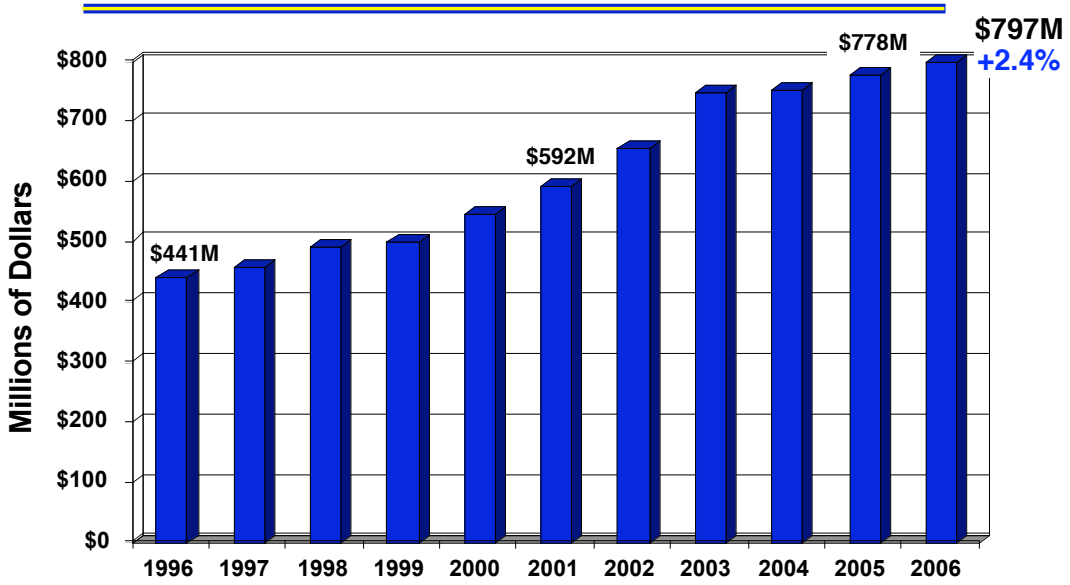
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Topics

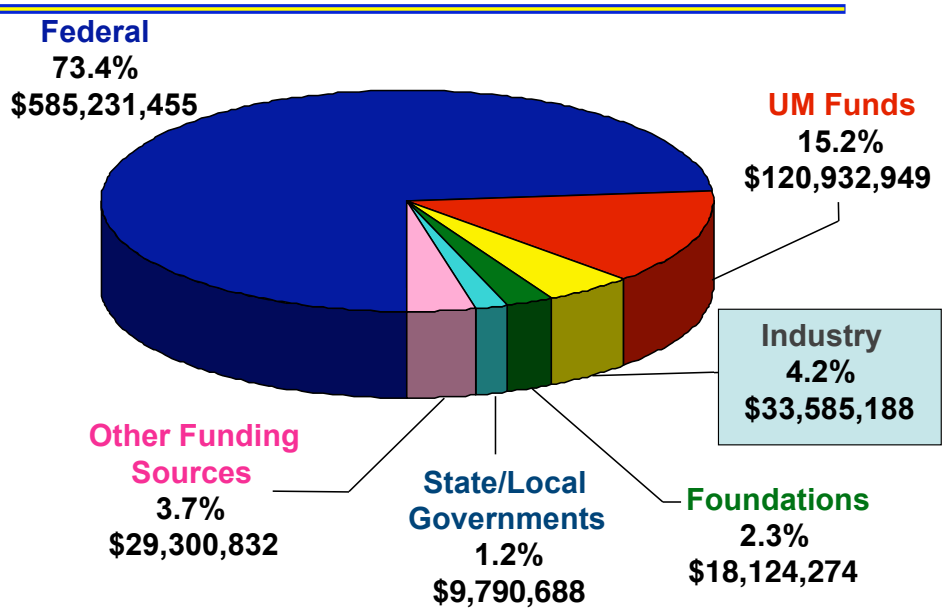
- **Where we are:** Research numbers
- **Initiatives:** Michigan Memorial Phoenix Energy Institute
- **A significant challenge:** Partnerships with Industry

