

MAINE STATE LEGISLATURE

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STATE FUNDED RESEARCH

ANNUAL REPORT

FISCAL YEAR ENDING JUNE 30, 2002 (FY2002)



University of Maine System

Office of Finance and Treasurer

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UNIVERSITY OF MAINE SYSTEM
STATE FUNDED RESEARCH ANNUAL REPORT
FISCAL YEAR ENDING JUNE 30, 2002 (FY2002)
TABLE OF CONTENTS

	Page
Introduction	1
UM Summary	1
USM Summary	4
State Research Appropriation for Operations	6
State Appropriation for the Maine Patent Program	7
State Funding for Research Capital Projects	8
 Additional Information:	 Appendix
Legislative History of R&D Appropriations	A
Summary Tables Showing Utilization of R&D Appropriation for Operations	B
Narrative Summaries Describing Utilization of R&D Appropriation for Operations	C
Summary Tables Showing Utilization of State Funding for Research Capital Projects	D

The University of Maine System is required to submit in January of each year an annual report on the utilization of state research appropriations for operations, state research capital bonds, and University R&D revenue bonds with debt service funded by a state appropriation. The following is the report for fiscal year 2002 (FY2002) that covers the period from July 1, 2001 to June 30, 2002.

I. University of Maine Summary

The University of Maine continues to grow the R&D enterprise as seeded with the Maine Economic Improvement Fund (MEIF). The Institution continues to use the fund as investment capital across the technology sectors that are important to Maine and across the R&D continuum to continue to leverage Federal dollars as well as create economic opportunities for UMaine graduates and businesses across the state. In FY2002, the University of Maine received \$8,080,000 of MEIF to support matching funds for grants and contracts, equipment purchase, capital construction, staff salaries and services to support research, development, technology transfer and economic development and in the areas of Advanced Materials Engineering, Advanced Technologies for Forestry and Agriculture, Aquaculture and Marine Sciences, Biotechnology, Information Technology and Technology Transfer. The \$3.5 million invested in matching funds alone generated \$39.4 million in direct grants and contracts, a return of 11 to 1 for each dollar invested.

Also in FY2002, research capital bond revenues were used at the University of Maine to complete the expansion and renovation of aquaculture research laboratories and renovations to Boardman Hall, and continue work on the Hitchner Hall addition, expansion and renovation, and construction of the Food Science wing.

• *Federal Grants and Contracts*

The University of Maine continues to leverage the MEIF funds to attract federal awards from the National Science Foundation, the Office of Naval Research, the National Institutes of Health, the US Department of Agriculture among others. Total extramural funding exceeds \$50,000,000 for the second year in a row. Notable projects in each targeted technology sector are detailed in the appendices. The University of Maine research administration continues to work closely with the federal delegation and other state research partners in pursuance of large multi-institution, multi-year projects such as the Gulf of Maine Ocean Observation System (GoMOOS) a partnership of the State Planning Office, Bigelow Labs, the Gulf of Maine Aquarium, the University of Maine and other research organizations.

- **Industrial Research**

Many of the University of Maine researchers work directly with Maine companies, either providing direct research services to the companies or involving them in their federally funded work. In particular, the University of Maine has been quite successful in supporting Maine companies doing R&D leading to product commercialization with support from the Maine Technology Institute. The Maine Technology Institute was established by the Maine Legislature to fund Maine companies developing new products or technology services. The University supports over half the 200+ projects, working with companies such as Applied Thermal Sciences in Sanford, Hancock Gourmet Foods in Scarborough, Benric Technologies in South Portland, Saunders Bros. in Westbrook, Kenway Corp. in Augusta, SAPPI Fine Paper in Somerset, Stillwater Scientific Instruments in Orono, Seabait of Maine in Franklin, and Indian Meadow Herbals in Easton to name a few.

- **Technology Transfer and Intellectual Property**

An important component commercializing the outputs of R&D is the protection and licensing of intellectual property most often through patenting. The University of Maine uses a small portion of MEIF funds for technology transfer that includes these patenting and licensing activities. In FY2002, the University of Maine filed 11 patent applications including; *Chemical/Biotech bonding of Wood fiber composites, Selective Filtration of Nerve Agents, High Shear Rate Viscosity Sensor, Cross Talk Filtering, Particle Beam Choppers Using Pseudo Random Binary Algorithms, Pressure Resin Process to Apply FRP Coatings to Wood Composites, Laminated Wood Beams with Varying Lamination Thicknesses, and Method for Reducing Cross-Talk within DNA Sequences.* In addition, we commercialize other non-patentable products such as software. Two products developed by our campus computer store are in beta-test in stores across the country. Similarly, the Advanced Wood Composites Center has received a proprietary building code for a wood-composites product that can be licensed to manufacturers. Many of these technologies are under joint development with Maine companies and if successfully commercialized will generate jobs in Maine and royalty revenue.

The University of Maine continues to strengthen the commercialization opportunities from R&D. In this effort, we pursue federal grants that support the development of the commercialization infrastructure at the University of Maine and the State. The University of Maine received a National Science Foundation "Partnerships for Innovation " grant of \$600,000 over three years to focus on the commercialization process of wood composites in our Advanced Engineered Wood Composites Center. The grant helps us to integrate the commercialization process into the basic and applied research, the training of graduate and undergraduate students, and partnering with various state programs such as the Maine Technology Institute, the Maine Manufacturing Extension Program and Eastern Maine Development Corporation to accelerate the development of new products suitable for commercialization in Maine.

Always looking to capitalize on existing investments by our partners, the University of Maine is cost-sharing the USM patent program attorney Woody Higgins, who now spends 2 days a week in Orono to serve as in-house patent council and advise on intellectual property matters.

- ***R&D and Technology Transfer Facilities***

While protecting the intellectual property that results from R&D is a necessary step in the commercialization process, it often takes real product to prove technical and commercial feasibility. Many of our research labs have been designed to serve as pilot-plants where first generation products can be made and tested and perhaps test marketed. This year marked the completion of the Hitchner Hall addition that includes our food processing pilot plant. The department of food science works with many companies in developing new food processing technologies and products. Efforts in the past year include a new stuffed pasta made with crab mince in partnership with Hancock Gourmet Foods. In addition, the University of Maine started-up the BlackBear Supercomputer at the Target Technology Center. The supercomputer, recently ranked the 336th fastest in the world, is made available to our R&D partners who are developing new codes to run on large clusters, such as Aero-Hydro of Southwest Harbor.

- ***Business Incubators***

Technology-Based Business Incubation is a recent effort in Maine to nurture the technology start-up companies in Maine. The Advanced Technology Development Centers Program, run through the Department of Economic and Community Development helped establish 7+ targeted technology incubators throughout Maine. The University of Maine is directly involved in running three centers. The Target Technology Center was opened in early 2002 and serves as the Information Technology Incubator in the state. Stillwater Scientific Instruments is a spin-off company from the University of Maine Laboratory for Surface Science Technology, commercializing technology developed with National Science Foundation funding. They moved into the Target Incubator in the spring of 2002 to get assistance with the business start-up issues that plague many new business owners.

In addition, the University of Maine operates the Aquaculture Advanced Technology Center in partnership with the Maine Aquaculture Innovation Center. The Aquaculture Center has business incubation spots available at the Darling Marine Center, the Center for Cooperative Aquaculture Research in Franklin and the Washington County Technical College in Eastport. The Darling Center space was completed in June of 2002. The University of Maine used MEIF funding to leverage \$1.8 million in additional funds to construct new facilities in Franklin and the Eastport facility is under design.

The University of Maine is a partner in the Composites Technology Center, the incubator for the composites industry, with Sanford Industrial Development Committee and the Piscataquis County Economic Development Council. The first incubator space is in Sanford, the second planned for Greenville, with the University serving as the R&D lab.

The University of Maine is looking for spin-off technologies suitable for all the incubators which include environmental technologies, precision manufacturing, advanced technologies for forestry and agriculture and biotechnology.

- ***Local and Regional Economic Development***

The University of Maine continues to partner with state and regional economic development organizations and local towns and communities to understand the needs of local businesses and the opportunities to use our R&D relationships to spin-off, grow or attract existing and new businesses. In FY2002, we were successful in attracting Seabait Int'l to Franklin, Maine by working with them to develop seaworm aquaculture technologies at the Franklin Center. The Advanced Engineered Wood Composites Center was successful in spinning-off its Advanced Engineered Lumber Technology by enticing Bangor investor Chip Hutchins and drawing in the development support of the City of Bangor. Engineered Materials of Maine, the new Bangor based venture is hoped to create 75 jobs in the near future. It is a clear example of technology developed with federal R&D support, prototyped and tested in our pilot plant, protected with patents and proprietary building codes, and shipped to the local economic development community which can create jobs in Maine. Partnering with these organizations gives Maine the critical mass to continue to grow.

- ***The Future***

As we move into the next year, we continue to have bright spots that will carry the momentum that the MEIF and state bond funds have initiated.

- The development of a molecular biophysics research program in partnership with the Jackson Laboratory and the Maine Medical Center Research Institute and the National Science Foundation.
- The construction of the Engineering and Science Research Center and the Advanced Manufacturing Center.
- The initiation of technology-based entrepreneurship programs for graduate and undergraduate students in all disciplines.
- Continued strong performance in the R&D funding from all sources.

II. University of Southern Maine Summary

Fiscal year 2002 was a building and consolidating year for R&D at the University of Southern Maine. New construction, new people, new grants, and new ways of working have been incorporated into the growing science and technology research activities at USM.

- ***Institutes and Opportunities***

USM has two research institutes to develop R&D capacity: the Bioscience Research Institute of Southern Maine (BRISM) and the Institute for Research in Information Science (IRIS). Primarily each institute provides a focal point for interdisciplinary research in its targeted technology, bringing together and supporting researchers from

different departments and different colleges to address research questions of national interest. Additionally, each institute serves as the primary facilitator of USM participation in the two Ph.D. programs: the collaborative Ph.D. program in Molecular Genetics and Cell Biology, and the University of Maine Computer Science Ph.D. program.