UM Total Research Expenditures
(FY 1996-2006)

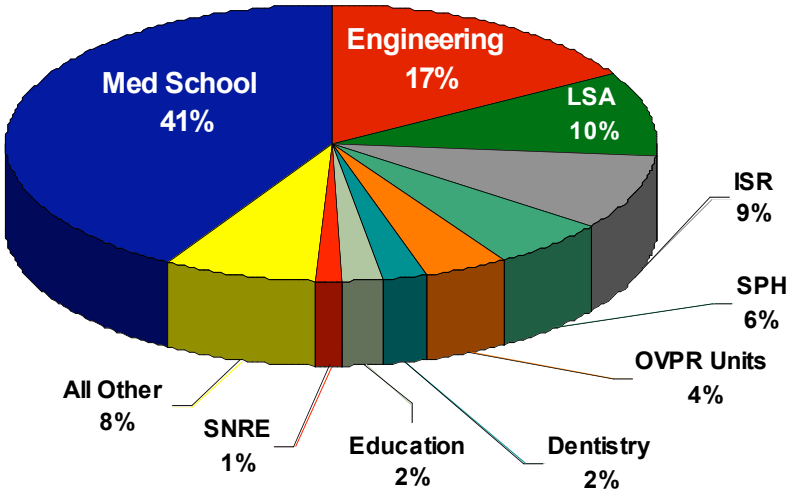


- Funding visibility into future unclear
- Expenditure outlook in FY 07 "guardedly optimistic"
- Long term prospects for growth are not above average

UM Research Expenditures, by Sponsor
FY2006: $796,965,386



UM Research Expenditures, by Unit
FY2006: $796,965,386



Snapshot of OVPR Accomplishments in 2006

- Launch of ***Search & Discovery***
- Distinguished Innovator Award
- New policies for OTT approved
- New AVP for Social Sciences & Humanities
- Arts & Humanities Funding Group Established
- Instituted effort to manage HPC resources & growth
- Improved IRB Processes in Health & Behav. Sci.
- eResearch & grants.gov Transition

Michigan Memorial Phoenix Energy Institute

Supporting and Growing Research & Education for a Clean, Affordable Energy Future



Defining Energy Research at UM

- **Established strengths are the core of the Institute**
  - Automotive Engineering
  - Nuclear Engineering
  - Solar
  - Low power/solid state electronics
  - Hydrogen
- **Priority areas for growth and coordination**
  - Policy, economics and societal impact of the energy challenge
  - Carbon-free energy sources
  - Transportation systems and fuels
  - Energy storage
  - Energy utilization

Resources

- **Phoenix Memorial Lab Renovation**
  - $11M from State and UM for facilities upgrade and partial renovation
  - 3rd floor for Hydrogen Energy Technology Lab (~$2M)
- **Schools and Colleges**
  - Commitment for over 4 chaired positions from LSA & CoE
  - 4+ graduate fellowships from/to Rackham
- **Operating budget**

Status Highlights

- **Director** (Prof. Gary Was) and **Assoc. Director for Outreach** (James MacBain) appointed
- **Deans of COE, LSA, Public Policy, ISR engaged**
- "Nano-hire" merged with energy mission
- **Development** identifying prospects for support
- Several major **corporations** engaged
- **Partnership with MSU**
- **RFP for cross-disciplinary energy projects**
- **Energy Symposium & Internal Workshop**

Industry Partnerships: Why Universities Do It

– **Academic Mission**
  - Dissemination of knowledge to the public
  - Test concepts and face challenges in the “real world”
  - Encourage partnerships that promote student learning & employment opportunities

– **Resources**
  - Create new jobs in a changing economy
  - Supplement and enable federal research support
  - Generate licensing income for research and education