- ***Bioscience Research Institute of Southern Maine (BRISM)***

USM recruited a major researcher from Yale University who brought a team of three laboratory professionals and approximately \$1.8 million in grants. Dr. John Wise and his team joined USM July 1, 2002.

We established Environmental Toxicology and Carcinogenesis as an area on which to focus, consistent with the expertise of the new research team and that of existing USM researchers. A proposal was submitted to NIH to complete the next phase of the Science Building research wing; the new space would house the environmental toxicology and carcinogenesis research program, providing a regional training center for research and laboratory techniques vital to environmental toxicology.

- ***Institute for Research in Information Science (IRIS)***

Two new faculty members in Computer Science, and one existing member in Information and Communications Technology established new research agendas at USM: the theoretical basis of object-oriented databases, the performability of distributed networks, and web-based tools to facilitate collaboration and information sharing among non-technical users. All three of these submitted proposals to federal funding agencies, and one of them has been funded. More than six publications and three graduate theses have been completed.

- ***Opportunity Programs***

During FY02 we implemented fifteen internally competitive research projects to enable faculty to do pilot research that enhances their capability to be externally funded. Twelve have submitted external proposals and seven of these have already been externally funded.

- ***Infrastructure***

The most visible research infrastructure is bricks and mortar, benches and equipment. That's what people see on tours. During FY02, USM R&D grappled with three major construction projects:

- Modifications to the laboratories at John Roberts Road were completed to accommodate the new research team and the research group temporarily displaced by the research wing construction.
- We completed renovations of the Science Building in Portland and commenced construction on phase one of the research wing of the Science Building in Portland. Construction of this phase will be complete in April 2003.
- During the year USM worked closely with the Gulf of Maine Aquarium to design their research laboratory building. Due to limited space at USM and the tremendous collaborative opportunities afforded by the Gulf of Maine facility, USM will occupy laboratory space there for research specifically focused on issues affecting the Gulf of Maine.

Not as visible as physical buildings, but just as essential for an organization doing competitive research, is the human infrastructure: the people and processes that support the work of researchers. During FY02, USM R&D solidified our human infrastructure in significant ways:

- o continuing support for a grants developer to assist faculty in developing successful grant proposals as part of structured research development plans
- o partial support for additional staff and new pre-award resources in the Office of Sponsored Programs
- o partial support for additional staff in the Office of Graduate Studies
- o new and continued library holdings augmenting specific R&D targeted technology areas.

Also during FY02, USM institutionalized a support structure for compliance with federal regulations concerning all areas of research. A coordinator of Research Compliance was hired, the human and animal review boards were reorganized, and compliance policies and procedures were reviewed and updated. Because these activities support all research, not only the work in the targeted technologies, these costs were funded completely out of indirect costs recovered on all grants and contracts. No R&D funds were used to create the USM Office of Research Compliance. USM can fund such a significant growth in its own research infrastructure because our performance in grants and contracts has dramatically improved, largely as a result of the R&D investments made in earlier years. It is compelling evidence that the whole idea is working. Seed investments, funded by the legislature, produce new grants and contracts with indirect costs that can be plowed back into the R&D work to seed new productivity. And onward it goes.

USM's externally funded research is growing—in the number of projects, in the amount that is funded, and in the quality and competitiveness of the research. Continuing the investments will continue to result in further increases in research productivity at USM, especially in Maine's targeted technology areas.

III. State Research Appropriation for Operations

The University of Maine System received an appropriation of \$500,000 in FY1998, an additional \$4,000,000 in FY1999, an additional \$5,550,000 in FY2000, and an additional \$50,000 in FY2001 bringing the total available for research in FY2001 to \$10,100,000. There was no additional appropriation for FY2002; therefore, the FY2002 appropriation remained at \$10,100,000. The FY2002 appropriation of \$10,100,000 was distributed between the University of Maine (UM - \$8,080,000) and the University of Southern Maine (USM - \$2,020,000).

Of the FY2002 allocation of \$10.1 million and \$0.2 million carried forward from FY2001, UM and USM (1) expended a total of \$6.3 million, (2) matched external grants & contacts with \$3.9 million, and (3) carried forward \$0.1 million in unspent funds to FY2003.

These state research dollars resulted in the UMS attracting \$40.1 million in external grant & contract funding (primarily federal), a ratio of 4 to 1. The \$10.2 million of State funds utilized during FY2002 resulted in a total of \$50.3 million being made available for research & development and supported 471 FTE positions.

The following is a summary of the utilization of the state research appropriation for operations during FY2002.

Summary of Utilization of FY2002 State Research Appropriation for Operations

	<u>FY2002 Expenditures & Physical Plant Commitments</u>	<u>Used To Match Grants & Contracts</u>	<u>Total Funds Utilized</u>	<u>Funds Carried Forward to FY2003</u>
<u>R&D Funds Utilized</u>				
UM	\$4,581,314	\$3,542,481	\$8,123,795	\$5,047
USM	<u>1,731,501</u>	<u>337,092</u>	<u>2,068,593</u>	<u>84,632</u>
Total R&D Funds	\$6,312,815	\$3,879,573	\$10,192,388	\$89,679
<u>Grants & Contracts Generated</u>			<u>40,112,567</u>	
<u>Total Funds</u>			<u>\$50,304,955</u>	

The research and development funding provided by the State of Maine was used to support (1) salaries for faculty and staff, (2) direct equipment purchases, (3) matching funds for grants and/or contracts, (4) research space, and (5) research in such areas as computer software & engineering, advanced materials engineering, advanced technologies for forestry & agriculture, aquaculture & marine sciences, biotechnology, technology transfer, information technology, and biosciences.

IV. State Appropriation for the Maine Patent Program

From the time the Program became operational and began providing public services in the first quarter of FY2002 until today, approximately 130 inventors, scientists and entrepreneurs have sought assistance from the Program. The number is presently increasing quite markedly, and stands at a rate of over ten applications for services per month. An even greater number of people have attended educational seminars on intellectual property law hosted by the Program and the Technology Law Center.

The Program works closely in partnership with other Maine economic development institutions, including the Maine Small Business Development Centers, the Maine MEP, and the Maine Technology Institute ("MTI"). Since September 2001, over 20 of the Program's clients have received seed or development grant awards from MTI and several

of these awards were for the purpose of pursuing patents. The Program estimates that since its inception, between ten and fifteen new clients have filed or soon will file patent applications with the Program's assistance, and several clients who had pending applications now hold issued patents.

The University of Maine System received an appropriation of \$300,000 in FY2001 for the Maine Patent Program. In FY2002, \$75,000 was deappropriated on a one-time basis from the Maine Patent Program resulting in a total FY2002 appropriation of \$225,000. The deappropriated \$75,000 was then reallocated to the Lewiston/Auburn College Teachers for Elementary and Middle Schools Project. The Maine Patent Program is a key component of the state's initiative to foster economic development by providing resources and improving opportunities for high tech businesses in Maine. The program provides Maine innovators with information, education, training, advice, and assistance with patent, trademark, copyright, and trade secret protection, commercialization, and licensing. During FY2002, \$197,145 of State appropriated funds was expended and \$265,774 was carried forward to FY2003. The unused funds have been or will be distributed to the program for use in future years.

V. State Funding for Research Capital Projects

On November 3, 1998, the voters of Maine approved a \$20.0 million bond issue to improve the Maine economy by supporting innovative research and development. The University of Maine System received \$13.5 million from this bond issue to be used for capital improvements and equipment purchases to support research and development. The bond proceeds were distributed between the University of Maine (\$10,800,000) and the University of Southern Maine (\$2,700,000).

On June 4, 1999, the Governor signed into law the Part II Supplemental Appropriation budget (Chapter 401) that appropriated \$2,500,000 in 2000/01 to the University of Maine System on a "base budget" basis to pay the debt service on a \$25 million university research & development revenue bond. The university issued the revenue bond on August 15, 2000 that provides \$20 million for University of Maine Engineering & Science Research Facility and \$5 million for the University of Southern Maine Portland Science Building Lab Renovation.

On April 25, 2000, the Governor signed into law a one-time supplemental appropriation (Chapter 731) that appropriated \$9 million for the renovation of teaching laboratories and classrooms in Aubert Hall at the University of Maine.

Summary of Utilization of FY2002 Research Capital Funds

	<u>Bond Portion</u>	<u>Other Funds</u>	<u>Total Project Budget</u>	<u>Expenditures to Date</u>	<u>Funds Carried Forward To FY2003</u>
<u>FY1999 State Bonds</u>					
UM	\$10,800,000	\$574,364	\$11,374,364	\$8,703,635	\$2,670,729
USM	<u>2,700,000</u>	<u>155,000</u>	<u>2,855,000</u>	<u>2,810,821</u>	<u>44,179</u>
Total	\$13,500,000	\$729,364	\$14,229,364	\$11,514,456	\$2,714,908

FY2001 University Revenue Bonds

UM	\$20,000,000	\$500,000	\$20,500,000	\$3,383,164	\$17,116,836
USM	<u>5,000,000</u>	<u>4,062,663</u>	<u>9,062,663</u>	<u>969,119</u>	<u>8,093,544</u>
Total	\$25,000,000	\$4,562,663	\$29,562,663	\$4,352,283	\$25,210,380

	<u>One-time Appropriation</u>	<u>Other Funds</u>	<u>Total Project Budget</u>	<u>Expenditures to Date</u>	<u>Funds Carried Forward To FY2003</u>
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FY2001 One-time Appropriation

UM	\$9,000,000	\$3,000,000	\$12,000,000	\$4,904,079	\$7,095,921
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LEGISLATIVE HISTORY OF STATE RESEARCH APPROPRIATION FOR OPERATIONS

The following is a summary of the actions of the 118th, 119th, and 120th Maine Legislatures with regard to appropriating research funds for operations to the University of Maine System.

118TH LEGISLATURE

- On March 26, 1997, the Governor signed into law the Economic Improvement Strategy (Chapter 24) that appropriated \$500,000 to the University of Maine System for research.
- On April 1, 1998, the Governor signed into law the Economic Improvement Strategy (Chapter 643, Part LL, Section S-3) that appropriated \$4,000,000 to the University of Maine System for research. These funds were allocated from the FY98 year-end state surplus for use in FY99.

119TH LEGISLATURE

- On March 15, 1999, the Governor signed into law the Part I Current Services budget (Chapter 16) that appropriated \$4,000,000 in 1999/00 and 2000/01 to the University of Maine System on a "base budget" basis for research. This extends the one-time FY99 \$4,000,000 research appropriation that was funded from the FY98 year-end state surplus.
- On June 4, 1999, the Governor signed into law the Part II Supplemental Appropriation budget (Chapter 401) that appropriated an additional \$5,550,000 in 1999/00 and an additional \$50,000 in 2000/01 to the University of Maine System on a "base budget" basis for research.
- On April 25, 2000, the Governor signed into law the Part II Supplemental Appropriation budget (Chapter 731) that appropriated \$300,000 in 2000/01 to the University of Maine System on a "base budget" basis for the Maine Patent Program.

120TH LEGISLATURE

- On June 21, 2001, the Governor signed into law the Part II Supplemental Appropriation budget (Chapter 439) that appropriated an additional \$2,000,000 in 2002/2003 to the University of Maine System on a "base budget" basis for research.
- On March 25, 2002, the Governor signed into law a one-time deappropriation (Chapter 559) that reduced the FY2003 \$2,000,000 Supplemental Appropriation by \$1,000,000 on a "one-time" basis for research.
- On July 1, 2002, the Governor signed a Financial Order that curtailed the FY2003 \$2,000,000 Supplemental Appropriation by an additional \$1,000,000. This eliminated the FY2003 increase of \$2,000,000 for research, bringing the FY2003 research & development appropriation back to the FY2002 level of \$10,100,000. On November 18, 2002, the Governor signed into law a supplemental appropriation budget (Chapter 714) that deappropriated the \$1,000,000 curtailment that was signed on July 1, 2002.

Summary of the Allocation of Operating Research Funds to UM and USM.**118th Legislature**

	<u>FY98 New Appropriation</u>	<u>FY99 New Appropriation</u>	<u>Total New Two-Year Appropriation</u>
UM	\$400,000	\$3,200,000	\$3,600,000
USM	100,000	800,000	900,000
TOTAL	<u>\$500,000</u>	<u>\$4,000,000</u>	<u>\$4,500,000</u>

LEGISLATIVE HISTORY OF STATE RESEARCH APPROPRIATION FOR OPERATIONS**119th Legislature**

	<u>FY2000 New Appropriation</u>	<u>FY2001 New Appropriation</u>	<u>Total New Two-Year Appropriation</u>
UM	\$4,440,000	\$40,000	\$4,480,000
USM	1,110,000	10,000	1,120,000
TOTAL	<u><u>\$5,550,000</u></u>	<u><u>\$50,000</u></u>	<u><u>\$5,600,000</u></u>

120th Legislature

	<u>FY2002 New Appropriation</u>	<u>FY2003 New Appropriation</u>	<u>Total New Two-Year Appropriation</u>
UM	\$0	\$0	\$0
USM	0	0	0
TOTAL	<u><u>\$0</u></u>	<u><u>\$0</u></u>	<u><u>\$0</u></u>

Total Research Appropriation for 2000/01 - 2002/03

	<u>FY2001 Appropriation</u>	<u>FY2002 Appropriation</u>	<u>FY2003 Appropriation</u>
UM	\$8,080,000	\$8,080,000	\$8,080,000
USM	2,020,000	2,020,000	2,020,000
TOTAL	<u><u>\$10,100,000</u></u>	<u><u>\$10,100,000</u></u>	<u><u>\$10,100,000</u></u>

LEGISLATIVE HISTORY OF STATE RESEARCH CAPITAL FUNDING**VOTER APPROVAL OF STATE RESEARCH CAPITAL BONDS**

On November 3, 1998, the voters of Maine approved a \$20,000,000 bond issue to improve the Maine economy by supporting innovative research and development by businesses and non-profit and educational institutions in the fields of biotechnology, computers and other information technology, aquaculture and marine technology, forestry and agriculture, and advanced materials. It is anticipated that the proceeds from this bond issue will provide the following benefits:

- will create new jobs, new products, new business and industries;
- will attract millions of dollars in federal funds to support Maine -based Research and Development;
- will help strengthen Maine's economy and improve its quality of life; and
- will help make Maine more competitive with other states.

The University will be receiving \$13,500,000 from the \$20.0 million bond issue to be used for capital improvements and equipment purchases to support research and development in marine biotechnology, software engineering and development, advanced technologies for forestry and agriculture, biotechnology and advanced materials engineering and development.

Allocation of Bond Proceeds

UM	\$10,800,000
USM	<u>2,700,000</u>
TOTAL	<u><u>\$13,500,000</u></u>

STATE APPROPRIATION FOR DEBT SERVICE ON UNIVERSITY R&D REVENUE BOND

On June 4, 1999, the Governor signed into law the Part II Supplemental Appropriation budget (Chapter 401) that appropriated \$2,500,000 in 2000/01 to the University of Maine System on a "base budget" basis to pay the debt service on a \$25 million university research & development revenue bond. The university issued the revenue bond on August 15, 2000 that provides \$25 million for the following R&D projects.

Allocation of Bond Proceeds

UM - Engineering & Science Research Facility	\$20,000,000
USM - Science Building Addition/Renovation	<u>5,000,000</u>
TOTAL	<u><u>\$25,000,000</u></u>

APPENDIX B

UNIVERSITY OF MAINE SYSTEM

UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION

ACCOUNTING PERIOD: 7/1/2001 - 6/30/2002

UM/USM COMBINED

University	Source of R&D Funds			Utilization of R&D Funds				Funds Carried Forward To FY2003 ¹	New Grants & Contracts Generated ²	Total FTE Positions Supported By All R&D Funds ³
	FY2002 R&D Base Budget	Total Unused R&D Funds from Prior Years	Total R&D Funds Available	FY2002 R&D Actual Expenditures	Transferred To Match Grants & Contracts	Commitments to Physical Plant Projects	Total R&D Funds Utilized			
UM	8,080,000	48,842	8,128,842	4,208,721	3,542,481	372,593	8,123,795	5,047	39,374,606	439
USM	2,037,369	115,856	2,153,225	1,666,501	337,092	65,000	2,068,593	84,632	737,961	32
TOTAL	<u>\$10,117,369</u>	<u>\$164,698</u>	<u>\$10,282,067</u>	<u>\$5,875,222</u>	<u>\$3,879,573</u>	<u>\$437,593</u>	<u>\$10,192,388</u>	<u>\$89,679</u>	<u>\$40,112,567</u>	<u>471</u>

¹Include year-end equipment carry-over funds (equipment ordered, not received, and not paid).

²Dollar value of new grants & contracts that resulted from FY2002 State R&D funds.

³One FTE position is equivalent to one full-time employee working for an entire year on R&D projects.

UNIVERSITY OF MAINE SYSTEM

UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION

ACCOUNTING PERIOD: 7/1/2001 - 6/30/2002

UM

Major Research Area	Source of R&D Funds			Utilization of R&D Funds				Funds Carried Forward To FY2003 ¹	New Grants & Contracts Generated ²	Total FTE Positions Supported By All R&D Funds ³
	FY2002 R&D Base Budget (a)	Total Unused R&D Funds from Prior Years (b)	Total R&D Funds Available (a)+(b)	FY2002 R&D Actual Expenditures (c)	Transferred To Match Grants & Contracts (d)	Commitments to Physical Plant Projects (e)	Total R&D Funds Utilized (c)+(d)+(e)			
Advanced Materials Engineering	2,732,164	48,755	2,780,919	1,574,391	1,206,528	0	2,780,919	0	8,358,635	109
Adv. Technologies Forestry & Agriculture	1,811,801	0	1,811,801	374,717	1,437,084	0	1,811,801	0	5,496,790	94
Aquaculture & Marine Science	1,159,776	0	1,159,776	493,445	366,331	300,000	1,159,776	0	8,064,312	69
Biotechnology	92,918	0	92,918	56,150	36,768	0	92,918	0	5,097,995	32
Computer Software & Engineering	804,677	0	804,677	561,062	182,032	61,583	804,677	0	3,572,379	53
Technology Transfer	1,478,664	87	1,478,751	1,148,956	313,738	11,010	1,473,704	5,047	8,784,495	82
Total	\$8,080,000	\$48,842	\$8,128,842	\$4,208,721	\$3,542,481	\$372,593	\$8,123,795	\$5,047	\$39,374,606	439

¹Include year-end equipment carry-over funds (equipment ordered, not received, and not paid).²Dollar value of new grants & contracts that resulted from FY2002 State R&D funds.³One FTE position is equivalent to one full-time employee working for an entire year on R&D projects.

APPENDIX B

UNIVERSITY OF MAINE SYSTEM

UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION

ACCOUNTING PERIOD: 7/1/2001 - 6/30/2002

USM

Major Research Area	Source of R&D Funds			Utilization of R&D Funds			Total R&D Funds Utilized (c)+(d)+(e)	Funds Carried Forward To FY2003 ¹	New Grants & Contracts Generated ²	Total FTE Positions Supported By All R&D Funds ³
	FY2002 R&D Base Budget (a)	Total Unused R&D Funds from Prior Years (b)	Total R&D Funds Available (a)+(b)	FY2002 R&D Actual Expenditures (c)	Transferred To Match Grants & Contracts (d)	Commitments to Physical Plant Projects (e)				
Lewiston-Auburn R&D	130,594	40,619	171,213	162,733	0	0	162,733	8,480	0	1
Library Research	95,000	3,600	98,600	84,617	0	0	84,617	13,983	0	0
J Wise Lab	0	0	0	3,942	0	0	3,942	(3,942)	0	0
John Roberts Road	236,000	0	236,000	192,298	46,986	25,000	264,284	(28,284)	0	0
Research Development	151,451	5,000	156,451	118,183	8,646	0	126,829	29,622	0	2
College of Arts & Sciences	75,000	0	75,000	71,944	1,060	0	73,004	1,996	0	1
Opportunity Programs	312,425	42,820	355,245	140,320	213,773	0	354,093	1,152	510,981	7
Information Technology Institute	395,281	20,730	416,011	363,868	6,000	0	369,868	46,143	163,980	11
Bioscience institute	641,618	3,087	644,705	528,596	60,627	40,000	629,223	15,482	63,000	10
Total	\$2,037,369	\$115,856	\$2,153,225	\$1,666,501	\$337,092	\$65,000	\$2,068,593	\$84,632	\$787,961	32

¹Include year-end equipment carry-over funds (equipment ordered, not received, and not paid).