U-M Tech Transfer Performance

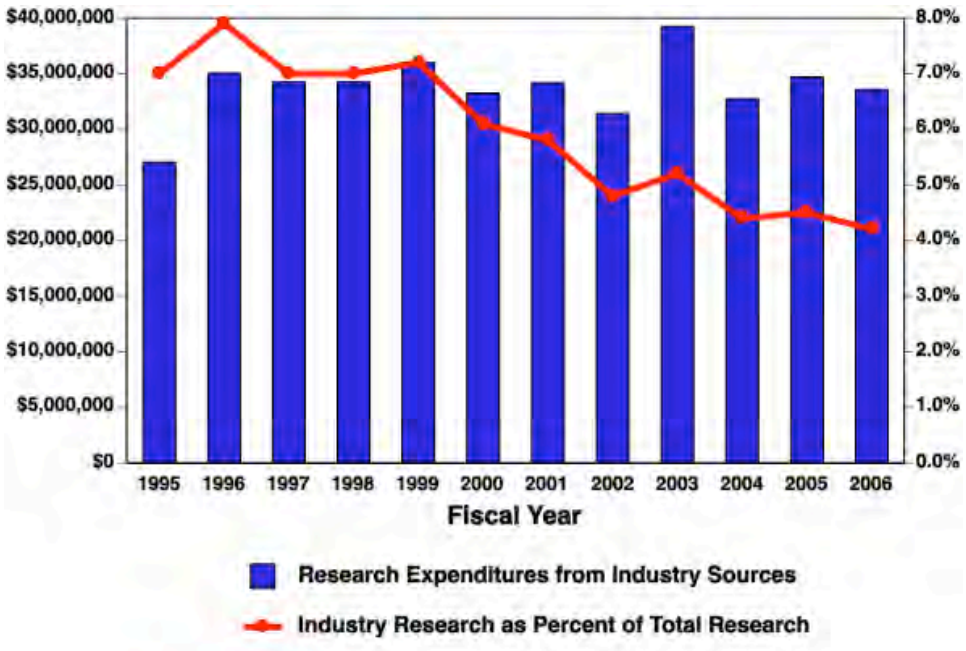


We are doing well, but…
•Licensing income is not a clear indicator of success with industry partnerships
•To the extent that partnerships contribute, it is far-trailing indicator
•Agreements=Partnerships

Recent BIG Events

- **Google** - selects Ann Arbor for new business center
- **NanoBio** - UM faculty spin-off receives $30 M investment, one of largest biotech investments ever in Michigan
- **OncoMed** - company based on UM technology raises $33 M in new investment
- Others are coming

UM Research Sponsored by Industry
(FY1995-2006)



Challenges Exist to Improving Our Engagement with Industry

- **Culture** - No deep tradition of industrial research & tech transfer at UM
- **Location** - Lack of high population density, robust technical & funding infrastructure
- **Knowledge** – Limited understanding of how to engage with industry
- **Reputation** – Some view UM as unsupportive of engagement

ADVANCING INNOVATION

UM INDUSTRIAL RELATIONS, RESEARCH, AND TECHNOLOGY TRANSFER

A PLAN FOR PROGRESS

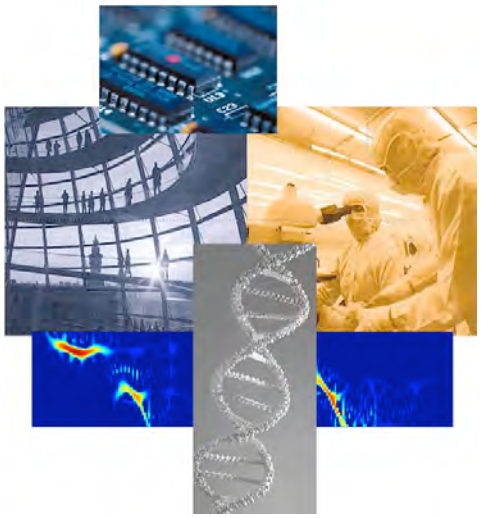
- Faculty Advisory Committee
- Professional & Administrative Staff Group
  - Charged to formulate objectives,specific plans, metrics, and a path forward
- Consultation with committed external partners

Critical Elements of OVPR Proposal

- Change the culture
- Make long term strategic investments
- Experiment with solutions: be entrepreneurial
- Measure success
- Manage resources

Next Steps

- We must define the **Michigan Difference**
  - Determine what makes us unique
  - Determine the opportunity
  - Rise fully to the challenge
  - Success is not obtained by a single “silver bullet”, it is through getting multiple solutions to work in sync.