²Dollar value of new grants & contracts that resulted from FY2002 State R&D funds.

³One FTE position is equivalent to one full-time employee working for an entire year on R&D projects.

APPENDIX B

UNIVERSITY OF MAINE SYSTEM

UTILIZATION OF FY2002 MAINE PATENT PROGRAM APPROPRIATION

ACCOUNTING PERIOD: 7/1/2001 - 6/30/2002

USM

Major Program Area	Source of Patent Program Funds			Utilization of R&D Funds					Funds Carried Forward To FY2003 ¹	New Grants & Contracts Generated ²	Total FTE Positions Supported By All Patent Funds ³
	FY2002 Patent Program Base Budget (a)	Total Unused Funds from Prior Years (b)	Total Patent Program Funds Available (a)+(b)	FY2002 Patent Program Actual Expenditures (c)	Transferred To Match Grants & Contracts (d)	Commitments to Physical Plant Projects (e)	Total Patent Program Funds Utilized (c)+(d)+(e)				
Maine Patent Program	228,501	236,418	462,919	197,145	0	0	197,145	265,774	0	3	

¹Include year-end equipment carry-over funds (equipment ordered, not received, and not paid).

²Dollar value of new grants & contracts that resulted from FY2002 Maine Patent Program funds.

³One FTE position is equivalent to one full-time employee working for an entire year on Maine Patent Program projects.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

AREA I: ADVANCED MATERIALS ENGINEERING

Development & Commercialization of Wood-based Composites in Maine

Principal Investigator: Habib Dagher

Sponsor and Amount: National Science Foundation: **\$575,543**

Project Title: "Development and Commercialization of Wood-Based Composites in Maine"

Purpose:

The objective of this project at the University of Maine's Advanced Engineered Wood Composites Center (AEWC) is to develop partnerships that will help commercialize Composite Reinforced Wood (CRW) technologies and revolutionize wood construction. Recent research has shown that CRW, which combines natural wood materials with synthetic resins and fiber reinforcements, offer superior properties to wood at reduced costs. UMaine studies demonstrated that 2% reinforcement can increase the strength of wood beams by over 50%, and can increase nail holding capacity in Oriented Strand Board (OSB) sheathing panels by nearly 50%. This important innovation may help mitigate the cost of hurricane and earthquake-related disasters, which amount to \$50 billion annually in the U.S. alone.

Description of Grant or Project:

The proposed project will create a permanent Innovation Unit (IU) within AEWC at UMaine. The IU will be housed in the new AEWC research laboratory and will draw on University, state, and private sector resources to facilitate commercialization of CRW technologies. **Integrating the IU within a research Center rather than elsewhere in the university administration will provide the closest possible link between researchers and the commercial markets.** The IU services will include comprehensive technology transfer, education, market assessment, and commercialization.

The following innovation partners have been carefully selected to help bridge the existing gap between research and commercialization: (1) **State organizations** including the Maine Technology Institute, the Eastern Maine Development Corporation, and the Maine Department of Economic and Community Development (DECD); (2) **Private organizations** in and out-of-state including Dow Chemical, Louisiana Pacific, State Farm, APA the Engineered Wood Association, and the Market Development Alliance of the FRP composites Industry; and (3) **National Laboratories** including the USDA Forest Product Laboratory and the NIST Building and Fire Research Laboratory.

Potential Outcomes / Economic Impact:

The \$280 billion/year U.S. residential construction industry is one of the industries least invested in R&D. Wood structural framing methods have made little progress in over 50 years. The lack of innovation continues to result in devastating tolls on both life and property. Hurricane Andrew alone cost State Farm Insurance \$30 billion.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

The wood products industry currently represents 25% of Maine's economy. Maine is the most heavily forested state in the U.S. and much of the available wood resource is lower-grade timber. The ability to reinforce this timber so that it can be efficiently used in construction has a significant economic value. **Having emerged as a research leader in CRW, the University of Maine is poised to make a strong impact on state, regional and national economies that rely on the forest product industry.**

Technology in Wireless Communications

Principal Investigator: Mauricio Pereira da Cunha

Sponsor and Amount: National Science Foundation; **\$375,000**

Project Title "Acoustic Wave Filters for High Wireless Communications"

Purpose:

Expanding commercial and military applications crowd the wireless communications frequency band, creating a critical need to expand the band to higher frequencies. With a prestigious five-year CAREER award from the National Science Foundation, Mauricio Pereira da Cunha of the Department of Electrical and Computer Engineering will study a newly discovered acoustic wave phenomenon that will help address that need.

Description of Select Grants and Contracts:

So-called "high velocity pseudo surface acoustic waves (HVPSAWs)" have the potential of satisfying the high frequency requirements of the **next generation of wireless communications**. The research objectives are to identify piezoelectric materials in which HVPSAWs exist, and to design, fabricate, and test prototype HVPSAW filters. The project will also develop educational activities to give experience in this fast moving area to high school and college students. Potential applications range from cellular phones to high speed communication and signal processing systems.

Potential Outcomes / Economic Impact:

The CAREER program will result in tangible research and educational benefits. Relative to research it will provide the knowledge base critical to the next generation commercial and military wireless systems. Educationally it will **establish a model program** whereby education is carefully integrated into a state-of-the-art research program to provide a learning experience for students ranging from high school to graduate level. Finally, it will **strengthen U.S. research and education capabilities in an area that currently has a significant need for highly trained industry and academic professionals.**

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

AREA II: ADVANCED TECHNOLOGIES FOR FORESTRY AND AGRICULTURE

Initiative for Future Agricultural and Food Systems

Principal Investigator: Stewart Smith

Sponsor and Amount: USDA; **\$2,000,000**

Project Title: "Re-Integrating Crop and Livestock Enterprises in Three Northern States"

Purpose:

The goal of this project is to identify, promote, and assist farmers in adopting integrated crop and livestock farming systems that **reduce costs, increase market opportunities and increase profits for small and mid-size family farms.**

Description of Grant or Project:

Working with 60 cooperating farms, the project uses a holistic systems approach that incorporates research, education, and extension activities and that evaluates six inter-related **outcome elements: economic impact, marketing opportunities, community impact, ecosystem impact, farmer adoption, and information transfer.** The project spans four years and involves the collaboration of ten institutions across three states with participants from ten different disciplines. The three states represent the Northeast, the Mid-West and the Great Lakes regions of the country; thus knowledge and farmer adoption experience gained from this project will be applicable to a significant portion of the U.S. agricultural sector.

Potential Outcomes / Economic Impact:

The project's objectives are directly related to the six outcome elements:

1. Identify integrated crop and livestock systems that **increase efficiency and profitability** for small and mid-sized family farms
2. Determine marketing opportunities created by integrated systems
3. **Identify community infrastructure needs** for supporting farmer adoption of integrated systems
4. Identify and estimate impact of **farming-system change on the natural ecosystem**
5. Evaluate farmer adoption process; identify constraints in adopting more integrated systems
6. **Assist farmers in adopting appropriate integrated systems**

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

New England Wood Utilization

Principal Investigator: Stephen Shaler
Sponsor and Amount: USDA; \$824,233
Project Title: "New England Wood Utilization"

Purpose:

The overall objective of this research project is to **increase our knowledge** of the properties of timber species located in the Northeastern U.S.—with special emphasis on Northern New England, **improve the efficiencies and environmental compatibility** of existing industries, and **develop new products** which could generate expansion of the forest products industrial base.

Description of Grant or Project:

The New England Wood Utilization Research grant is a multi-project program which addresses wood resource and utilization issues of specific interest to Maine. Program activities include:

- Improvement of environmental compatibility of wood pulping and bleaching
- Use of low-value wood residues (sawdust) in extruded wood/plastic composites for residential markets
- Development of a stock glue-laminate material from hardwood resources
- Improved lumber drying for white pine
- Development of processes to bond wood together without the need for petrochemical-derived adhesives

Potential Outcomes / Economic Impact:

The project on development of stock glue-laminate material has had a direct economic impact through the creation of market data and process information, which was used in the planning of the recently announced manufacturing company in **Bangor, Engineered Materials of Maine**.

The research activities in extrusion have generated technical information of value to the company **Correct-Deck of Biddeford, Maine**. This recent start-up company has expanded its employment to 24 people since its founding three years ago. It purchases raw residual material from other wood products manufacturing companies in Maine - thereby having a multiplier effect on the vitality of the wood products manufacturing sector of Maine. The other research activities have generated information which is being evaluated for commercial applicability.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

Climate Modeling

Principal Investigator: Gregory Zielinski

Sponsor and Amount: National Science Foundation: **\$326,329**

Project Title: "Highly Detailed Reconstructions of New England Weather Over the Past Few Centuries and Their Climatic Implications"

Purpose:

Obtaining highly detailed and lengthy records of past climatic variability at the regional level is particularly important to better inform society about the range of climatic change. This is of the utmost importance because the New England region—especially Maine, may not respond to future climatic change in the same manner as other parts of the country. It is equally important to develop records of past climatic conditions to evaluate how the number and magnitude of severe climatic events have changed with time. It is these extreme events that can greatly alter one's lifestyle. **The purpose of this study is to develop daily weather conditions for New England over the past 300+ years by compiling and analyzing written records of climate history.** For the most part, instrumental records only extend back to the turn of the century giving us a very short window to use for understanding how climate has varied in New England. Historical climatology provides the means to extend instrumental records back in time to better understand how the climate system works in New England, and thus, better predict future changes.

Description of Select Grants and Contracts:

This project has two general goals. The first goal will answer specific questions about how New England's climate as a whole has varied over the past few centuries. Examples of some key questions include:

- How has yearly weather conditions varied during the cold periods of the 1800s compared to the overall warmer climate of the present?
- What could be the major circulation patterns in existence that drive any differences?
- How much variability in snowfall has there been over the last 300-400 years, and what may be the cause of this variability?
- How much variability has there been in severe weather, such as nor'easters, hurricanes and tornadoes compared to more recent climatic conditions, and most importantly,
- How much change has occurred in the frequency and magnitude of extreme specific events?

The second major goal is to make the data compiled in this study available to the general public, primary and secondary schools, and other researchers through the development of a relational database on the web. The first year of this study has focused on establishing the database. Initial entries can be found at www.umaine.edu/oldweather.

Potential Outcomes/Economic Impact:

- **Provide relevant information on local climatic change to teachers, students and the general public**
- Provide details on the range of past climatic conditions in the state to **better prepare stakeholders—such as farmers, fishermen, and the ski, tourist and sugaring industries—for the possible climatic conditions they may face in the future**

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

AREA III: AQUACULTURE AND MARINE SCIENCES

Marine Sediments and Seabed Mines

Principal Investigator: Larry Mayer

Sponsor and amount: Office of Naval Research: **\$717,902**

Project Title: "Nutritional Control of Bioturbation in Marine Sediments"

Purpose:

With a grant from the Navy, Larry Mayer and Peter Jumars at the University of Maine's Darling Marine Center are currently studying the mixing of sediments (bioturbation) by animals which dwell on the sea bottom. **This mixing is important to the Navy because it can bury or expose mines on the seabed, and change the acoustic properties that allow the Navy to find them.** The project tests the idea that mixing is limited by the amount of food available to the animals.

Description of Grant or Project:

Bioturbation of marine sediments is driven by the feeding activities of small sea bottom-dwelling animals. It follows that bioturbation will be strongly influenced by the food quality of the edible sediments. Patterns of bioturbation in the oceans show some connection to sediment food quality, but this dependence is not well understood. This project is therefore structured as a series of nutritional studies on animals typically found on the sea bottom, followed by field surveys of food content, animal populations, and mixing activity. **The results will be used in latest-generation computer models of seabed mixing.** Field studies will be carried out in coastal Maine and the shelf of the Mississippi delta region.

Potential Outcomes/Economic Impact:

The results of this project will provide not only a test of the food quality hypothesis, but also a **series of valuable new data on feeding styles of bottom-dwelling animals**, how temperature affects a variety of the animals, and how the animals' feeding affects ocean acoustics. These tests will be used to test and implement several new modeling approaches to bioturbation. It will also provide useful information for a potential worm aquaculture industry, in which there has been some recent interest, by providing nutritional guidelines for the types of animals under consideration.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

AREA IV: BIOTECHNOLOGY

Research Infrastructure

Principal Investigator: Robert Lad

Sponsor and amount: National Science Foundation: **\$893,199**

Project Title: "University of Maine Research Infrastructure to Enhance Maine's High Technology Industries-BioSensor portion, Year 2"

Purpose:

The overall objectives of Biological Sensor research at UMaine are four-fold:

- Address national and international needs in the area of sensor technology including **detection of chemical and biological agents**; monitoring of air, soil and water quality; industrial process control and **medical diagnostics**.
- **Maintain a comprehensive research and development program** addressing the theory, design and fabrication of sensor elements, and the characterization and testing of prototype sensors.
- **Contribute to human resource development** in the broad area of sensor technology by providing advanced training for undergraduate and graduate students, postdoctoral fellows, and visiting scientists.
- **Transfer the products of basic and applied research to the government and industrial sector** by emphasizing the integration of new types of sensor technologies into end-product instruments and systems.

This research initiative is establishing new research expertise and infrastructure at UMaine in the area of Biosensor Technology. The initiative is **addressing the nation's critical need for the development of small, sensitive, and selective biosensor devices and detection systems** that can reliably operate in real time and in extreme and diverse physical environments. Biosensors are used in many applications such as **food-safety diagnostics, medical monitors, and detection systems for biological-warfare agents**. Fundamentally, this research project is working toward overcoming several significant scientific and engineering barriers currently preventing commercial realization of biosensors.

Potential Outcomes / Economic Impacts:

Accomplishments of the Biosensor program include the following:

- **More than a dozen research collaborations** created with chemists, physicists, microbiologists, food scientists, and electrical engineers at UMaine and its **industry partners: The Jackson Laboratory, Fairchild Semiconductor**, and the design firm Andrew Bodkin Associates of Wellsley, MA
- Significant research and educational opportunities being provided for students at various levels
- New research programs developed from collaborations and recently funded by, or pending with, agencies such as USDA and NIH
- New Biosensor-related products created, including several data collection computer programs that will be useful to researchers beyond UMaine

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

- **New technologies to be commercialized in:**
 - *health care *environmental protection *food safety *safeguarding of our military
 - ...Generating **new high technology jobs** for Maine
- **Three new chemical sensor patents filed**, with numerous more expected
- Three new post-docs positions filled
- The hiring and investment in **three new highly skilled researchers**, providing Maine with **technological expertise** unavailable until now

Biosensor Research

Principal Investigator: Paul Millard

Sponsor and amount: National Science Foundation: **\$70,000**

Project Title: "A Biosensor Platform for Detection of Fish Pathogens"

Description of Grant or Project:

Conventional approaches for direct microbial sampling of marine organisms are typically slow and labor-intensive. There is a need for alternative rapid pathogen detection methods that avoid the pitfalls of the current techniques and provide cheaper, simpler, and user-friendly approaches to pathogen detection.

Purpose:

The overall project goal is to combine proven molecular and solid state electronic technologies to **create an inexpensive hybrid biosensor** that can be used by individuals without specialized training to perform rapid, accurate, and reliable detection of microbial pathogens in marine finfish and shellfish.

Potential Outcomes / Economic Impacts:

Each year infectious diseases give rise to substantial economic losses to industries that rely on the cultivation and/or harvest of marine finfish and shellfish. Early detection of microbial pathogens could greatly reduce the effect of these agents on the marine fisheries and aquaculture industries. **Inexpensive yet reliable methods for rapid detection of a range of disease-causing organisms** are clearly needed for the evaluation of wild populations, marine animals grown in aquaculture, seed stocks for propagation, and harvested marine animals destined for market as food.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

AREA V: COMPUTER SCIENCE AND ENGINEERING

Next Generation Geospatial Information Management

Principal Investigator: Peggy Agouris

Sponsor & amount: National Science Foundation; **\$1,500,000**

Project Title: Enabling the Creation and Use of GeoGrids for Next Generation Geospatial Information

Purpose:

A research team led by scientists in UMaine's Department of Spatial Information Science and Engineering is developing GeoGrid, an environment for the intelligent management of geospatial information. UMaine scientists are collaborating with faculty members at Iowa State University and the Supercomputer Center at University of California-San Diego to develop concepts, algorithms, and system architectures to enable expert and non-expert users anywhere to query, analyze, and contribute to heterogeneous, quality-aware geospatial information. **The objective is to extend the concept of the computational grid to facilitate ubiquitous access, interaction, and contributions of quality-aware next generation geospatial information.** The project aims to enable the integration and use of large collections of disperse information of varying quality and accuracy, with example potential applications in geographic information systems, mobile computing, and bioinformatics.

Description of Grant or Project:

The GeoGrid project deals with loose groups of geospatial information sources with corresponding services, and is designed to function in anticipation of a reality where users and producers, processes and products, requirements and expectations, all vary well beyond today's standards-driven world. From a scientific point of view, the project researchers will develop novel architectures, query processes as well as quality and similarity metrics to enable the integration and use of large collections of disperse information of varying quality and accuracy. The project focuses on three main research areas:

- establishment of a statistical framework for assessing geospatial data quality
- development of uncertainty-based query processing capabilities
- development of space- and accuracy-aware adaptive systems and agents to improve the organization of information within GeoGrid and to evaluate information contributions to it

Potential Outcomes / Economic Impact:

- Address the problems introduced by higher rates of information availability, but also higher variation in data quality, content, and accuracy
- **Improve access to geospatial information by the community**
- **Improve the quality of geospatial information and services provided to all users (expert or non-expert)**
- Enable the use of various communication modalities (ranging from workstations to hand-held devices) to access, analyze and/or contribute geospatial information of varying quality
- Expand the availability of quality geospatial information beyond the office and into the field

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

State-of-the-Art Software for Testing Child Vocabulary

Principal Investigator: Alan Cobo-Lewis

Sponsor & amount: National Institutes of Child Health and Human Development: **\$350,000**

Project Title: "Computer Aided Assessment of Early Vocabulary"

Purpose:

Tracking language development in very young (8 to 30 months) children is often done by surveying parents about words their children use and understand. A widely used standard paper and pencil test is known as the MacArthur Communicative Development Inventory (CDI). With a \$350,000 three-year grant from the National Institutes of Child Health and Human Development through a subcontract from the Trefoil Corp. of Orono, Alan Cobo-Lewis, assistant research professor of psychology at the University of Maine, is developing a computerized approach to the CDI. **The goal is to make the test more useful in assessing language development.**

Description of Grant or Project:

This project is developing a computerized vocabulary assessment for typically developing or language-delayed children. The state of the art for evaluating infant/toddler vocabulary is represented by the MacArthur CDI, the culmination of over 20 years of research. **The researchers on this project will create a computerized test based on the CDI, but boasting improved *utility, reliability, and speed.***

Potential Outcomes / Economic Impact:

The last several years have seen the widespread adoption of the MacArthur Communicative Development Inventory as a research tool for evaluating infant/toddler vocabulary. The computerization of this tool, and the application of modern statistical methods, will render the instrument even easier to use. Its effectiveness as a research tool increase, and its enhanced potential for clinical use will expand the potential market.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

AREA VI: TECHNOLOGY TRANSFER

Supercluster Distributed Memory Technology

Principal Investigator: James S. Ward

Sponsor & amount: U.S. Department of Defense; \$1,727,000

Project Title: "Supercluster Distributed Memory Technology Theater Missile Defense Solutions"

Purpose:

The objectives of this program are to (1) connect numerous individual high performance computers into a parallel system that is tailored to the performance requirements of modern computational fluid dynamics (CFD) codes, (2) optimize hardware configuration and high speed networking hardware for this application, (3) demonstrate a 90% cost reduction while maintaining the computational performance required to achieve Army Theater Missile Defense (TMD) system objectives.