Thank You!

University of Michigan Research Expenditures
By Sponsor (FY2005 & FY2006)

SOURCE	FY 2005	PERCENT OF TOTAL	FY 2006	PERCENT OF TOTAL	PERCENT CHANGE
FEDERAL SOURCES					
Health and Human Services					
Centers for Disease Control	5,245,680	0.7%	6,494,379	0.8%	23.8%
Food and Drug Administration	797,320	0.1%	785,943	0.1%	-1.4%
Health Resources & Services Administration	1,025,924	0.1%	1,012,950	0.1%	-1.3%
Centers for Medicare & Medicaid Administratio	1,500,457	0.2%	2,398,163	0.3%	59.8%
National Institutes of Health	362,368,568	46.6%	**388,341,125**	**48.7%**	7.2%
Substance Abuse and Mental Health Services	815,206	0.1%	616,166	0.1%	-24.4%
Other HHS	4,283,747	0.6%	2,610,065	0.3%	-39.1%
Total Health and Human Services	376,036,902	48.3%	402,258,791	50.5%	7.0%
National Science Foundation	68,062,430	8.7%	**63,663,033**	**8.0%**	-6.5%
Department of Defense					
Army	26,558,361	3.4%	25,217,986	3.2%	-5.0%
Air Force	7,299,411	0.9%	5,982,346	0.8%	-18.0%
Navy	6,996,519	0.9%	7,198,061	0.9%	2.9%
Other	19,084,617	2.5%	13,843,299	1.7%	-27.5%
Total Department of Defense	59,938,908	7.7%	**52,241,692**	**6.6%**	-12.8%
Energy	19,242,840	2.5%	17,569,419	2.2%	-8.7%
N.A.S.A.	16,732,514	2.2%	16,635,867	2.1%	-0.6%
Transportation	9,480,253	1.2%	6,917,453	0.9%	-27.0%
Commerce	5,077,822	0.7%	6,289,628	0.8%	23.9%
Education	5,336,965	0.7%	5,411,580	0.7%	1.4%
Environmental Protection Agency	2,447,804	0.3%	2,933,752	0.4%	19.9%
Social Security Administration	2,018,663	0.3%	2,404,122	0.3%	19.1%
Justice	1,664,471	0.2%	1,494,572	0.2%	-10.2%
General Services Administration	450,503	0.1%	1,176,416	0.1%	161.1%
Homeland Security	691,640	0.1%	1,172,367	0.1%	69.5%
Agriculture	1,294,424	0.2%	1,089,530	0.1%	-15.8%
Interior	961,807	0.1%	1,022,998	0.1%	6.4%
Central Intelligence Agency	343,600	0.0%	812,911	0.1%	136.6%
Agency for International Development	247,301	0.0%	343,745	0.0%	39.0%
Smithsonian Institution	302,713	0.0%	317,133	0.0%	4.8%
State	18,627	0.0%	244,207	0.0%	1211.0%
Veterans Affairs	158,843	0.0%	130,244	0.0%	-18.0%
National Endowment for the Humanities	189,396	0.0%	99,979	0.0%	-47.2%
Museum and Library Services, Institute of	85,014	0.0%	73,895	0.0%	-13.1%
Federal Reserve System	191,145	0.0%	68,274	0.0%	-64.3%
District Courts, U.S.	185,889	0.0%	61,610	0.0%	-66.9%
Other Federal	347,860	0.0%	798,237	0.1%	129.5%
Total Federal Government	571,508,335	73.5%	**585,231,455**	**73.4%**	2.4%
NON-FEDERALSPONSORS					
Industry	34,702,641	4.5%	**33,585,188**	**4.2%**	-3.2%
Foundations	19,902,948	2.6%	18,124,274	2.3%	-8.9%
Other (includes Universities & Gifts)	7,774,819	1.0%	7,582,775	1.0%	-2.5%
Public Charities	10,745,800	1.4%	10,549,039	1.3%	-1.8%
State of Michigan & Local Michigan Authorities	12,136,369	1.6%	9,790,688	1.2%	-19.3%
Endowment	4,849,532	0.6%	4,837,267	0.6%	-0.3%
Trade and Professional Associations	6,810,927	0.9%	5,597,769	0.7%	-17.8%
International Organizations	62,024	0.0%	545,576	0.1%	779.6%
Foreign National Governments	162,392	0.0%	188,406	0.0%	16.0%
Total Non-Federal Sponsors	97,147,452	12.5%	**90,800,982**	**11.4%**	-6.5%
Total Sponsored Research	**668,655,787**	85.9%	**676,032,437**	**84.8%**	1.1%
UNIVERSITY OF MICHIGAN SOURCES					
University of Michigan Funds	109,405,940	14.1%	**120,932,949**	**15.2%**	10.5%
TOTAL RESEARCH EXPENDITURES	**778,061,728**	100.0%	**796,965,386**	100.0%	**2.4%**