Description of Grant or Project:

The U.S. Army is developing TMD systems that are required to counter the potential threat of weapons of mass destruction. In an effort to meet this challenge, advanced technologies are called upon to achieve the technical requirements, minimize cost and demonstrate deterrence before threats become apparent. Design of these defensive missile systems requires sophisticated computer simulations that accurately predict the control forces exerted on a missile over its entire flight trajectory. Predictions based on sophisticated CFD programs are a critical tool for solving the most technically challenging problems of TMD missile guidance. These computer programs use numerical techniques involving extensive repetitive calculations. Existing computing resources are unable to meet the computational challenge of these simulations in a timely manner and involve high maintenance costs. To facilitate this modeling effort, **a special purpose supercomputer is being developed and optimized.**

Potential Outcomes / Economic Impact:

This project has established a Supercluster Distributed Memory Technology (SDMT) computing facility in Orono, Maine that is linked to a special purpose computational environment and devoted to the solution of TMD guidance research. The University of Maine and its private sector partner, Applied Thermal Science, Inc. (ATS) of Sanford, Maine, are operating the facility under the supervision of the U.S. Army. This project builds upon ongoing small-scale SDMT demonstration, code adaptation and performance tuning activities conducted by ATS over the past several years. D.N. American, Inc., of Fairmont, WV, will **develop a suite of innovative software tools** to increase the use efficiency of the supercluster.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

UM

Acquisition of Modern Research Equipment

Principal Investigator: Charles Guidotti

Sponsor and Amount: National Science Foundation; **\$475,000**

Project Title: "Acquisition of Modern Electron Microprobe at the University of Maine"

Purpose:

This grant allows the University of Maine to **acquire a modern electron microprobe** for the Department of Geological Sciences. This new microprobe will replace an out-of-date electron microprobe built in 1981, which lacks the capabilities needed for research in modern earth science departments. The many state-of-the-art features and capabilities of a new microprobe are available on the Department's existing microprobe, forcing faculty and student researchers to go off campus to stay competitive in their fields.

Description of Grant or Project:

The new electron microprobe will be used for instruction as well as research. The Department's undergraduate program emphasizes direct observation of geological processes and materials whenever possible, in both the field and laboratory. Courses such as Analytical Methods provide hands-on exposure to our electron microprobe and other facilities. In addition, **undergraduate students can carry out independent research projects** using the Department's analytical facilities as part of their "Capstone Experience," a University requirement for graduation.

Potential Outcomes / Economic Impact:

A modern electron microprobe will enable faculty and students to carry out complex geological science research on campus, enhancing research productivity and the educational experience of both graduate and undergraduate students. **An on-campus facility will save on precious grant funding that currently goes to facilities at other institutions.**

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *Lewiston-Auburn R&D*

Purpose of Research Area and Description of How Funds Were Spent:

This account was designated in FY02 to provide funds for research infrastructure supporting the Natural and Applied Sciences program at USM's Lewiston-Auburn College. Recent renovations at Lewiston-Auburn have created excellent spaces for research that is also well integrated with student learning. R&D funds were used to purchase laboratory equipment and supplies for those new laboratories, and to provide summer salary and student research assistant support for projects undertaken in those new spaces.

- Dr. Harris is using GIS technology in the study of ice seal stranding. His work will be funded by the National Marine Fisheries Service (NMFS) in FY03.
- Dr. Harris is also using GIS and statistical extraction techniques in the assessment of community clinic programs reducing incidence of complications for patients with diabetes. This work is being submitted to the National Institute of Nursing Research (NINR) for funding
- In collaboration with UM, Northeastern and Atlantic Salmon, Dr. Levine is developing commercially viable land-based integrated seaweed/finfish aquaculture. The red algae known as nori is both a cash crop and a method of remediation of the waste stream from the fin fish culture (salmon and halibut). Proposals have been submitted to both the Maine Technology Institute and the USDA SBIR programs.
- Dr. Whitaker is studying local species—smallmouth bass, loon, osprey, eagle, mink, seal—as sentinels of anthropogenic chemical-induced genotoxicity. Molecular biology assays (comet assay, AFLP) are now functional in the L-A laboratories. The work focused on chemotoxicity in the Androscoggin has been published and is to be presented at a national meeting.

Description of Grant & Contract Funds Generated:

(See above)

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

The three faculty members who utilized funds from this account have submitted seven proposals, of which to date two have been funded (beginning in FY03). Considerable work has been done establishing preliminary data on aquaculture and environmental toxicology projects.

All three Lewiston-Auburn faculty are actively collaborating with local industry, other USM researchers, and researchers at other Maine institutions.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *Library Research Materials*

Purpose of Research Area and Description of How Funds Were Spent:

This account supports the acquisition of new research materials in scientific areas of importance to USM's R&D efforts. Acquisitions have been primarily scientific databases and electronic journals. These resources significantly augment the existing collection in order to bring USM's research resources up to a level that supports competitive research in the areas of biosciences, biotechnology and the information sciences. Additionally, we have preserved subscriptions to some scientific journals that would have been eliminated because of the difficult combination of funding cuts and the rising costs of serials.

Funds were also allocated for 50% of a research collections developer. Twice, searches to fill this position have been unsuccessful. Because of rising costs of scientific serials, the personnel funds have been reallocated to acquisitions for the future.

Description of Grant & Contract Funds Generated:

None

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

Provides needed information infrastructure for R&D at USM.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *Wise Lab (Environmental Toxicology)*

Purpose of Research Area and Description of How Funds Were Spent:

This account was activated at nearly the end of the fiscal year (06/01/02) for the purpose of tracking the R&D funds expended to start up the laboratories and activities of the John Wise Laboratory (Environmental Toxicology).

Description of Grant & Contract Funds Generated:

None yet.

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

None yet.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *John Roberts Road*

Purpose of Research Area and Description of How Funds Were Spent:

USM is renting research facilities in South Portland (formerly occupied by the Maine Medical Center Research Institute) so that bioscience and information science research can be conducted for which there is not space on campus. Thus we advance USM's research activity while the new research wing is built on the Portland campus. This account covers rent, utilities, renovations and other operational expenses.

As of June 2002 the facility contained

- the USM animal facility, with BL2 tissue culture and procedure rooms, plus an office for the animal manager
- shared molecular biology equipment (microscopes, flow cytometer, sequencer)
- the autoimmune laboratory (Dr. Pelsue)
- the psychopharmacology laboratory (Dr. Markowski)
- the Bioethics Project (Dr. Murphy)
- one of three GIS research computers (Dr. Bampton)
- the eCollaboratory/IRIS irregulars (Dr. Wilson)
- primary offices for the director and administrative assistant
- primary office for the grants developer
- a conference room suitable for research seminars, workshops and technical presentations

During the summer, renovations were accomplished to accommodate the Environmental Toxicology laboratories. An additional researcher is being recruited, expected to begin during the Fall 2003. The 8,000 square foot facility is now crowded and will remain so, at least until the opening of the Science Building research wing next summer.

Description of Grant & Contract Funds Generated:

None directly.

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

At John Roberts Road, USM does research that could not happen on campus. Without this facility, we would not have had space for two new hires, one group displaced by the construction, or for the environmental toxicology group (Dr. Wise).

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

USM

At John Roberts Road, USM stimulates research productivity through meetings, presentations, and conversations. JRR is a central place easily accessible from the Portland, Gorham and Lewiston-Auburn campuses. During FY02, JRR hosted more than 30 meetings, research seminars, visiting federal agency personnel, technical presentations by researchers, and other opportunities for southern Maine researchers to congregate, collaborate, and share their work.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *Research Development*

Purpose of Research Area and Description of How Funds Were Spent:

This account provides support for increasing USM's capability to generate and manage funded research. Specific investments include the following:

- a grants developer to assist faculty in developing successful grant proposals
- partial support for additional staff in the Office of Sponsored Programs
- additional pre-award resources in the Office of Sponsored Programs
- partial support for additional staff in the Office of Graduate Studies

Description of Grant & Contract Funds Generated:

None directly. These investments enhance USM's ability to obtain and manage external grants and contracts, and to attract and support the graduate students involved in those projects.

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

Proposal development within the R&D targeted technologies increased substantially in FY2002. In FY2001, 20 proposals were submitted for a total dollar value of \$2,795,400. In FY2002, 42 proposals were submitted for a total dollar value of \$13,277,439. Continuing the investments in these research support areas will result in further increases in research productivity at USM, especially in Maine's targeted technology areas. Increased support for the Office of Sponsored Programs has led to improved pre- and post-award services to researchers and their administrative staff.

As USM becomes more research intensive, compliance with federal and state regulations and improving institutional review board operations becomes more critical. During FY02, a Coordinator of Research Compliance was hired, the human and animal review boards were reorganized, and compliance policies and procedures were reviewed and updated. Because these activities support all research, not only work in the targeted technologies, these costs were funded completely out of indirect costs recovered on all grants and contracts. No R&D funds were used to create the USM Office of Research Compliance. USM can fund such a significant growth in its own research infrastructure because our performance in grants and contracts has dramatically improved, largely as a result of the R&D investments made earlier.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *College of Arts and Sciences R&D*

Purpose of Research Area and Description of How Funds Were Spent:

This account is used for supplies and student research assistance for faculty in the largest college, the College of Arts and Sciences. Preliminary data, early publications and feasibility studies are critical to the success of proposals, and this account provides funds to support these modest expenses of early-stage research. The preliminary projects that utilized these funds during FY02 span the range of biological sciences at USM.