Volume of Research by Major University Units

UNIT	FY 2003	FY 2004	FY 2005	FY2006	Average Percent Change
Architecture & Urban Planning, Taubman Total	**471,817**	**704,231**	**675,270**	**1,129,078**	**37.50%**
External Research Support	277,600	459,968	346,546	424,478	21.20%
Internal Research Support	194,217	244,263	328,724	704,600	58.20%
Art and Design Total	**125,021**	**283,343**	**107,418**	**103,728**	**20.40%**
External Research Support	31,352	190,626	-2,089	-616	112.10%
Internal Research Support	93,670	92,717	109,507	104,344	4.10%
Business Administration Total	**6,612,487**	**5,298,858**	**5,588,887**	**7,357,726**	**5.80%**
External Research Support	778,185	1,553,759	1,689,296	3,168,869	65.30%
Internal Research Support	5,834,303	3,745,099	3,899,591	4,188,858	-8.10%
Dentistry Total	**13,285,984**	**14,193,178**	**17,346,895**	**18,467,027**	**11.80%**
External Research Support	11,772,382	11,707,888	15,153,868	15,979,378	11.40%
Internal Research Support	1,513,602	2,485,289	2,193,027	2,487,649	22.00%
Education Total	**14,020,236**	**12,553,966**	**13,694,446**	**13,994,542**	**0.30%**
External Research Support	12,860,450	11,742,060	12,806,925	13,113,405	0.90%
Internal Research Support	1,159,787	811,906	887,521	881,137	-7.10%
Engineering Total	**137,945,748**	**135,659,608**	**131,798,174**	**131,246,439**	**-1.60%**
External Research Support	116,425,104	114,466,401	111,316,627	110,235,468	-1.80%
Internal Research Support	21,520,644	21,193,207	20,481,547	21,010,971	-0.80%
Graduate School, Rackham Total	**4,049,725**	**3,454,034**	**4,624,578**	**3,740,837**	**0.00%**
External Research Support	1,385,083	2,157,317	2,422,734	1,364,156	8.10%
Internal Research Support	2,664,642	1,296,717	2,201,843	2,376,681	8.80%
Information Total	**3,370,335**	**3,592,698**	**4,251,989**	**5,268,352**	**16.30%**
External Research Support	2,797,506	3,120,727	4,003,241	4,329,088	16.00%
Internal Research Support	572,829	471,970	248,748	939,264	70.90%