- Dr. Gainey is working on clam gill respiration, potentially important to the Maine clam industry. He submitted a proposal to the National Science Foundation entitled "Effects of Dissolved Gases and H₂O₂ on Gill Function in Mercenaria".
- Dr. Knight has demonstrated significantly increased growth in plants consequent to altered metabolism. He is investigating the utility of his procedures to increase white pine growth, of obvious significance to Maine's timber industry. This work will extend his work funded by Los Alamos National Laboratory entitled "Increasing Nitrogen Use Efficiency in Plants".
- Dr. Maher is studying sociality in woodchucks using genetic analysis to determine familial relationships. This funding allowed her to supplement a National Science Foundation project "Sociality in Marmots".
- Dr. Moore studies marine cyanobacteria. She received a grant from the American Association for the Advancement of Science, effective in FY03, "P Genes Prochlorococcus".
- Dr. Pennuto investigates biological mechanisms in lakes and ponds. He submitted a proposal to the National Science Foundation entitled "Bioturbation in Lake Sediments".
- Dr. Walker studies fish and insect locomotion. He used these funds to supplement a grant received from the Field Museum in FY2001. He received two grants described in connection with the Opportunity Programs.
- Dr. Langley-Turnbaugh studies urban forest health. She received two grants described in connection with the Opportunity

Description of Grant & Contract Funds Generated:

None here. (See related entries for Opportunity Programs)

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

Of the more than 10 CAS faculty members who have utilized these funds, eight investigators submitted proposals to major funding agencies during FY02. Of those, three proposals will be funded in FY03. During FY02, twenty-four CAS proposals in the R&D areas requested more than \$4.8M. Of those, 10 have been funded for more than \$750K.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *Opportunity Programs*

Purpose of Research Area and Description of How Funds Were Spent:

The purpose of this account is to invest funds to help USM faculty become more competitive in receiving external funding for R&D. One mechanism is internal competitions for funding to do pilot research, purchase essential but expensive equipment, and to create opportunities for collaboration locally and nationally. A second mechanism is providing matching funds to enhance proposals and increase their competitiveness for external funding.

During FY02, this account supported eight faculty doing pilot research projects (one semester and one summer) and seven faculty doing more extensive development work, involving one or two years including summers. Twelve of these fifteen faculty have submitted one or more external proposals; two of the remaining three have left the University.

The second major area of expenditures is as match for funded external grants. During FY02 funding was provided for five grants.

Description of Grant & Contract Funds Generated:

Project Title: *Differential Control of Target Gene Expression by Ecdysteroid*

Principal Investigator: David Champlin

Department: Biological Sciences

Sponsor and Amount: NIH \$147,000 4/1/02-3/31/04

Future Cost Sharing (Includes only R&D cash commitment) \$19,000

The long term objective of this study is to understand the molecular mechanisms that cause some target genes to be induced by moderate concentrations of ecdysteroid while other target genes are induced only by much higher concentrations of the steroid. The primary objective of the current study is to examine ecdysteroid regulation of target gene expression in *Drosophila* cell culture lines in order to characterize the mechanisms that allow different sets of target genes to be activated by different concentrations of the steroid. One long-term goal of the project is to extend the findings of the detailed promoter analysis begun here into analysis of target gene expression in the developing fly.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

USM

Project Title: ***X-Ray Diffraction at the University of Southern Maine***

Principal Investigator: Stephen Pollock

Department: Geosciences

Sponsor and Amount: NSF \$120,174 9/15/01-8/31/03

Future Cost Sharing (Includes only R&D cash commitment) \$36,621

This grant includes the purchase of a high-performance X-ray diffraction system with supporting computer and software. The equipment will support geological, soil science and archaeological geology and archaeological research projects.

Project Title: ***Cohort & Problem-Based Learning in an Undergraduate Environmental Science & Policy Curriculum***

Principal Investigator: Christopher Pennuto

Department: Environmental Science and Policy

Sponsor and Amount: NSF \$91,203 6/1/02-5/30/04

Future Cost Sharing (Includes only R&D cash commitment) \$30,000

The equipment purchased with this grant, an inductively coupled plasma spectrometer, will have extensive use among the ESP faculty and other USM researchers.

Project Title: ***Collaborative Research: The Evolutionary Interplay Between Life Histories, Morphologies, Performance, and Behavior in Trinidad Guppies***

Principal Investigator: Jeffrey Walker

Department: Biological Sciences

Sponsor and Amount: National Science Foundation \$70,000 7/1/01-6/30/04

Future Cost Sharing (Includes only R&D cash commitment) \$0

The empirical study of natural selection reveals that adaptations often involve compromises among competing influences. Because natural selection acts on whole organisms rather than individual traits, the final product will necessarily represent a compromise among all the different ways that a given trait influences fitness, all the different traits that compromise the phenotype, and all the correlations that exist among those traits. This research examines how selection acts on the integration of life histories, body shape, swimming performance, and behavior in natural populations of the guppy.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

USM

Project Title: *National Marine Aquaculture Initiative*

Principal Investigator: John Duff

Department: Marine Law Institute

Sponsor and Amount: National Sea Grant Office \$44,634

9/1/01-8/31/02

Future Cost Sharing (Includes only R&D cash commitment) \$5000

- To identify legal and policy issues related to the property interests involved in ocean aquaculture financing.
- To assess other property interest regimes that may serve as model(s) for allowing common property resource users to define a sufficient property interest that will meet the requirements set forth by financial institutions to warrant financing of aquaculture operations.
- To determine the state, local, and federal governments' willingness to convey such an interest to aquaculture operators.
- To determine the means for guaranteeing a public benefit for such transactions; to gauge public willingness for such transactions; and to inform stakeholders of results of research through presentations and publications.

Project Title: *Seaweed Harvesting in Maine: Evolving Laws to Meet the Needs of an Evolving Industry*

Principal Investigator: John Duff

Department: Marine Law Institute

Sponsor and Amount: Maine Sea Grant \$10,490

3/1/02-6/1/02

Future Cost Sharing (Includes only R&D cash commitment) \$0

To assess current legal regime governing seaweed harvesting in Maine's intertidal zone

Project Title: *MIPS/MEMS Sensors to Detect Airborne Contaminants*

Principal Investigator: Mustafa Guvench

Department: Electrical Engineering

Sponsor and Amount: Brims Nest Corp./MTI \$8,000

6/15/02-4/30/03

Future Cost Sharing (Includes only R&D cash commitment) \$3,000

The goal of this project is to develop a new gas sensor technology by combining "Molecular Imprintable Polymers" (MIPs) and "Micro-Electro-Mechanical-Systems" (MEMs) technologies. The MEMs based resonator gas sensors to be developed, by utilizing very highly gas absorptive properties of some MIPs, are expected to be of better quality, lower cost, higher sensitivity and versatile compared to existing sensors to detect a great majority of the 118 Clean Air Act toxic air pollutants.

APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA

USM

Project Title: ***Assessing the Influence of Environmental Parameters on Asthma in Maine***
Principal Investigator: Samantha Langley-Turnbaugh
Department: Environmental Science and Policy
Sponsor and Amount: MSGC/NASA \$9,980 5/1/02-4/30/03
Future Cost Sharing (Includes only R&D cash commitment) \$0

The objectives of this proposal are to identify spatial and temporal trends in Maine asthma hospitalization by age, gender and race, to determine the reliability of historical data to predict future hospitalization frequency for asthma, and to examine relationships between acute asthma attacks and potential environmental triggers. This project establishes Maine as a sister site in an on-going research project by scientists at NASA's Goddard Space Flight Center. (see related Travel Grant below)

Project Title: ***Collaborative Seed Grant Program-EPSCoR Travel Grant***
Principal Investigator: Samantha Langley-Turnbaugh
Department: Environmental Science and Policy
Sponsor and Amount: MSGC/NASA \$750 9/1/01-3/30/02
Future Cost Sharing (Includes only R&D cash commitment) \$0

Scientists at NASA's Goddard Space Flight Center in Greenbelt, MD have initiated a project to examine the relationships between patterns in children's asthma attacks and various environmental parameters monitored through remote sensing and ground based data. There are many possible triggers for childhood asthma attacks including outdoor and indoor air toxins and particulates, climate, pollen, the presence of eroded and contaminated soils and brownfields, and the use of possible irritants such as pesticides and fertilizers in urban areas. We will be collaborating with Dr. Elissa Levine to establish Portland, Maine as a sister site for this study.

Project Title: ***Maine Space Grant Consortium Travel Grant***
Principal Investigator: Irwin Novak
Department: Geosciences
Sponsor and Amount: MSGC/NASA \$750 1/1/02-4/30/02
Future Cost Sharing (Includes only R&D cash commitment) \$0

Earlier Space Grant funding has helped our research expand from basic research of the geology of Lesbos and Chios Islands, Greece to a NASA Goddard Space Flight Center, University of Southern Maine, and University of the Aegean collaboration which uses satellite imagery to relate topographic and bathymetric data to the tectonics in the Aegean Sea and vicinity. Funding has had a major impact in involving undergraduate students in research. Thus far, three conference papers and one journal article have come as a result of support. Application of the methodologies to a similar Maine setting is planned as a result of this work and the faculty travel to Goddard Space Flight Center

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

Project Title: ***Metal-Metal bonded Exciplexes and Their Tunability for Excited State Energy Transfer in d10 Systems***

Principal Investigator: Henry Tracy

Department: Chemistry

Sponsor and Amount: U Maine/ACS Petroleum Research Fund \$8,000 5/1/02-8/31/02

Future Cost Sharing (Includes only R&D cash commitment) \$0

The purpose is to further the understanding of exciplexes in a number of closed-shell d10 systems with dicyanoargentate(I) and dicyanoaurate(I) ions along with mixed metal Au(CN)₂/Ag(CN)₂ systems through a series of experimental and theoretical investigations. At the heart of the investigation will be lifetime and time-resolved studies, intended to yield information about energy transfer rates, as well as about the character of the excited states involved.

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

MIPS/MEMS Sensors

Start Date: 6/15/02

The University of Southern Maine has entered into an agreement with Brims Ness, Inc., a South Portland, Maine company, on behalf of Electrical Engineering faculty Mustafa Guvench, who will be working with that company on research with the objective of commercialization.

Environmental Parameters on Asthma

Start Date: 5/1/02

Fourteen years of clinical data, demographic data, and environmental data (climate, air quality, soil properties, and biological allergens) have been collected.

Evolutionary Interplay... Guppies

Start Date: 7/1/01

A 260 gallon recirculating, temperature-controlled system was built and now contains six populations of lab-reared, F2 (second generation from wild caught parents), guppies. Preliminary tests on the design of the swimming performance experiments have been completed. Swimming performance tests of the F2 individuals are in progress.

Problem-Based Learning Environment

Start Date: 6/1/02

In FY 2002 a Perkin-Elmer ICP spectrometer was purchased and a donation from Dragon Products of Thomaston of a new Perkin-Elmer AA spectrometer was received.

X-Ray Diffraction

Start Date: 9/15/01

The equipment was purchased and installed, with utilization to be initiated during summer of 2002.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

MAJOR RESEARCH AREA: *Inst for Research in Info Sciences (IRIS)*

Purpose of Research Area and Description of How Funds Were Spent:

The purpose of this account is to support research and development of information science and technology research at USM and to develop and operate the Southern Maine Institute for Research in Information Science (IRIS). The purposes of the Institute are:

- to serve as a focal point for attracting external funding for R&D in the information sciences and
- to facilitate the participation by USM and affiliated faculty in delivering the University of Maine Computer Science Ph.D. program.

Funds were used for partial salaries of the Institute Director, one research faculty member in the Information and Communications Technology program, and two new Computer Science faculty members. All the supported faculty are Institute members, and they have substantial (more than 50%) research commitment. Additional funds were used for start-up equipment for the new faculty, graduate student stipends, and the operations of the institute and its faculty.

The areas of research include:

- theoretical interactions of Java technologies with object-oriented database systems
- the performability of highly redundant, highly parallel networks
- improved access, visualization and presentation of research data and research resources for USM research areas
- high-precision digital mapping of geological and geographical features

This account also funds a university-wide site license for the ESRI suite of GIS tools and the servers on which the software is provided. In partnership with the GIS lab on the Gorham campus, IRIS encourages the use of GIS software to enhance research, and the presentation of research results by investigators in all areas of the University of Southern Maine.

Description of Grant & Contract Funds Generated:

Project Title: *Assessing the Performability of Parallel Computing Systems with Power-Tail Distributed Task Execution Time*

Principal Investigator: Pierre Fiorini

Department: Computer Science

Sponsor and Amount: MSGC/NASA \$39,430 1/1/02-12/31/03

Future Cost Sharing (Includes only R&D cash commitment) \$44,688

In recent years, there has been much interest in the integrated modeling of computer performance and dependability. This is what is known as performability modeling and evaluation and has been motivated by the fact that the servicing of jobs can continue in the presence of failures. This project investigates the performability of parallel processing systems with power-tail execution time.

**APPENDIX C
UTILIZATION OF FY2002 OPERATING RESEARCH APPROPRIATION
NARRATIVE BY MAJOR RESEARCH AREA**

USM

Project Title: ***Digital Mapping & Strain Analysis of Deformed Veins & Intrusions***

Principal Investigator: Mark Swanson

Department: Geosciences

Sponsor and Amount: NSF \$122,091 5/1/02-4/30/04

Future Cost Sharing (Includes only R&D cash commitment) \$0

A series of high resolution analytical base maps of crystal deformation processes visible in outcrops of Coastal Maine will be developed. Project will include a six-week summer research session and a fall semester independent study culminating with collaborative work on abstracts and posters for presentation of results at a professional meeting.

Project Title: ***Ecological Functions & Values of Fringing Salt Marshes Susceptible to Oil Spills in Casco Bay, Maine***

Principal Investigator: Matthew Bampton

Department: Geography and Anthropology (GIS)

Sponsor and Amount: With University of New England \$2,459 2/1/02-1/31/04

Future Cost Sharing (Includes only R&D cash commitment) \$0

The effectiveness of oil spill cleanup operations and accurate assessment of natural resource damages caused by spills is enhanced by improved knowledge of the ecological functions and values of habitat that may be affected by oil spills.

Casco Bay is the largest oil port in Maine and northern New England. Because the extensive Casco Bay marshes are predominantly fringing marshes, and because so little is known about their ecological functions, we propose to gather information about these marshes that will clarify their value to the Bay. The values we will assess include the role these marshes play in supporting shellfish and finfish production and their ability to help protect shorelines from erosion and counter the effects of sea level rise. Knowledge of the functions and values of Casco Bay marshes and their contributions to the Bay's larger ecosystem will help guide oil spill management and improve the baseline knowledge for assessing natural resource damage assessment if a spill affects the marshes. Also, information developed in this study will be useful by planners and natural resource managers in understanding the functions and values of marshes and protecting them from human and development impacts.

Description of Outcomes/Economic Benefits Including Progress Made on Projects:

Five proposals requesting more than \$750,000 were submitted during FY02. Of these two were funded (see above) and one is still pending. Of the five graduate students employed here, two have completed their theses. Six publications have been produced.

APPENDIX D

UNIVERSITY OF MAINE SYSTEM

FY2002 SUMMARY OF STATE FUNDING FOR RESEARCH CAPITAL PROJECTS

UM/USM COMBINED

<u>Project Name</u>	<u>Referendum Bond Portion</u>	<u>Other Funds</u>	<u>Total Project Budget</u>	<u>Expenditures to Date</u>	<u>Funds Carried Forward To FY2003</u>
<u>FY1999 State Bond Issue</u>					
UM	\$10,800,000	\$574,364	\$11,374,364	\$8,703,635	\$2,670,729
USM	2,700,000	155,000	2,855,000	2,810,821	44,179
TOTAL	\$13,500,000	\$729,364	\$14,229,364	\$11,514,456	\$2,714,908

FY2001 University R&D Revenue Bonds (Debt Service Paid by \$2,500,000 State Appropriation)

UM	\$20,000,000	\$500,000	\$20,500,000	\$3,383,164	\$17,116,836
USM	5,000,000	4,062,663	9,062,663	969,119	8,093,544
TOTAL	\$25,000,000	\$4,562,663	\$29,562,663	\$4,352,283	\$25,210,380

	<u>One-time Appropriation</u>	<u>Other Funds</u>	<u>Project Budget</u>	<u>Expenditures to Date</u>	<u>Funds Carried Forward To FY2003</u>
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FY2001 One-time Appropriation

UM	\$9,000,000	\$3,000,000	\$12,000,000	\$4,904,079	\$7,095,921
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APPENDIX D
UNIVERSITY OF MAINE SYSTEM
FY2002 SUMMARY OF STATE FUNDING FOR RESEARCH CAPITAL PROJECTS

Project Name	<u>UM</u>		Total Project Budget	Expenditures to Date	Funds Carried Forward To FY2003	Estimated Completion Date
	Referendum Bond Portion	Other Funds				
<u>FY1999 State Bond Issue</u>						
Hitchner Expansion & Renovation and Food Science Building	\$8,900,000	\$548,220	\$9,448,220	\$7,274,138	\$2,174,082	1/31/03
Hitchner Connector Bridge	500,000	0	500,000	11,988	488,012	1/31/03
Aquaculture Renovation & Expansion	200,000	0	200,000	191,365	8,635	10/31/01
CRW Lab Related Work	250,000	64	250,064	250,064	0	6/15/99
Barrows Lab Renovation	74,015	1,080	75,095	75,095	0	5/10/01
Software Eng & Adv Materials Labs	875,985	25,000	900,985	900,985	0	10/25/00
	<u>\$10,800,000</u>	<u>\$574,364</u>	<u>\$11,374,364</u>	<u>\$8,703,635</u>	<u>\$2,670,729</u>	
<u>FY2001 University R&D Revenue Bonds (Debt Service Paid by \$2,500,000 State Appropriation)</u>						
Engineering & Science Research Facility	\$14,500,000	\$500,000	\$15,000,000	\$780,827	\$14,219,173	3/31/04
Machine Tool Lab Addition	3,000,000	0	3,000,000	102,337	2,897,663	9/30/03
Hitchner Addition	2,000,000	0	2,000,000	2,000,000	0	12/31/02
Boardman Hall Renovation	500,000	0	500,000	500,000	0	2/01/02
	<u>\$20,000,000</u>	<u>\$500,000</u>	<u>\$20,500,000</u>	<u>\$3,383,164</u>	<u>\$17,116,836</u>	
	One-time Appropriation	Other Funds	Total Project Budget	Expenditures to Date	Funds Carried Forward To FY2003	Estimated Completion Date
<u>FY2001 One-time Appropriation</u>						
Aubert Hall - Phase I	\$9,000,000	\$3,000,000	\$12,000,000	\$4,904,079	\$7,095,921	5/31/03

D-2

APPENDIX D

UNIVERSITY OF MAINE SYSTEM

FY2002 SUMMARY OF STATE FUNDING FOR RESEARCH CAPITAL PROJECTS

USM

<u>Project Name</u>	<u>Referendum Bond Portion</u>	<u>Other Funds</u>	<u>Total Project Budget</u>	<u>Expenditures to Date</u>	<u>Funds Carried Forward To FY2003</u>	<u>Estimated Completion Date</u>
<u>FY1999 State Bond Issue</u>						
Portland Science Building Lab Renovation	\$2,242,856	\$30,000	\$2,272,856	\$2,268,711	\$4,145	4/30/03
Portland R&D Parking	70,000	0	70,000	29,966	40,034	4/30/03
Subtotal Science Building	2,312,856	30,000	2,342,856	2,298,677	44,179	
Mitchell Center R&D Renovations	387,144	125,000	512,144	512,144	0	11/30/00
	\$2,700,000	\$155,000	\$2,855,000	\$2,810,821	\$44,179	
<u>FY2001 University R&D Revenue Bonds (Debt Service Paid by \$2,500,000 State Appropriation)</u>						
Portland Science Building Lab Renovation	\$5,000,000	\$4,062,663	\$9,062,663	\$969,119	\$8,093,544	4/30/03

D-3