Volume of Research by Major University Units

UNIT	FY 2003	FY 2004	FY 2005	FY2006	Average Percent Change
Kinesiology Total	**1,342,085**	**1,747,089**	**2,608,825**	**2,720,699**	**27.90%**
External Research Support	894,073	1,182,336	1,749,038	2,327,688	37.80%
Internal Research Support	448,011	564,753	859,787	393,011	8.00%
Law Total	**1,621,946**	**1,506,196**	**1,631,737**	**1,657,526**	**0.90%**
External Research Support	1,311,459	1,479,872	1,539,559	1,583,258	6.60%
Internal Research Support	310,487	26,324	92,178	74,268	46.40%
Literature Science, and the Arts Total	**61,642,886**	**67,059,033**	**73,256,629**	**77,139,838**	**7.80%**
External Research Support	47,598,975	52,242,056	55,245,318	55,846,090	5.50%
Internal Research Support	14,043,911	14,816,977	18,011,311	21,293,748	15.10%
Medical School Total	**284,371,638**	**295,508,606**	**321,341,382**	**333,282,755**	**5.50%**
External Research Support	265,510,197	272,897,544	295,400,292	301,141,183	4.30%
Internal Research Support	18,861,441	22,611,062	25,941,090	32,141,573	19.50%
Music Total	**291,049**	**326,140**	**226,556**	**277,386**	**1.30%**
External Research Support	10,017	47,961	-1,101	0	58.80%
Internal Research Support	281,032	278,180	227,656	277,386	0.90%
Natural Resources and the Environment Total	**9,683,598**	**7,809,171**	**10,077,732**	**11,503,070**	**7.90%**
External Research Support	7,345,302	6,990,752	8,817,170	10,435,801	13.20%
Internal Research Support	2,338,297	818,420	1,260,561	1,067,269	-8.80%
Nursing Total	**4,981,069**	**4,602,890**	**5,320,405**	**4,834,449**	**-0.40%**
External Research Support	4,623,562	4,134,437	4,811,459	4,352,987	-1.20%
Internal Research Support	357,508	468,454	508,947	481,463	11.40%

Volume of Research by Major University Units

UNIT	FY 2003	FY 2004	FY 2005	FY2006	Average Percent Change
Pharmacy Total	**5,502,315**	**7,154,799**	**5,882,782**	**6,670,773**	**8.50%**
External Research Support	4,426,247	6,409,604	4,969,778	5,494,865	11.00%
Internal Research Support	1,076,068	745,195	913,004	1,175,908	6.90%
Public Health Total	**38,275,272**	**45,019,318**	**50,175,621**	**46,951,482**	**7.50%**
External Research Support	36,539,618	42,700,780	47,887,395	44,635,100	7.40%
Internal Research Support	1,735,654	2,318,538	2,288,226	2,316,382	11.20%
Public Policy, G Ford Total	**1,287,479**	**2,505,572**	**2,851,440**	**2,592,389**	**33.10%**
External Research Support	933,369	2,123,793	2,486,507	2,229,068	44.80%
Internal Research Support	354,110	381,779	364,933	363,321	1.00%
Social Work Total	**4,213,733**	**5,228,715**	**5,755,231**	**6,342,344**	**14.80%**
External Research Support	2,617,363	3,307,332	3,752,132	4,067,295	16.10%
Internal Research Support	1,596,370	1,921,382	2,003,099	2,275,049	12.70%
Institute of Social Research	**94,500,711**	**77,634,225**	**72,307,456**	**72,122,740**	**-8.30%**
External Research Support	78,128,417	55,646,067	57,629,648	57,639,979	-8.40%
Internal Research Support	16,372,294	21,988,158	14,677,808	14,482,761	-0.10%
OVPR Research Units	**43,029,345**	**41,843,713**	**32,699,971**	**31,826,033**	**-9.10%**
External Research Support	33,815,583	33,263,686	25,124,327	23,291,113	-11.10%
Internal Research Support	9,213,762	8,580,026	7,575,644	8,534,920	-2.00%
Other Units Total	**2,152,531**	**5,770,780**	**8,888,453**	**12,415,653**	**87.30%**
External Research Support	1,273,182	5,380,400	7,306,664	9,766,671	130.70%
Internal Research Support	879,349	390,380	1,581,789	2,648,982	105.70%

Volume of Research by Major University Units

UNIT	FY 2003	FY 2004	FY 2005	FY2006	Average Percent Change
UM Dearborn Total	**2,447,131**	**3,399,944**	**3,432,357**	**3,547,762**	**14.40%**
External Research Support	1,407,179	2,099,913	2,291,582	2,208,082	18.20%
Internal Research Support	1,039,951	1,300,032	1,140,774	1,339,680	10.10%
UM Flint Total	**1,022,878**	**876,362**	**1,178,568**	**1,124,140**	**5.20%**
External Research Support	757,552	647,236	951,553	870,356	8.00%
Internal Research Support	265,326	229,126	227,016	253,784	-0.90%
University Administration Total	**1,961,880**	**845,739**	**936,961**	**810,929**	**-19.90%**
External Research Support	1,515,879	0	39,130	150,305	92.10%
Internal Research Support	446,002	845,739	897,831	660,624	23.10%
Unassignable Services Total	**11,135,598**	**7,948,850**	**1,401,965**	**-162,314**	**-74.20%**
External Research Support	2,369,186	-340,010	542,081	1,533,629.18	-63.60%
Internal Research Support	8,766,412	8,288,860	859,884	-1,695,943.00	-130.80%
All Activities Total	**749,344,497**	**752,527,056**	**778,061,728**	**796,965,385**	**2.10%**
External Activities Support	637,404,821	635,612,504	668,279,682	676,187,696	2.00%
Internal Activities Support	111,939,676	116,914,552	109,782,046	120,777,689	2.80%

University of Michigan Symposium



Energy Science, Technology and Policy

Facing the Challenge

The University of Michigan launched an energy research initiative in September 2006 with the establishment of the Michigan Memorial Phoenix Energy Institute. This symposium brings together many influential people from government, industry and academia to present their views on science, technology and policy topics in the energy field.

Organized by the Office of the Vice President for Research and the Michigan Memorial Phoenix Energy Institute.

Sponsored by

DTE Energy

8:00 AM - 4:30 PM, February 13-14, 2007
Horace H. Rackham Amphitheatre
915 E. Washington, Ann Arbor 48109-1070

KEYNOTE ADDRESS
Samuel W. Bodman
U.S. Secretary of Energy

Speakers Include:

Dennis N. Assanis, University of Michigan • advanced powertrains
Rosina M. Bierbaum, University of Michigan • climate change science & policy
J. Christopher Brown, DTE Energy • addressing consumer needs
Lawrence D. Burns, General Motors • transporation & sustainability
John R. Dearborn, Dow Chemical • challenges for the chemical industry
James J. Duderstadt, Univ. of Michigan • energy futures in the Great Lakes region
Stephen R. Forrest, University of Michigan • advances in lighting
Kenneth G. Keegstra, Michigan State University • future of biofuels
Gregory A. Keoleian, University of Michigan • energy sustainability metrics
Nathan S. Lewis, CalTech • sustainable energy technology
Thomas P. Lyon, Univ. of Michigan • carbon constraints & energy investments
William McDonough, Wm. McDonough & Partners • design for sustainability
Ernest J. Moniz, Massachusetts Institute of Technology • nuclear options
Margo T. Oge, Environmental Protection Agency • energy and pollution
James E. Rogers, Duke Energy • fuel diversity for utilities
Gerhart Schmidt, Ford Motor Company • environment & energy security
Daniel Sperling, University of California-Davis • new fuels & vehicles
Levi T. Thompson, University of Michigan • hydrogen technologies
Gary S. Was, University of Michigan • UM approach to the energy challenge

Symposium attendance is free to all
Registration at www.mmpei.umich.edu/symposium.html



University of Michigan

Workshop on Energy

Thursday, January 18, 2007 • Michigan League

All-day workshop where you can hear short presentations by faculty from Engineering, Natural Resources & Environment, Public Policy, LSA, Business, Architecture, Law and UMTRI on a variety of energy-related research projects at Michigan.

8:30 AM	**Plenary Session** (UM Tech, Environment, Business Overview)		
Concurrent Presentations *(including one policy talk per block)*			
9:30 AM	Fuels	Utilization	Enabling Technologies
11:15 AM	Production	Utilization	Enabling Technologies
12:30 PM	LUNCH & Session summaries		
1:30 PM	Production	Utilization	Sustainability
3:00 PM	Transportation	Vehicles/Fuels	Sustainability
4:15 PM	Session summaries		
4:45 PM	Reception & Announcement of MMPEI seed grants		
Details, including speakers at www.mmpei.umich.edu/workshop.html			

Workshop Co-Sponsors

Michigan Memorial Phoenix Energy Institute

Graham Environmental Sustainability Institute

GESI

Erb Institute for Global Sustainable Enterprise